

Studio Properties : a Field Guide to Design Education

JONES, Derek, BROWN, James Benedict, BOLING, Elizabeth, CORAZZO, James <<http://orcid.org/0000-0002-9542-6551>>, GRAY, Colin M and LOTZ, Nicole

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Studio. Properties

A Field Guide to Design Education

Derek Jones
James Benedict Brown

Elizabeth Boling
James Corazzo

Colin M. Gray
Nicole Lotz

B L O O M S B U R Y

Studio Properties

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Studio Properties

*A Field Guide to
Design Education*

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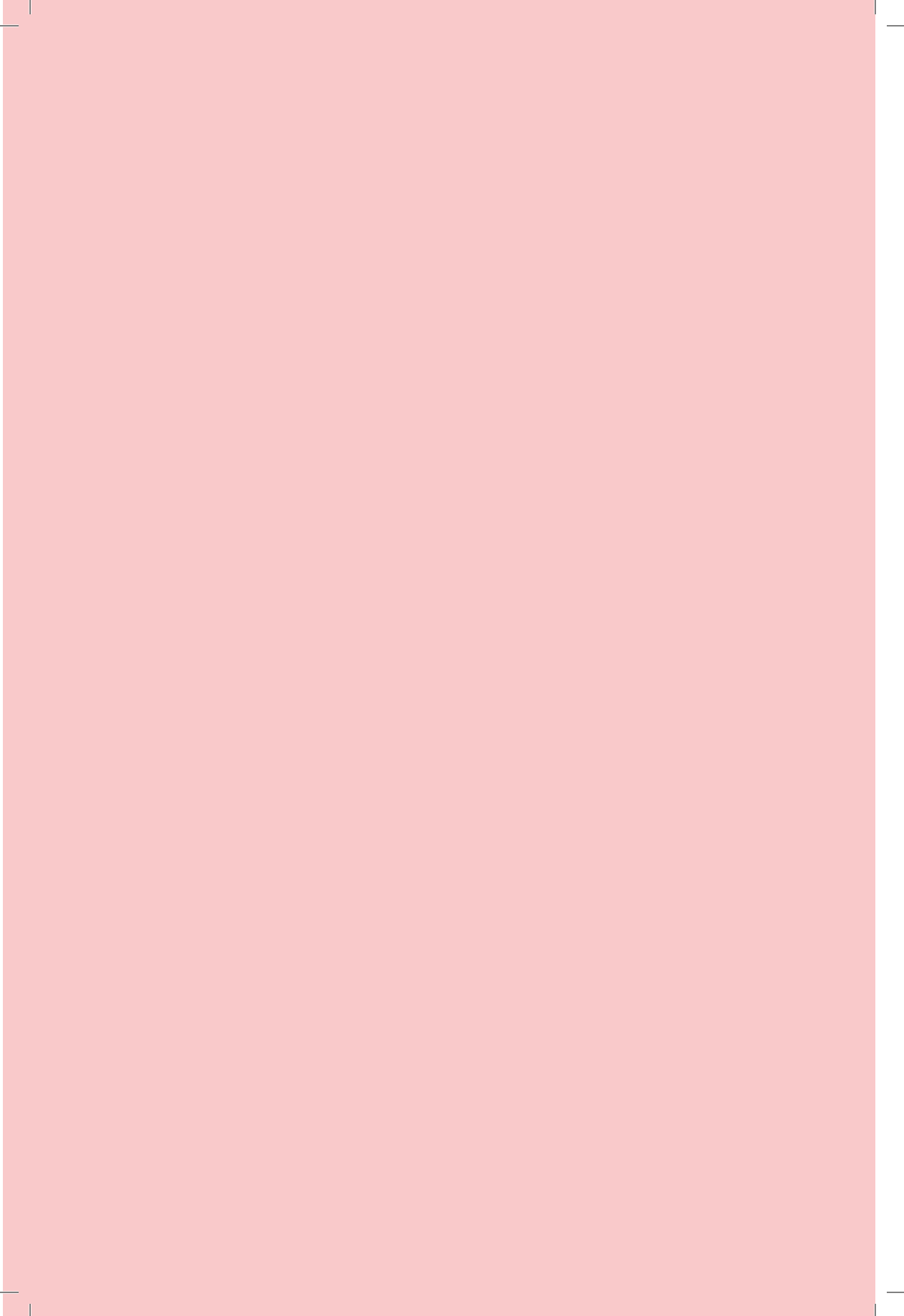
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Studio Properties is a practical and academic text that offers a series of descriptions of things, events, interactions, and experiences you may encounter as a student, educator, researcher, or observer in an educational design studio. As a practical text, it addresses the reality of being an educator or student in studio. As an academic text it is informed by relevant, rigorous scholarship and research.

Studio is complex and difficult in particular ways. Studio depends largely on implicit knowledge, personal experiences, and human cultures rather than a single canon of knowledge or universal knowledge

system. It should also be understood comprehensively, as a practice over time — not just as a series of individual events or details. A book about studio pedagogy should simplify the complexity of studio without losing its richness. More importantly, a single book cannot prescribe what studio is or should be; it can only offer different bits of knowledge about what goes into different studios as a useful way of helping the reader think about *their* studio. We call these ‘bits of knowledge’ *properties*.

Studio Properties does not define studio as an entity, practice, or culture. We adopt the warning that ‘[t]he reader looking here for a template or guide book on studio teaching will be disappointed — by intent. There is no single, generalisable set of guidelines that we can, or want to, offer’ (Boling & Schwier, 2016, p. 20). We do not provide a set of ingredients that, if put together, will automatically make a successful

studio. Instead, we propose studio must be approached holistically. The only way to understand the whole is to examine the parts, and the parts of studio only make sense when you put them together as a whole. This putting together has to be done in an applied context: teaching studio, studying studio, or researching studio. *Studio Properties*, then, is a book for more than one audience, and there is more than one way to read it. Ultimately, studio is best known through experience *and* scholarship.

The need for a book on studio education

Studio is a central and significant feature of nearly all Western design curricula. This centrality comes from the history of studio and its relationship to both design practice and education – design is both conducted and learned in studio. We present a generalised view of studio framed by a Western/Euro-centric outlook. Although there have been variations in studio throughout its existence, and studio continues to evolve, its fundamental properties and structures have remained consistent.

Studio is a place of complex pedagogies, where the type of learning that occurs is deliberately challenging and transformational. At the same time, studio is simple in certain ways. It can be initiated through little more than a space that houses collective design activity. This simplicity has allowed studio to propagate as a professional and pedagogical form, able to adapt to specific needs while retaining certain core attributes.

Despite its significance, studio lacks a clear definition, and ‘even a cursory review of educational literature [...] quickly reveals that the construct of studio means different things to different authors’ (Cennamo, 2016b, p. 248). In place of definition, educators, and researchers often describe it using metaphors or analogies, highlighting the difficulty in defining something as general and complex as studio. Farías and Wilkie introduce studio as a ‘peculiar and remarkable lacuna’ (2016b, p. 1); Orr and Shreeve describe studio as more than a place and also a ‘state of mind’ (2018, p. 91); and Jones observes that studio remains ‘messy, ill-defined, and open to (re)interpretation’ (2022b, p. 84). This book was written to address a perceived lack of definition, or even collection of definitions, around the concept of studio.

In academic literature, there are some considerations of types or components of studio but there is very little that brings work together in a single place, and far less that attempts to synthesise it. Studio, despite its complexity and lack of definition, remains a critical component of design education because it is a place where *applied* and *experiential* knowledge is constructed. This means knowledge is generated through being and working in studio itself and can be passed on without needing to be articulated in words or symbols. We think *with* studio, rather than *about* studio (Shulman, 2005). This internalisation helps to simplify the formidable and complex challenges of professional education. However, it also risks missing opportunities to learn or ask difficult questions about studio. This is where studio-based scholarship and research become important and highlighting this is a core aim of *Studio Properties*.

Introduction

In this book, we bring together what we know about studio, whilst preserving the ambiguity that an understanding of it demands. Studio remains both ‘important and frustrating’ (Lyon, 2011) – it may be difficult to define or understand, but it remains critical to the education of designers.

Studio is complex

Studio is a collection of people, in a shared space (physical or digital), performing uncertain and ambiguous activities, using unpredictable, recursive, contingent and looping processes to produce artefacts that cannot be proved correct or even objectively good. Boling captures this complexity, observing how ‘students follow a pattern that goes, roughly, panic, ruminate, plan, stumble, recover, plan, do, revise, do, revise, do’ (2016, p. 94). Schön summarises the dialogue between an expert (educator) and a novice (student) in this way:

It is as though the studio master had said to him, ‘I can tell you there is something you need to know, and with my help you may be able to learn it. But I cannot tell you what it is in a way you can now understand. I can only arrange for you to have the right sorts of experience for yourself. You must be willing, therefore, to have these experiences. Then you will be able to make an informed choice about whether you wish to continue. If you are unwilling to step into this new experience without knowing ahead of time what it will be like, I cannot help you. You must trust me.’

(Schön, 1987, p. 93)

Studio is a place of trying things out and learning from both consequences and experiences: from doing, copying, failing, evaluating, doubting, and repeating. Nelson and Stolterman describe this process as a reflection of the construction of knowledge in design itself (2012). For students who are trying to learn to design (and grasp what design is about), it can at times seem impossible, frustrating, and demotivating. However, as they move forward with increasing success, designing becomes more exhilarating, enlightening, and energising. This activity in studio can lead to progression, improvement, and personal development. Studio, instead of being labelled complex, is perhaps better framed as rich, energetic, and filled with opportunity. A place to experience the complexities of real design within a suitable frame.

Studio Properties

To put it another way, the characteristics of studio that are hard to explain are what makes it most valuable:

What is being taught is uncertain, complex, and messy. The deliberate uncertainty, complexity, and messiness of studio reflects the process of design itself: uncertain, in that the outcome is unknown, requiring judgement to assess its completeness; complex, in that design uses uncertainty and ambiguity in order to create a broader problem space, or to offer greater, wider sets of creative response; and messy in that it depends on the designers holding on to the multiple realities generated by the process.

What is learned is diverse. What students need to learn varies considerably and comprises more than just facts or information. For example, dealing with risk and uncertainty is not something that can be taught directly – it has to be learned, and usually through experience and practice. How we each respond to risk and uncertainty varies considerably as well and the strategies we learn to adopt vary likewise.

The learning experience is personal and transformational. Design education concentrates on the development of the individual as a design practitioner far more than on the delivery of content or information. Part of becoming a designer is the development of expertise, connoisseurship, judgement, discipline, attitudes, and dispositions. All these involve challenging an individual's beliefs as well as adding to their knowledge and skills. Studio has to offer a place within which such transformation and personal development can take place safely and supportively.

What needs to be taught or learned depends on the student. We do not all learn the same things in the same way, at the same time, or within the same contexts. Studio teaching must be highly responsive to student needs at particular moments in their projects or learning journeys. Studio must be a place that supports such responsive forms and modes of teaching.

What studio supports is a subject that is also a culture and praxis. Studio supports creative disciplines that are non-deterministic and that make regular use of tacit knowledge. These types of uncertainty and inarticulability depend on particular forms of communication and interaction that have developed in design disciplines over long periods. Studio offers a space within which such a shared, disciplinary language and culture can be demonstrated and passed on.

Studio is hard to define explicitly

Different authors have described and framed studio in different ways, but rarely in an explicit manner. In the literature on studio, a reader can find formal organisations of studio, such as Ostwald and Williams's (2008) five central characteristics of studio, Schön's (1984) four learning constructs, or the coherent system of elements outlined by Shaffer (2007). Similarly, some authors have used frameworks or concepts from other disciplines and applied them to studio settings, such as the concept of *habitus* [→ 265] (Stevens, 1995; Gray, 2013b), the idea of a signature pedagogy (Shulman, 2005; Crowther, 2013; Shreeve, 2011), or broader methodological concepts such as actor-network theory (Nottingham, 2018; Farías & Wilkie, 2016a).

Still other authors describe studio from within the confines of a single discipline or from within the context of studio itself, making use of metaphor or analogy to explore the complexities involved. This approach has given rise to various ideas such as the *sticky curriculum* (Orr & Shreeve, 2018), the *learning ecology* (McDonald & Michela, 2019; Jones & Dewberry, 2022), and studio as an *idea* rather than a tangible entity (Wilkie and Michael, 2016).

What is interesting to note is that none of the conceptions of studio are complete, perfect, or widely adopted as the best way to define, explain, or even outline the necessary whole of any studio. Studio is perhaps best considered a conceptual gestalt: easily understood but indefinable. We cannot know the whole by analysing the parts in isolation. It is a concept that resists reduction to isolated parts but is defined largely by the importance of the relationship between the parts.

Properties help to make sense of studio

Studio may be hard to define, but that shouldn't preclude attempts to describe, examine, or try to make sense of it. It is common in literature to reference studio using a cautionary tone regarding appreciation of studio as a holistic yet incomplete entity. Studio is not created by a precise or singular combination of properties: my studio is different to yours (perhaps radically). Nor can it be created *a priori* from properties: studio depends on activation by people. Properties allow us to identify instead what is shared, latent, or overlapping about studio.

In this book we offer properties as useful concepts commonly found in studio education, referencing research, examples, and evidence to outline the current state of knowledge in that area. These properties commonly recur across different studios albeit some may operate in a particular studio, but not necessarily another. Properties in the book are highlighted with page numbers like this [→ 18].

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Where appropriate, we have identified scholarship in other knowledge areas, often education research, which is relevant to studio but that has not been applied directly to studio. For instance, the literature on general creativity [→222] is significant but the amount of research that explores the intersection of creativity and studio is much smaller.

In other properties, we have tried to bring together literature that *collectively* outlines an idea but not necessarily in a fully interrelated or integrated way. Reflection [→83] falls into this category and, while there is a significant body of literature that refers to reflection, less material critically examines the concept and some of its founding premises.

Finally, some properties have very little research to support them but remain vital because they are referred to regularly in the literature. No front [→46], for example, describes an easily recognisable property of studio mentioned by authors in a variety of ways, but that has yet to be researched as a fully explored concept.

It is also important to acknowledge what has *not* been included. We selected the properties in the final version from a much larger list, making decisions about what we thought should and should not be included. Similarly, even if we had included everything, this would still not result in a complete set of properties. In describing the ‘perfect’ classification system, Bowker and Star conclude that no method of organising can ever meet these ideals because ‘no one classification organizes reality for everyone’ (1999, p. 41).

The consequence of this is that, as you read this book, you may come across examples and properties you might not recognise from your own studio experiences. Very often these are differences that arise from divergent studio traditions or practices, where the underlying commonalities are less obvious or have had very little attention paid to them in the literature. These can manifest themselves in: different words or phrases (e.g. the phrase ‘desk crit’ instead of ‘one-to-one review’), variations in the extent to which certain properties are emphasised (e.g. a social, open studio as opposed to one that focuses on individual skills development), or even socio-cultural differences in approaching what is accepted as studio (e.g. a rigid definition of studio as part of a structured curriculum as opposed to an open studio with fluid practices). Each of these are valid conceptualisations of studio and we believe that the properties in this book remain applicable across different views and personal perspectives of studio.

There are also limitations in presenting a book on studio with a particular socio-historical background. This work is necessarily situated in the Western tradition of studio, and this is both an important boundary

Introduction

and its limitation: important because it allows us to identify a bounded set of descriptions from a particular socio-historical context, and a limitation because it acknowledges a dominant pedagogy. Not the only pedagogy, or the best pedagogy, or even a fully competent pedagogy. As van Amstel and Gonzatto (2020, p. 17) state:

[D]esign studio is not a universal, neutral, or a timeless approach to design education. It was developed by European schools and, thus, embodies European values and definitions of what design is and what a designer could be. When appropriated by the Global South, these values and definitions should be taken with a good grain of salt.

The Western studio tradition cannot escape its colonial and neoliberal industrial production history and context. The perspective taken in this book comes from a Global Northern tradition of art and design, relying primarily on design and architecture education literature. We do not speak for or represent the many other types and contexts of studio, everywhere, or at all times. We acknowledge that a singular view of studio is changing and should change (Harris, Salama, & Gonzalez Lara, 2023), but there remains utility in the effort to describe it as we see and experience it here and now as a part of a much wider plurality of possible studios.

There is no singular studio or way to educate designers or way to become a designer and studio is not a universal approach to design education. Trying to classify, list, and order a complete set of studio properties in some ways misses the point of knowing studio usefully. The real benefit of bringing properties together is seeing how they interrelate and create a dynamic, conceptual mapping of studio: a way to temporarily hold a domain still to see the relationships between things (Sanders, 2008). It is this active putting back together of parts, based on experience, that allows us to know something new or interesting about studio.

What you will find in this book

The book comprises *properties*, *clusters*, and *narratives*. Each offers a different way to view, explore, and understand studio through its parts.

Properties

Properties are concise descriptions that consist of observations, findings, and discussions drawn from scholarship, research, and practice. All properties are based on supporting scholarship and research, where available, in addition to our own collective knowledge and experience as design educators. It is important to note that properties are interconnected, hence why we have designed the cross-references to properties in book the way they appear. Some properties have stronger connections to others while some are less connected. Additionally, certain properties serve as lenses which present theories, concepts, or frameworks that have been *applied to* studio in the literature, as opposed to *being properties of* studio. Academic references appear in all the properties, tying the descriptions of studio to empirical evidence and scholarly thought wherever appropriate. This does mean that there are a lot of references throughout the text and, whilst these can seem intensive, they do represent a *collection* of knowledge, not knowledge that any one person has. The primary function of the references is to allow the reader to follow up on what interests them or to learn more about some specific aspect of studio.

Clusters

The properties have been loosely grouped into nine thematic clusters which help organise the book and offer additional ways to use it. Each cluster is introduced with a description and a diagram to illustrate how the properties might relate to one another, indicating their interdependencies and connectedness. The clusters emerged as we wrote and rewrote the individual properties and as we started to identify and name synergies among and across properties. This means the clusters are not defined structures; they aren't chapters or definitions, but rather they add meaning, focus, and shape to the book.

Narratives

We have included two short *narratives* of imagined studios towards the end of the book. These narratives provide insight into how properties interrelate, overlap, and depend on one another, offering alternative ways to appreciate how properties manifest themselves in the context of studio.

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Whilst the characters portrayed in these narratives are fictional and do not depict real persons, living or dead, the situations are based on the authors' collective experiences and knowledge. We hope they offer a way into the tangled, enmeshed, and interdependent properties of studio.

Navigating this book

This book is intended to offer more than one way into the text, and multiple pathways through it. For this reason, the clusters of properties are not conceived as well-defined chapters but as groups of properties with thematic relationships. They could have been grouped differently, although these groupings made best sense to us as co-authors. Links from one property to another frequently cross cluster boundaries, emphasising once again the integrated and plural nature of properties in studio.

An academic researcher might traverse the entire volume from start to finish, building a complex understanding of studio properties and the scholarly references that inform them. This path might be undertaken to ensure that a reader hasn't missed anything and it will be evident that there are plenty of open questions available to pursue through research.

Those who teach in studio might, in contrast, begin near the end of the book where the narratives bring the properties to life, then decide to follow some of the interesting links there back into the clusters and then go on to explore further links between properties. Such a path could offer experiential connections for a reader which would improve the accessibility of the somewhat abstract property descriptions. The properties might offer the chance for reflection on teaching, for contemplating new possibilities in studio, for deepening understanding of studio pedagogy, or for explaining and even justifying studio to those who are not familiar with it.

Any reader with a particular interest in some aspect of studio can, of course, jump right in at the point of that interest while those with a general interest might begin with the first cluster and follow whatever links look interesting.

About the authors

This book is a snapshot in time. As authors, our experiences in studio, our readings of the literature, and our unique backgrounds have shaped the properties we present.

Writing this book was a collaborative process, and as we progressed, it became harder to know which authors were responsible for writing which properties. As we grouped properties into clusters, individual authors took responsibility for these based on their expertise. This emergent method reflected our values as a writing team. It also mirrors studio itself, where collaborative and individual working arrives at a shared, but not definitive, set of descriptions and explanations. Writing this book has been iterative, as has the process of creating the properties – all in the best traditions of studio and the prototyping design process.

As an insight and acknowledgement of our different positions in this work, we offer very brief accounts of what brought us to this project and the perspectives we bring to this effort:

Derek's obvious positive biases towards studio come from his experience in a Scottish Brutalist, 100-metre-long, windowless, architecture studio, where he acquired a second family, a small tattoo, and a romanticised view of studio as a place to live (but also some very bad time-keeping habits). Pedagogically, this still infects how he thinks learning is done: the importance of social learning, but especially the relationship of our thinking to the spaces and places in which we do that thinking. What really motivated Derek in this project was the frustration that there was no book on studio in the library to make his PhD easier. After completing this book, Derek now realises that there still isn't such a book – but there is one that *tries* to get as close to this as possible. Moreover, that this book at least makes more visible the fact that we know more about design education research than we sometimes realise (or are prepared to convey). If this book can help one other educator feel a bit less lonely or lost then that will do. Derek Jones is a Senior Lecturer in Design at The Open University, UK, and the Convenor of the Design Research Society's Education Special Interest Group (EdSIG).

James B. studied architecture from the thirteenth to eighteenth storeys of a 1960s tower block. By the time of his enrolment in 2001, the physical separation of the University of Sheffield School of Architecture from ground level had fuelled a strong culture of feminist and critical pedagogies. As a Masters student, James got to take part in live projects that engaged students with communities and clients to research, write and deliver projects with real outcomes. Both of the live projects that James

Introduction

took part in had fairly shambolic outcomes, but they revealed to him the fascinating dissonance between academic and non-academic value systems. After writing a PhD on live projects, James was left with the nagging feeling that architecture and other studio-based disciplines struggled to fit within normative university structures. First teaching studio in 2012, he found studio advocates alienated potential allies in the wider university by reverting to normative pedagogies derived from the nineteenth-century *École des Beaux-Arts* and the early twentieth-century *Vkhutemas* and *Bauhaus*. Studio – in all disciplines that employ it – fascinates James as a site of friction between the pedagogies of design and the technocracy of the neoliberal university. James lives in the forest and prefers not to teach studio, unless it's working hands-on with architecture students on live projects or design-build projects far outside the walls of the university. James Benedict Brown is Associate Professor of Architecture at Umeå University in northern Sweden.

Elizabeth took a BFA and an MFA in Fine Arts printmaking, absorbing 'traditional Western' studio both uncritically and enthusiastically, accepting angst, overwork, and subjugation to authority as the cost of learning while suffering none of these at levels outside the norm. Years later, struggling to make sense of, and working to transform, the traditionally scientised field of instructional design, she has shoehorned a form of studio into the graduate programme where she teaches. She now spends a good deal of time questioning both how this form of studio works and what was really going on during her earlier education. Some of her questioning has manifested as formal studies on, and within, her own studio courses. Participation in this project has extended and deepened the base of understanding from which she will continue to pursue both making improvements to her teaching in studio and establishing a form of studio as foundational in her current field. Elizabeth Boling is Professor of Instructional Systems Technology at Indiana University Bloomington, USA.

James C. was 24 years old when he experienced his first studio. By then, he had completed a degree in philosophy (a miserable and alienating academic experience) and failed as a musician. He returned to school to study graphic design at a local college. He was *that* mature student, always in studio, hungry to learn, and comfortable speaking to educators. He would spend equal time with educators (and sometimes peers) in the nearby pub, which operated as an extension of studio – occasionally moaning about peers who didn't come into studio (or the pub). His idea of a studio was open, vital, and generative, with the capacity to welcome all – you just had to put the effort in. He didn't stop to think about the range of histories, obligations, and challenges his 'absent' peers were contending with. He didn't see the unevenness of opportunity. When he started teaching, those who didn't

Studio Properties

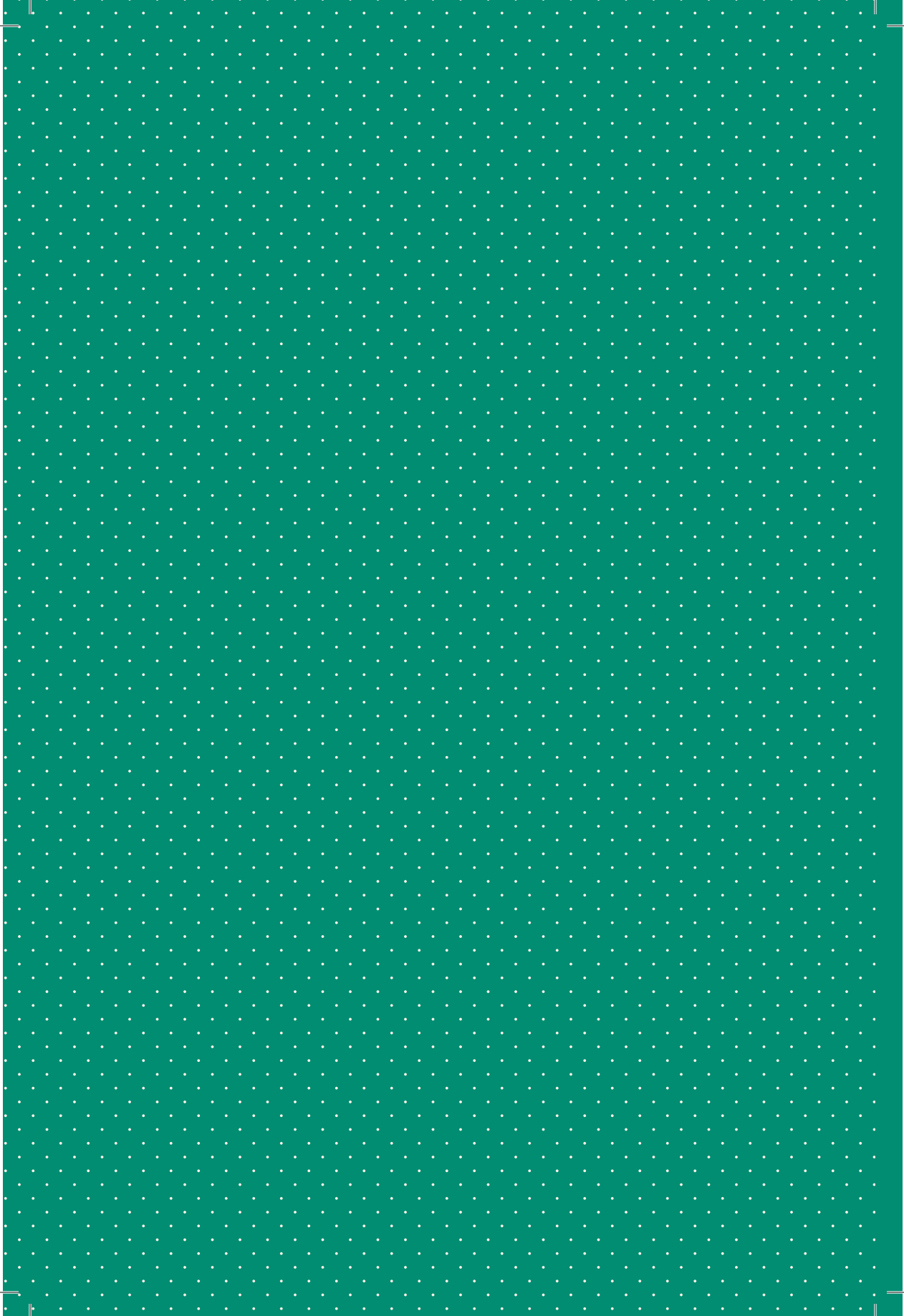
come into studio were now his problem. Over the last 15 years, he has been exploring how to make studio a *location of possibility* (hooks, 1994) for all. This book is an extension of that mission and, simultaneously, a way to mesh and synthesise the existing and sometimes disparate research literature on studio into a useful pattern. James Corazzo is Associate Professor of Design Pedagogy at Sheffield Hallam University, UK.

Colin's experiences in studio were forged in the American Southeast, where they engaged with graphic design and fine art studio pedagogies – often unsuccessfully and marked by periods of failure. Although Colin's early studio experiences were often disempowering, they later had more positive experiences in instructional design and human-computer interaction (HCI) studios, which informed their present work as director of an HCI studio programme in the American Midwest. Through engaging in this project and deeply investigating properties relating to identity, power, and culture, Colin was able to pinpoint and better understand their historic difficulties in succeeding or thriving in studio. And by understanding the potential pedagogical causes for their own failure, they have been able to lay the groundwork for a more caring and emancipatory approach for future generations of design students. Through this writing and reflective process, Colin has grown to better understand the ways they have sought to redeem and remake portions of studio in their own pedagogical practice, while also seeking to reject the worst of studio as 'magic' in the process. Colin M. Gray is Associate Professor of Human-Computer Interaction Design at Indiana University Bloomington, USA.

Nicole's design education began in Germany, in a traditional studio, steeped in the Bauhaus legacy. But instead of finding her tribe, she encountered a culture that felt alienating and exclusionary. This experience planted a seed of doubt about the value of these institutional settings. It also sparked a rebellious streak, leading her to create an alternative – a student-run studio with a large storefront window, inviting the public to engage with her design work, fostering a sense of community that was absent in her earlier experiences. During her postgraduate research in Hong Kong, Nicole encountered a massive, interdisciplinary studio environment. This experience exposed her to the possibilities of design education on a grander scale and, more importantly, planted the seeds for a future in distance learning. Today, Nicole designs and teaches online studios in the UK. Here, she caters to students who, like her younger self, might prefer the 'independent' approach, while simultaneously encouraging them to engage socially, albeit virtually. One question continues to guide Nicole's research and scholarship: how can we create studio environments that embrace social engagement, regardless of students' backgrounds

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or preferred learning styles? By understanding the values and mechanisms of social interaction in design education, she hopes to empower students with unconventional paths to find their place in studio. Nicole Lotz is a Senior Lecturer in Design at The Open University, UK.



The Properties

Clusters

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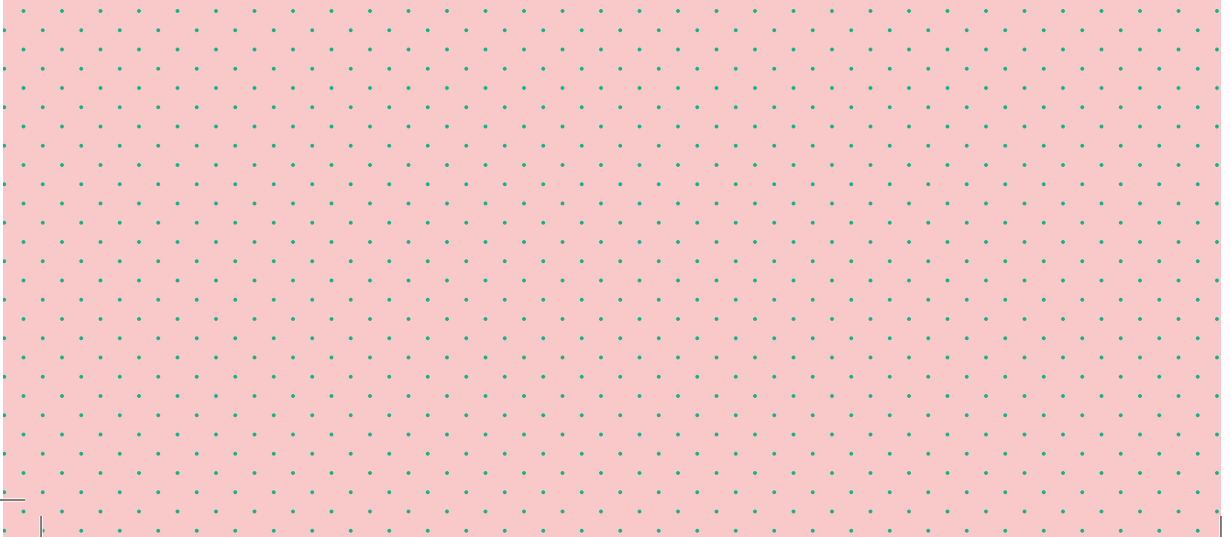
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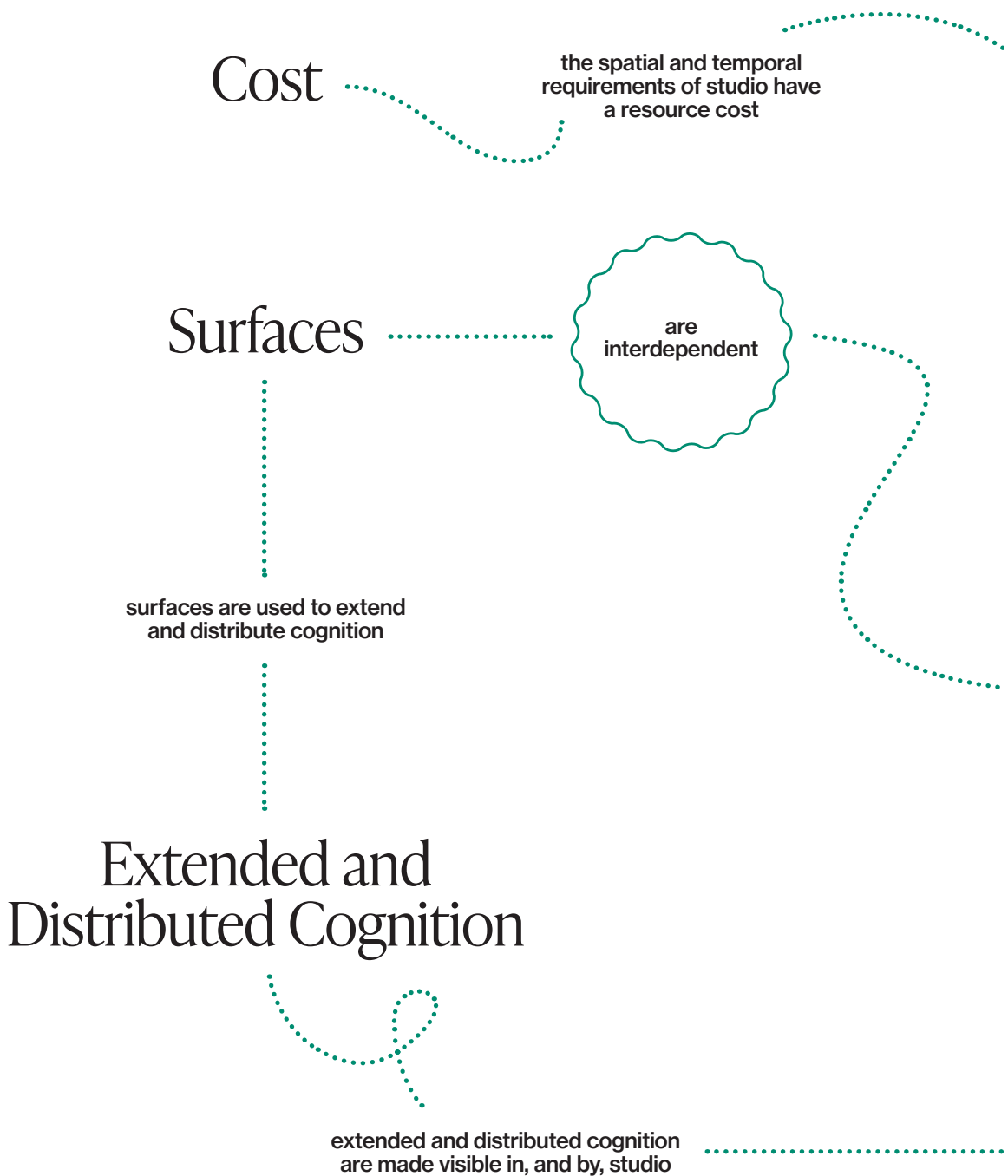
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Visibilities and Proximities



Walking into a studio teaching space can be a very different experience than walking into a lecture hall or a teaching auditorium. It can be difficult to discern where the 'front' of the class might be when neither the arrangement of the room nor the behaviour of the occupants is oriented towards a single point of focus ^{no front}. The space may feel cluttered with objects lying around and materials stacked up ^{extended and distributed cognition}. Work in progress can be seen stuck to walls, desks, or space dividers ^{surfaces}. People don't always stay in place; they visit each other's work spaces, stand and discuss pinned up sketches ^{making visible} and may even be gathered in unexpected corners, which are not always inside the room ^{informal learning spaces}. On the other hand, some may be hidden away, working behind ad hoc privacy barriers ^{public and private space}. Even when a studio is equipped with basic work tables in rows, these may be rearranged one day and moved again the next as participants use studio as a space to design *with*, not just design *in*. A shabby studio space in an old building still needs to provide for these basic affordances, as does an online studio environment, and either will generally entail both time and money ^{cost}.

A map of the Visibilities and Proximities cluster showing possible relationships and connections between properties.



No Front

informal learning spaces
are possible because studio
has no front

Informal
Learning Spaces

Public and
Private

public and private spaces emerge
through the spatial characteristics
of studio

public and private are defined
by degrees of visibility in studio

Making Visible

Making Visible

The engagement with material itself and with development of ideas through sketchbooks, drawing, performance, recording of process and reflecting on the process means that learning has a visible and social dimension.

(Shreeve et al., 2010, p. 130)

Enter most studios, and you will see people drawing, clicking, assembling, thinking, idling, or discussing. You will also be able to see their work being made visible, and even if people aren't present, there will be half-made things on tables, evidence of activity, and other objects or images pinned to the walls or posted in online shared spaces. In studio, you can see the learning, thinking, processes, and knowledge across tables, walls, objects, artefacts, and people. Studios make what is normally invisible visible.

Studio intentionally activates things by making them visible

Studios are often located in large open-plan spaces or shared online environments, meaning there are ample opportunities to see the work of students, educators, technicians, and visitors, and (sometimes) the performance [→ 107] of activities (Orr & Shreeve, 2018). They are often spaces with no front [→ 46] that encourage mutual oversight. In and around studios, there will be surfaces [→ 48] for displaying work, experiments, and ideas in progress: walls, vitrines, online image shares, shelves, temporary boards, whiteboards (digital or physical), projectors, and screens.

The visibility of artefacts [→ 151] and processes allows them to be debated and scrutinised. Their visibility prompts dialogue [→ 181] and develops the habit of discussion, providing opportunities for mutual oversight, belonging [→ 189], forming identity [→ 94], setting standards and signalling what is valued (Shreeve et al., 2010). What is made visible in studio is usually an indication of what, or whom, is valued: Visibility draws our attention to the work that visible things do and the types of visibility that can exist in studio: transparency, mimicry, hiding in plain sight, governing behaviour and actions. This recognises that studio learning is not only the consequence of instrumental and behavioural activity, but 'is also an effect of inhabiting a particular world of design school' (Nottingham 2017, p. 47, after Thrift, 2007).

Studio makes people visible

Studio has the potential to encourage interaction between people. By making people and their actions visible to one another, studio can nurture and encourage social learning and provide opportunities for various interactions and sociality, such as [learning and designing collectively](#) [[→166](#)], [listening-in](#) [[→170](#)], or [social comparison](#) [[→172](#)]. The [apprenticeship](#) [[→64](#)] approach also depends on visibility, and Schön (1987) explicitly describes this model as students *watching* the expert, where, in its ideal form, students can observe and copy the processes of design. This model of learning, when compared to other forms of teaching, relies on the transfer of [tacit knowledge](#) [[→248](#)] and challenges the assumption that everything knowable is visible (Ashton & Durling, 2000; Kvan, 2001). For example, [listening-in](#) [[→170](#)] is a form of invisible learning that, for many educators, has a vital pedagogical role in studio, involving a far greater degree of cognitive engagement than is visible (Rogoff et al., 2003; Dannels, 2005), in both physical or online studios (Jones et al., 2021).

In the same way a congregation makes itself visible by gathering, studio provides ways to build a feeling of [affect](#) [[→200](#)], [belonging](#) [[→189](#)], and community amongst students. As communities become visible – often through different kinds of [performance](#) [[→107](#)] or [habits and rituals](#) [[→262](#)] – they can support and encourage shared activities and goals. Rieber et al. (2016) refer to the visible shared experience across studio groupings, such as study stages, and the importance of this to development and learning. Building cultures of [belonging](#) [[→189](#)] can contribute positively to the visibility of students who might be less visible in other learning environments, such as the different voices that emerge from students in online studios compared to physical ones and how this influences [identity](#) [[→94](#)] and [enculturation](#) [[→285](#)] (Gray, 2021).

Studio education tends to be underpinned by an expectation of presenteeism, i.e. that students must come into studio and be visible to others for a certain amount of [time](#) [[→121](#)] in order to develop [expertise](#) [[→90](#)]. Several researchers have reported educators' concerns and frustrations with students that don't frequently attend studio (Logan, 2006; Orr et al., 2014; Shreeve, 2011). The educators in Logan's study describe absent students as placing themselves at the margins of learning, limiting their access to design knowledge and interactions with others.

Yet an environment that purports to value the idea of making people and things visible can still render some invisible. S. Jones (2022), a black design educator, draws on his experience studying design to show how studio can make some students invisible. He describes how, as a design student, he presented work that drew on cultural and visual traditions

unfamiliar to the White Gaze of his educators. He describes how this gaze, developed through the predominantly white design canon, could not see value in the visual references Jones was making. As a result, Jones suppressed expressions of his authentic self and adopted an aesthetic that would be more visible to the educator. Jones invokes the word *unvisible* as both the opposite of visibility and a means of resistance, arguing that *unvisibility* can serve as a process of dismantling the prejudiced construction of visibility in the studio. Jones's advice for students of colour embarking on a design programme is to resist these processes (of enculturation, acculturation, and indoctrination [→ 285]) and to 'embrace what is yours – this is the only beneficial alternative – the only way to be *unvisible*'. (S. Jones, 2022, p. 145).

A similar mechanism, albeit arguably accidental, was observed in the emergency transition to online teaching during the 2020 pandemic. Several educators noted that different student voices were heard online when compared to who was visible through engagement in traditional studio spaces (e.g. Gray, 2021; Jones & Lotz, 2021). Such instances are now being explored as important variations in visibilities, not simply deficits in confidence to speak [→ 176], and Jones's concept of *unvisibility* remains a vital concept to apply in such settings.

Studio makes processes and artefacts visible

People and their actions are visible in studio, making parts of the design process visible too: the research, the making, the experimentation, and various stages of production of artefacts. Students are typically required to document creative processes in sketchbooks, process journals, diaries or blogs making their learning visible, albeit to a restricted audience of peers and educators. Orr and Shreeve (2018, pp. 131–132) link this visibility of process to evidence of a student's learning journey [→ 104], observing this is a common (or sticky) metaphor used by many design educators as evidence of expertise [→ 90] development. More public displays of visibility can be found on desks, pinned to walls, or added to shared online spaces – ideas, test prints, mistakes, alternate versions, concepts, prototypes, or research – showing how design is being carried out (Vyas & Nijholt 2012), acting as a record for the creator, or a narrative of process for assessment (Jones, 2014b).

Studio provides opportunities for learning by encouraging chances for listening-in [→ 170] or observing what others have done. The physical environment, the way educators move around the space, and the varying types of dialogue [→ 181] and crit [→ 79] extend the idea of mimicry and take advantage of an open studio being a place where all sorts of two-way conversations can be overheard. These activities provide opportunities for making social comparisons [→ 172], explicitly or implicitly (Ashton &

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Durling, 2000; Cennamo & Brandt, 2012). The surfaces [→ 48] of studios – wall space, personalised desk spaces, online whiteboards, or image sharing platforms – are regularly used to individually or collaboratively manage projects (Vyas & Nijholt, 2012). These surfaces [→ 48] can be used to coordinate activities amongst a group of people, such as found in learning and designing collectively [→ 166].

Studio also renders the artefacts [→ 151] of learning visible to others, most commonly in events such as a final project crit [→ 79], where work is displayed for a whole group to witness its formal scrutiny and assessment [→ 234]. Critique happens through artefacts [→ 151], and Dannels (2005) emphasises it addresses objects when they are visible. Studios frequently acquire and display exemplar artefacts to be seen, not just referred to (Cennamo & Brandt, 2012), functioning as inspiration, ways of indicating standards, and as tacit signals of what is valued. Displays of exemplar work are targeted at forming a ‘design eye’ (Nottingham, 2017) and provide opportunities for ‘forming taste’ in the presence of others (Hennion, 2007). The mechanism of seeing where you are going is observed by Nottingham (2017), whereby making work of advanced students visible to novice students acts as an indicator of intent, direction, and aim. In this way, visibility is about far more than simply seeing – it requires students to engage in visual thinking and imagine themselves in some future state, as part of their journey [→ 104] in developing their identity [→ 94] and character [→ 101].

Extended and Distributed Cognition

But in the studio nobody can apply fixed knowledge. Instead they engage with their bodies [...] If we are in this room and we have an idea, but 'ah, nothing is there, we can't try it' [...] no, no! You need the media, the computers, the paint.

(Hennion & Fariás, 2016, p. 74)

Studio can be an extension of a designer's thinking by supporting the activities, interactions, and connection-making undertaken as part of creative design practice. Put simply, the tools, people, and artefacts designers surround themselves with are inextricably linked to how they think. This contradicts the idea of separating thinking from context; of mind from body (Damasio, 2006). For example, the sketchbook is more than a repository of ideas; it offers a place for a process of thinking (Garner, 2008). This is called extended or distributed cognition, where our thinking is influenced by and dependent on where and how we go about that thinking, a 'constitutive dependency between cognitive processes, and processes in brain, body, and environment' (Aizawa, 2014, p. 31). This interdependence of thinking and doing through our bodies is a particularly central aspect in all design disciplines.

Whilst the details of precisely how cognition is extended are still debated in cognitive neuroscience, there is sufficient evidence to support some of the common ways it is manifested (Shapiro, 2011; 2014), many of which will be familiar to studio educators. Most theories agree that thinking (cognition) takes up significant amounts of energy in the human body and that controlling this is an important human ability (Dehaene, 2020). This is achieved by either reducing the complexity of the task (e.g., abstraction) or 'offloading' the thinking elsewhere (e.g., using surfaces [→48]), both common techniques found in studio. For this property, we use the distributed cognition model outlined by Hollan et al. (2000) as a starting point for design contexts (Kirsh, 2014). This model proposes that cognition can be distributed across material and environmental structures, members of a social group, and through time and cultures.

Cognition extends to the tools and artefacts designers use

Using tools and artefacts [→151] to design with is one of the most obvious forms of extended cognition. The objects used in learning (physical,

mental, or digital) are directly linked to developing expertise [→90] as a designer, where the level of thinking changes as expertise and experience grow. Initially, the tools used may be accompanied by deliberate and conscious thinking about what is happening and how the tool is working. As experience grows, less attention is paid to the details of what is happening and deliberately thinking about using the tool becomes secondary to thinking about the purpose or value of the tool in the design process (Sennett, 2008). For example, an expert using a pencil to sketch ideas, thinks about the idea, and may not entirely think about the specific details of how to move the hand, allowing the designer to engage in other forms of thinking and cognition that are more useful during the design process (Garner, 2008).

Garner goes on to identify four extensions of thinking through sketching: storing, talking, thinking, and communicating, arguing that these are extended cognitive functions of sketching, not simply thinking coinciding with action. Hence, as designers, our tool use is not only a process that helps us ‘store’ thinking – a separation of mind and object – it is also, literally, thinking with our hands (Pallasmaa, 2009). This argument is echoed by Groth (2017) who articulates the impossibility of separating thinking and doing in a creative design context. The fact that ideas can be extended and distributed to objects, explains the role and importance of artefacts [→151] in studio as both intentional and liminal objects.

Cognition can extend to the spaces within which design takes place

Just as cognition is extended to the tools designers use, other artefacts, and arrangements of artefacts, also contribute to supporting thinking in studio. As Kirsh (2014) argues: ‘the environments people successfully operate in are richly imbued with cues, constraints, and indicators that reduce the complexity of [...] problems and serve as hints about what to do.’ (p. 151). Studio is an important location for this work to be located, where objects, contexts and spatial arrangements can extend design cognition, often without this being made explicit. Many of these will be familiar to practitioners and researchers – how we lay out our workspaces and surfaces [→48]; the artefacts [→151], precedents, and examples we surround ourselves with; and the tools we select and have ready to hand (and even where these are located). The concept of *artful surfaces* proposed by Vyas & Nijholt (2012) highlights how surfaces [→48] can be fully incorporated into a designer’s thinking and process, acting as ‘sites of methodic design practices’ (p. 178). Importantly, such laying out of personal workspaces has been linked to positively informing student agency in studio (Kavousie et al., 2020).

Similarly, the act of *gathering* is considered a core function of studio, where a designer brings together artefacts of interest, utility, or inspiration into studio space (Hennion & Fariás, 2016). This *bricolage* is critical to practice, culture, and even aesthetics in the studio (Houdart, 2016; Waller, 2016), and is a form of extended cognition. Examined from the opposite point of view, a space without such artefacts and affordances can be difficult to imagine as a studio: ‘[i]f we are in this room and we have an idea, but “ah, nothing is there, we can’t try it” [...] no, no! You need the media, the computers, the paint’ (Hennion & Fariás, 2016, p. 75). When the affordances offered by a studio space are removed, the loss of extended cognition becomes evident, but is rarely acknowledged by institutions that prioritise other modes of learning (Radzikowska et al., 2019).

Cognition can be extended in digital and online spaces just as readily as physical ones and the cognitive affordances are often similar (Kirsh, 2014; Jones, 2013). For example, document writing and editing software holds content and is a tool to store the ideas created with it, but it also offers a method of navigating structures of content, allowing operations at multiple scales of concept.

Cognition can be distributed between people

Ideas around socially distributed cognition have been around for some time; there remain many different conceptions of it in different disciplines (Hutchins, 2001), and a number of models exist (Theiner, 2014).

A group of people can think collectively by distributing cognitive functions in an organised way allowing them to handle larger and more complex tasks: a form of distributed cognition (Hutchins, 2001; Theiner, 2014). A useful example is social memory, where different participants in a group remember different things, thereby reducing the individual work required (Hutchins, 2001). Groupwork, co-working, co-construction, and learning and design collectively [→166] in studio are examples of distributed cognition. Co-working in studio to conduct research and gather precedents are cognitive tasks in design that are also good examples of Busby’s (2001) point that ‘[d]istributed cognition is essentially concerned with solving problems by collaboration, where none of the collaborators individually can have a full appreciation of the problem’ (p. 238).

Beyond these simpler examples, some theories of distributed cognition argue that the structures and relations of human interaction are in themselves a form of cognition. Returning to social memory in a larger group, knowing who holds a particular memory is also a piece of knowledge in itself (Hutchins, 2001). To extend this to studio, students use this type of knowledge to form social networks [→185] and connections, such as

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identifying and using specific peers for social comparison [→172]. This suggests that the structure of the group relates in some way to the structure of its knowledge.

Extended and distributed knowledge between people is often a form of tacit knowledge [→248], making it difficult or impossible to articulate formally. Participants in a group using social knowledge are generally unaware of the importance of interaction and communication required to create the overall system of knowledge in a group (Norman, 2014). For educators, it can be useful to be aware of the tacit nature of distributed knowledge and that it will often depend on distributed and diverse artefacts and connections between students. In other words, because much of distributed cognition is tacit, it can be easy to forget that it depends on simple affordances, such as wall space or shared digital spaces. But educators can, to some extent, make visible [→34] aspects of extended cognition. For example, in the early stages of developing social networks and confidence to speak, it can be helpful to allow social comparison [→172] to emerge without explicitly stating that this is the intention, and then allowing the ‘natural’ formation of social networks [→185] of learning (Lotz et al., 2019; Jones et al., 2021).

Cognition can extend and be distributed through time

Designed artefacts [→151] have physical and intentional properties (Kroes, 2002), offering a way of making visible [→34] their value and meaning at a practical level. Interacting with a designed object can tell us something about its purpose, intention, utility, and feel because we assume some level of shared experience of it. This knowledge that resides in objects is argued to be stored in that artefact [→151] (Cross, 1982). Malafouris (2012; 2013), making a similar point in a different discipline, suggests that a contemporary way of thinking about artefacts [→151] in archaeology is to treat them as embodied cognitive objects. This allows them to be interrogated in a designerly way, using sensory, tactile, and experiential ways of considering them as technical, intentional, social, or cultural artefacts [→151], just as they might in studio.

Other forms of embodied and distributed cognition may be apparent in studio

As noted, there are a number of models of distributed and embodied cognition, many of which can be useful in considering studio practices (see Theiner, 2014 for an introduction to some of these). For example, the idea of *collective induction* allows the collective testing of different ideas, meaning very quick evaluation of responses can be distributed in a group (Laughlin et al., 2006; Theiner, 2014). In the early days of many design courses, students

have to orient themselves to very different ways of working and a key way to navigate the many options is to make use of [social comparison](#) [[→172](#)], [listening-in](#) [[→170](#)], [social networks](#) [[→185](#)], to test and validate approaches (Lotz et al., 2019; Jones et al., 2021).

A final example of distributed cognition is that of group agency, where a group is considered to have properties normally ascribed to an individual, such as beliefs, attitudes, intentions, and so on. These types of disposition can be observed in groups and sub-groups in any social setting (Theiner, 2014) and are likely to emerge in studio, where forming ideas and positions is an important part of developing [identity](#) [[→94](#)], [character](#) [[→101](#)], or [belonging](#) [[→189](#)]. For example, a student group may take on an [identity](#) [[→94](#)] around a particular position or stance, such as sustainable futures, and use that as a guiding principle for project work. In addition, the distribution of cognition can be partially planned or encouraged as part of an explicit social learning design or set of instructional moves in studio, where the superficial group activity serves one function but the shared values that emerge serve another (Fathallah, 2021).

Informal Learning Spaces

The wonder is that so little attention has been paid to the benefits attaching to third spaces.
(Oldenburg, 1989, p. 20)

The traditional physical studio is a place of quasi-residential [immersion](#) [[→118](#)] (Schön, 1987, p. 311) and [informalities](#) [[→204](#)], allowing students to experience, and learn from, [risk and failure](#) [[→227](#)]. It offers a space within which students can create [place](#) [[→198](#)] through a sense of [belonging](#) [[→189](#)], and this comes about through the making of informal settlements – temporary, but personalised, inhabitations of space (Logan, 2006; Bostwick-Lorenzo Eiroa & Jones, 2014). These are likely to be the types of spaces familiar to most readers and they are easily taken for granted. However, encouraging students to create their own informal learning spaces in and around studio is critical to permitting them to define their learning [journeys](#) [[→104](#)] and foster informal interactions. Through these informal interactions ‘students begin to project themselves as part of the

larger practice community, employing characteristics of design thinking, reflective practice, and interaction in professional ways with their peers' (Gray & Howard, 2014, p. 146).

Studio is only one learning space, and students seek out, adopt, and create their own informal learning spaces, a process that is supported by the fact that studio has no front [→46]. In addition, informal learning spaces can be designed for students by others (for example, the breakout lounge space of many contemporary Western universities) or nested in formal learning spaces like studio, just as formal learning spaces can be nested in informal learning spaces (Corazzo & Gharib, 2021). This reflects how formal learning in studio can emerge from informal learning and vice versa. Studio depends on the dynamic and shifting provision and availability of both.

The design studio can be an informal learning space

Studio relies heavily on constructivist pedagogy, meaning that the specific details of activities and interactions are unplanned to a certain degree (see general education concepts and theories [→242]). This requires students, peers, and educators to regularly construct negotiated approaches to situations and activities in the shared and social setting of studio. Providing informal learning spaces – or giving students the agency to create them – facilitates opportunities to conduct such negotiations, engage in dialogue [→181], and build on formal learning activities (Setola & Leurs, 2014). Practically, informal learning spaces are often complimented by the physical affordances of studio, such as the informal surfaces [→48], floors, windows, and partitions that allow for the display of work-in-progress (Shaffer, 2003). The design studio also enables students to choose when and how to participate in the informal learning it supports, such as, at preferred time [→121] or rhythms [→124] (early risers or night owls), or whether to work alone, in synchronicity and proximity [→128] to others, or with others in social networks [→185].

Spaces intended for structured informalities may share some characteristics with the design studio, such as the flatter hierarchy of no front [→46]. But studio represents a more complex informal learning environment than a traditional classroom, being more conducive to making messes as a byproduct of a creative process (Bostwick-Lorenzo Eiroa & Jones, 2014; Hennion & Farías, 2016). Functionally, mess-making in studio is an important function or prerequisite for play [→155], serendipity [→212], and as an extension of cognition [→38]. However, the degree to which an institution or individual educator emphasises play, serendipity, and extension of cognition will depend on the curriculum, level of the student, and educator preferences.

Informal learning spaces can be outside the studio

Students, educators, and managers may observe the potential for other intermediate spaces in the university to support and host informal learning. The design studio as a space for informal learning conflicts with the institutional and managerialist conception of informal learning as a tidy activity that can be undertaken in *intermission spaces* (Radzikowska et al., 2019; Thoring et al., 2018). These are often deliberately designed to be informal, suggesting self-directed learning can occur, often with some idealised conception of working with a laptop and latté, leaving behind few traces of activity. Austin (2012) and Austin & Sharr (2021) refer to this as an extension of a corporate *lounge space* into the academic sphere. They write:

Lounge space is, we argue, the defining space of contemporary western urban life. It extends beyond cafe chains and transport interchanges into libraries, hospitals, schools, and even housing. Though it takes different forms – from the branded interiors of Costa Coffee franchises to WeWork co-working spaces; from ‘social hubs’ in luxury student accommodation to new academic buildings – it tends to follow a consistent formula. Organizationally, it mixes office park bürolandschaft with tropes from the food court and department store. It forms a loose-fit landscape of varied seating threaded through with meandering circulation. Its styling comprises a deliberate but eclectic mix of pseudo-domesticity – modish hipster cafe retro, IKEA mass-market modernism, and heritage nostalgia – simulating personalized places within open-plan spaces.
(Austin & Sharr, 2020, p. 77)

Away from the managerial intentionality of breakout spaces, students activate their own informal learning spaces with spontaneous discussion between peers in corridors, stairwells, social areas, or kitchen areas. This often extends to the display of work in progress by adapting informal surfaces [→ 48], floors, windows, and even toilets (Oh et al., 2013). Marshalsey (2023) notes how ‘every empty room or outdoor space can evolve with human participation and activity into a learning space...’ (p. 80).

Informal learning spaces can also challenge disciplinary silos of classes, courses, or year groups (see discipline [→ 238]), allowing different groups to come together in shared spaces in a relaxed and casual way. The influence of such groups creates important socio-spatial structures in studio (Budge, 2013; Gray 2013a; Corazzo & Gharib 2021; Jones, 2022a).

Informal learning spaces can be digital, distributed, and relational

Institutional Virtual Learning Environments (VLE), such as Blackboard or Canvas, can provide important digital spaces for study, writing, discussion, and support. Research demonstrates that formal and informal online social spaces can operate similarly to those physically located in studio, contributing significantly to pedagogical outcomes (Güler, 2015; Jones et al., 2021). In addition, digital and online informal and semi-formal social spaces are increasingly important as part of contemporary design practice, and have a valuable role in students' enculturation, acculturation, and indoctrination [→ 285] into professional communities (Budge, 2013).

Incorporating online social and professional spaces into studio can be challenging, particularly where institutional policies or requirements create conditions or limitations on how these are integrated. In institutions that use learning platforms as *alternatives* to informal online social spaces (and do not recognise external services), promoting and developing their use is a challenge in terms of time and resource and very often ends up the responsibility of individual educators. Conversely, institutions that allow fully open and distributed social spaces without any guidance or boundaries, can lead to issues outwith the influence of individual educators. In the literature, the general consensus tends towards advocating a more flexible approach to the inclusion of informal online learning spaces, taking account of student preferences and needs (Güler, 2015; Castro, 2019).

Informal learning spaces can be exclusionary

In their study of computer-mediated communication between students of a design discipline, Gray & Howard (2014) note 'not all student populations may have the willingness or innate capability to use a social network' (p. 161). Formal and informal learning spaces, whether proximate, hybrid, or online, can potentially exclude some individuals (see *belonging* [→ 189]). While efforts to ensure equal access have made huge strides to eliminate exclusionary characteristics from formal learning spaces, informal learning spaces may also exclude. Only students who smoke or drink will normally benefit from the reflection-in-action that comes from brief conversations between peers in designated smoking areas or local pubs. Only students with *confidence to speak* [→ 176] will engage in the *dialogue* [→ 181] and *reflection* [→ 83] that takes place in shared spaces. And despite the provision of ramps, elevators, and electrically assisted doors, only students without physical differences will be able to comfortably decompress between crits in the secluded half-landing of a staircase (Boys, 2010). In short, if we

only pay attention to the formal spaces when considering diversity, inclusion and access, we miss the opportunities of diversifying and opening access to informal spaces.

No Front

Here students assemble around work areas with physical models or virtual designs on computer screens; there is no obvious 'front' of the room.

(Shulman, 2005, p. 54)

The arrangement and layout of [artefacts \[→151\]](#), [surfaces \[→48\]](#), spaces, and people in studio rarely conform to traditional education spatial hierarchies, such as those found in lecture halls or classrooms. In studio, the distribution of objects, people, and activity often appears informal, unstructured or even unplanned: the furniture does not necessarily all point the same way; students are active without the need for an educator to guide them; educators move around the studio rather than having the studio focus on them (Boling, 2016). Most studios have no focal point, or no front, from which one educator broadcasts to the room or no central point from which to lecture (Taylor, 2009). Shulman (2005) identifies this 'no obvious "front" to studio' as part of studio's signature pedagogy.

No front encourages flexibility and emergence of layouts in studio

Without a front the design studio supports and encourages a fluid mix of formal, semi-formal, and [informal learning spaces \[→42\]](#), all of which rely on the connections and [synchronicity and proximity \[→128\]](#) between people. This fluidity encourages design and learner behaviours because of how people interact (personally and culturally) in space and in response to the layout of [artefacts \[→151\]](#) (Bostwick-Lorenzo Eiroa & Jones, 2014; Marshalsey, 2023). We tend to adopt behaviours we believe spaces 'allow' us to have or are expected of us in those contexts, particularly in studio (Boling, 2016). For example, setting out a studio as if it were a classroom and teaching from the front will encourage different behaviours and attitudes in students compared to a less formal layout and encourage tutoring instead of teaching (Hilton, 2019).

Structures still emerge in studios with no front

Despite having no front, studio is a setting with structure, order, and shape. Group project reviews, desk crits [→79], informal learning spaces [→42], demonstrations, and other organised spatial structures are supported in studio. One of the advantages of no front is the possibility of flexible and responsive spatial arrangements. Beyond organised spatial layouts, many other proximities also define the connections made in studio, such as social networks [→185] and relationships (Jones, 2022b). These can be reflected in the spatial arrangements adapted and used by students as individuals, in groups, or in other semi-formal structures (Williams, 2013; Thoring et al., 2018). For educators with no experience of studio, these emergent structures can make studio appear chaotic, unstructured, or incomplete, because the many of the structures operate invisibly. It is through these implicit structures of studio – enculturation [→285], place [→198], informalities [→204], or habitus [→265] – that students are inducted into the other important structures of studio.

In online and virtual studios, having no front is often treated as an explicit functional property of studio (Jones, 2022a). For example, where students contribute discrete elements of work, often have both formal and informal spaces for student work, such as the example given in Lotz et al. (2019). As a further example, large-scale federated studios often have very open, flexible, or informal structures, depending on social or collective structures emerging. The massive open course DS106 (Groom, 2011) makes use of design prompts and tagging to inform a structure that emerges from the contributions and community. In both examples, the emerging structures are based on emergent social networks [→185], instead of predetermined physical or curricular relationships.

Structures arising from studio having no front are often invisible

Because studio can be seen as having a less formal structure than those evident in traditional education spaces, the emerging power structures can be less visible (see power transaction [→282] and hidden curriculum [→271]). This has an obvious influence on spatial relationships, such as the formation of the spatial layout of wall or public crits [→79]. Awareness of these hidden power structures and relationships can also be used to de-emphasise or flatten power relations to offer alternative learning opportunities and different types of spatially organised activity, as demonstrated in the much wider variety of peer critique paradigms now emerging in teaching and literature (Liow, 2019; Barrett, 2019).

Surfaces

... and no two studio desks looked the same by the second week in the semester. The low walls of the cubicles were covered with sketches, postcards, inspirational examples of architectural design, and even candy and other junk-food wrappers pinned up as merit badges for work done through the hours of the night.

(Shaffer, 2003, p. 8)

Surfaces are the literal *outsides* of objects and artefacts in studio: the interfaces people work on, interact with and use. A surface used to pin up work for a crit [→79] can also act as a surface to signal identity [→94], or place [→198], or provide privacy (see public and private [→54]). Similarly, a desk surface used to demonstrate a prototype [→158] is also a shared surface for expert dialogue [→181] or social comparison [→172] (Shaffer, 2007). By extension, online and digital surfaces represent analogues of these functions, offering new ways to use and interact with surfaces (Wolford et al., 2021). Hence, surfaces have a value far beyond their practical uses.

Shaffer's (2007, p. 121) work proposes the broader definition of *surface structures* to be one of three core parts of a studio as a system (the others being pedagogical activities and epistemology), defining these as 'time, space, access to experts, and media of expression'. Whilst this remains a useful high-level framework with which to consider studio, this property focuses on the surfaces themselves and how they offer practical, cognitive, social, and identity-forming opportunities.

The practical utility of surfaces comes from their variety of type and assemblage

The typical studio offers a wide range of familiar surfaces, some of which offer particular functions – desks, drawing boards, sketchbook page, pinboards, noticeboards, shelves, and others that can have informal or emergent functions – tabletops, partitions, walls, or windows. The adaptation of surfaces in studio often centres around specific activity (Vyas & Nijholt, 2012). For example, project-specific functions can be represented by a physical or digital pinboard or post-it note arrangement on studio walls as means of making visible [→34] and systematically thinking through a project, together or by oneself. This interaction demonstrates the active and emergent nature of surfaces, which Ingold (2017)

refers to as *surfacing*, where the value comes from interaction, activity, and something being continually generated into being.

At a broader scale, surfaces can divide studio into smaller spaces of individual or collective activity. By using moveable surfaces – like pinboards – educators and students create different levels of personal or shared space (see *public and private space* [→54]) and have a surface to capture processes and outcomes that can be reflected back to the broader studio community. The creation of spaces using surfaces can also support less formal interactions, such as floorspace used to create areas of informalities [→204], or shelves used to display artefacts that encourage interactions through *serendipity* [→212] or *dialogue* [→181].

Surfaces support thinking and making in studio

Surfaces are used to support, externalise, and *make visible* [→34] designers' making and thinking (Yaneva, 2009). Whether *making* [→147] on a desk surface or gathering material for ideas and inspiration on a pinboard, surfaces enable and support students' *extended and distributed cognition* [→38] by strengthening selective attention, *facilitating perception*, making choices, and increasing memory capacity (Kirsh, 1995). Because designers work with resources at hand using tools, such as surfaces, they bridge the gap between problem and solution in particularly spatio-temporal ways (Dorst & Cross, 2001). This same affordance can be found in online surfaces (Spruce et al., 2021) and studios (Jones et al., 2021), hosting both shared and individual cognition (Christensen et al., 2019). Surfaces in studio, then, are not only the carriers of design outputs, but also sites of *methodic design practices* (Vyas & Nijholt, 2012).

In an educational context, surfaces have an additional pedagogic function through the simple act of student and educator sharing a surface. This allows the sharing of *artefacts* [→151], *facilitates dialogue* [→181], and assists the *making visible* [→34] of thinking and understanding. Additionally, the type, location, and exposure of surfaces also influences their use. For example, the desk or wall crit [→79] both depend on the surfaces chosen to host the activity: the desk crit remains a generally private or small peer-group activity, whereas the wall crit affords a larger and more public audience (see *public and private space* [→54]).

The value of surfaces in supporting design cognition extends to a wide range of digital surfaces, where many of the same physical affordances can be found, such as: shared and individual co-creation (Christensen et al., 2019), design process communication and assessment (Jones, 2014b), or the creation of hybrid assemblages for critique (Wolford et al., 2021). Over time, these individual affordances or functions build into substantive practices.

Surfaces are visible and shared in studio

Surfaces can assist the creation of public and private spaces [→54] in studio (Coleman & Oakley-Brown, 2017), giving them shared and social affordances. Actively shared surfaces allow students to engage in co-working, offering the further benefits of distributed cognition, such as collective assemblage and memory (Ackerman & Halverson, 1999; Hutchins, 1995). The permanence or transience of surfaces impacts their use and meaning, ranging from temporary and transient use of whiteboards to quickly share ideas, to the semi-permanent collection of precedent material as part of a shared project pinboard. Digital surfaces offer similar impermanent and semi-permanent affordances and have been argued to support even greater overlap of activity by offering different ways of interacting (Christensen et al., 2019; Hepburn & Borthwick, 2021; Spruce et al., 2021).

Surfaces also take on passive affordances by literally being a backdrop to a studio, where their appearance remains an influence on cohorts of students over time. As studio members work and circulate, they critique, work and engage in social learning [→172] by making use of available surfaces (Marshalsey, 2023). Here, surfaces become visible – shared expressions of learning and designing collectively [→166], social networks [→185] and belonging [→189] – displaying and reinforcing identities [→94] in studio. These latter background uses and effects of surfaces are highlighted by Nottingham (2017, pp. 47-48), who notes the affective [→200] and pedagogic importance of surfaces:

Student work galleries, like that found in the AAU hallway, form part of that world; they are the ‘background hum’ (Anderson & Harrison 2010) of design school. Often overlooked, performing their work to assemble the design student in largely unknown, and mostly unacknowledged, ways, design school student work galleries can be seen as objects set up for pedagogic purposes (Latour 2004) and one of a suite of pedagogic practices targeted towards the formation of a student’s design eye.

Surfaces are used to situate place and identities in studio

Surfaces can represent individual and shared identities [→94] (as teams and collaborations). The images hung on studio walls or personal spaces display students’ creative influences, artefacts [→151], materials, and ideas. In this way, students visibly project and process their identities [→94] as proto-professional designers (Vyas & Nijholt, 2012), which can

Visibilities and Proximities

happen in both offline and online surfaces. This identity formation takes place over time; it can be both an immediate, personal display of preference or a longer-term gathering of material as students become immersed over time [→ 121] in longer project cycles [→ 132] in studio.

Students' efforts to express and form identity through surfaces contribute to creating place [→ 198] in studio. Through these populated surfaces, preferences are displayed and shared, and the character of studio participants becomes 'more than' the sum of the parts. Surfaces encourage interactions that form a sense of place [→ 198], and a system of studio norms or habitus [→ 265]. Visible elements can also reflect a hidden curriculum [→ 271] or forms of enculturation, acculturation, and indoctrination [→ 285]. These surfaces are a 'phenomenological notion of "place" that interweaves the material, social and situated' (Vyas & Nijholt, 2012, p. 181).

Cost

In an era of economic pressure on higher education there is a growing demand to be financially accountable. This manifests itself in changes to the funding councils' requirements of HE institutions, resulting in measurement of space usage, the costing of courses in relation to student numbers, contact teaching time and resource allocation, including technical support, studio and workshop spaces. (Shreeve, 2011, p. 120)

Developing and maintaining the structures that make studio a coherent cultural context, or habitus [→ 265], requires designing and managing project cycles [→ 132], supporting continual active teaching [→ 71], providing dedicated facilities, and significant time investment within the overall curriculum. Effective studio education, then, has a cost associated with it in terms of time, facilities, resources, and people.

Personnel-intensive education is costly

Studio teaching can require a high ratio of educators to students: '[b]ecause every student's design develops along a unique trajectory, every student's design requires unique feedback, giving rise to the need for students in the design studio pedagogical model to have intense face-to-face, real time engagement with a design tutor' (Hill, 2017, p. 113). The highest financial

Studio Properties

cost in any institutional budget is that of personnel (Desrochers & Kirshstein, 2014; Getz & Siegfried, 2004), and while not unique in higher education, studio is certainly significant in its personnel costs. This is owing to the comparatively low numbers of students assigned to each educator in traditional studio formats. (Bender & Vredevoogd, 2006; Eigbeonan, 2013). If administrators or management are unaware of these characteristics of studio or misunderstand the needs of studio teaching, educator workloads can be inappropriately overloaded. In times of economic pressure, or responding to mandates around expanded educational access (or both), the difficulty of scaling up class size while retaining some of the properties often considered essential for enacting studio highlights how 'in an era of managerialism and the massification of higher education, the status of the art, design, and architecture studio is increasingly precarious' (Corazzo, 2019, p. 1249).

Dedicated physical and digital facilities are required for studio

First, let's think of this resource from the point of view of the poor, harassed higher education manager, the Head of School, the Dean of Faculty, the Pro-Vice Chancellor for Undergraduate Programmes. Just consider, if you will, all that expensive real estate just sitting there; all that heating, lighting, cleaning, all that opportunity cost, i.e. how much more throughput of students you could achieve if those acres of space were converted into lecture theatres or self-help computer suites.

(Heywood, 2019, p. 198)

Dedicated facilities (e.g., dance and design studios, theatres, sports facilities, science laboratories) are a particular expense to higher education institutions. Physical spaces represent cost to the institution in several ways; acquisition, upkeep, and opportunity cost (the loss of use for other purposes when a teaching space is dedicated around the clock to one course, or limited set of courses, cohorts, or special programmes of study). The cost of dedicated spaces appears best understood by those budgeting for them when they are justified by specialised physical and equipment requirements of a pedagogical domain, or when a new, or newly perceived, pedagogical trend makes an appearance; makerspaces, for example, or digitally-enhanced collaborative workspaces (Lee et al., 2018). However, when the primary requirement is space with deceptively simple physical

attributes – for example ‘an A1 drawing board, a table for layout space or to carry a laptop computer, a chair, a pin-up space, sufficient lighting (lamps), and sufficient electrical/data/cabling points’ (Wood et al., 2003, p. 5) – situated in proximity to others who are each allocated the same, the argument can be difficult to make.

In the case of online studios, supporting sufficient learning by doing [→145] leads to the generation of many digital artefacts which require both presentation and storage. Development and maintenance costs may be associated with software platforms for managing events like crits [→79], and providing online workspaces to educators and students (Lloyd, 2011). Students of online studios may bear costs not experienced by students in proximate studios – presenting potential barriers to education in addition to the burden of overt costs such as tuition – including not only their purchase of hardware and software, but also the potential psychological costs for those who lack confidence or the digital proficiency required to participate in studio online (Butcher & Curry, 2022; George, 2014).

Dedicated facilities can be difficult to justify in the face of their cost

The corporate university has mechanisms for reporting costs, including assets, overheads, and liabilities. Not only are design studios and supporting spaces costly, but they are also difficult to describe in comparable terms to other spaces. Lawson (2019, pp. 1717–1718) explains how it is difficult to accurately calculate students’ use of design libraries, since students will often browse, study, or make copies from books but not check them out, so no readily measurable trace is left of the activity. Similarly, how students use design studios may be selectively represented by space utilisation surveys as extensions of the traditional classroom requirements or expectations versus differently conceived criteria (Hassanain et al., 2012). The value of extended cognition in physical studio settings is well recognised in design (Williams, 2013; see extended and distributed cognition [→38]) but its importance in education is often overlooked in institutions where spatial requirements are considered only operationally or functionally, or where modes of teaching that require less space are preferred (Radzikowska et al., 2019).

The appearance of cost in the literature is generally ancillary to other discussions of studio and studio pedagogy, although in the Covid-19 pandemic in 2020, the emergency transition to online modes caused by the pandemic motivated specific attention to the question (Grover & Wright, 2023). Even so, it is the experiences of educators who are trying to hold onto spaces in their institutions, upgrade, or renovate existing spaces, or establish learning spaces within the range of what might constitute a studio format where

conversations of cost most frequently appear. For example, the ‘scruffy’ studio spaces that Boyer and Mitang (1996, pp. xvi–xvii) recommended for others (besides architecture programmes) to consider as ‘models for creative learning’, were by 2006 coming into question as potentially uneconomic spaces (Cunliffe-Charlesworth, 2006). Only five years later, Rigley (2011) mentions alarm over ‘a crippling loss of studio space’ (p. 2) because of institutional growth and, presumably, resulting economic pressures. Furthermore, by 2014, MacKenzie & Hocking named studios explicitly as the institutional targets of “‘savings” per square metre’ because costs were difficult to justify (p. 2).

Finally, there is often a general assumption that studio space is a valuable and necessary part of design education without considering critically whether this is the case. As an illustrative instance of the cost of studio as a component of design education, Brown (2021) points out that, in the United Kingdom and at the time of writing, an architecture student must spend fifty percent of their programme credits learning via design project work. Arguably, this large footprint in the curriculum crowds out forms of learning and subject matter directly relevant to the practice of architecture, including elective courses – inside or outside the design curriculum – with direct bearing on the totality of effective design practice.

Public and Private Spaces

The subdivision of our social world and the spaces we inhabit into public and private spheres is one of the key features of how a society organizes itself. This affects individuals’ mental state and experiences, regulates their behaviour, and superimposes a long-lasting structure onto human societies.

(Madanipour, 2003, p. 1)

How we think, make, and act shapes, and is shaped by, our settings (see [extended and distributed cognition](#) [→ 38]). The physical and social organisation of studio is intended to help a community of students think, make, and act in designerly ways of knowing and being (Cross, 2006; Shreeve et al., 2018). To achieve this, studio depends on a complex overlay of activities.

It can be a place of intense, personal working and production; at the same time (sometimes literally), it is also a place of group presentation, discussion, and debate. One of the key variables in this milieu of activity (Fariás & Wilkie, 2016a; 2016b) is the spectrum of private and public spaces that emerge in studio arising from individual or shared activity spaces: from a zoned-off, personal desk space to the large [surfaces](#) [[→48](#)] given over to public [crits](#) [[→79](#)]. This span of individual to shared spaces can be usefully examined as private and public spaces, based on their use and the pedagogical activities that take place in them and how shared or not these are allowed to be (Jones et al., 2021).

Public and private space is a socio-material phenomenon in studio

In a TEDx talk, the architect Damaris Hollingsworth illustrates how spaces shape our thoughts and actions by recounting her experiences attending an iconic and purpose-built architecture school at the University of Sao Paulo. The building comprised an enormous open-plan space with few walls or doors. Hollingsworth describes entering the space for the first time and being overwhelmed by a studio experience she hadn't been prepared for. Unlike the other students, who seemed younger, from different backgrounds and appeared to know what was expected of them, Hollingsworth describes how the space made her want to hide. Yet the lack of walls and doors meant she couldn't. Over the next few weeks she began paying attention to the conversations students around her were having. She overheard their conversations about the same theories and processes she was wrestling with (see [listening-in](#) [[→170](#)] and [social comparison](#) [[→172](#)]). She became curious and started to deliberately overhear her peers. From this, Hollingsworth began interacting with her peers, and over time this transformed into friendship and community (see [social networks](#) [[→185](#)] and [belonging](#) [[→189](#)]). Hollingsworth (2018) describes how the space created opportunities to overhear and interact and, in the process, how the building 'delivered togetherness'. The space shaped how she thought and acted.

Hollingsworth's account recognises the importance of private and public activities in studio, for example, the benefits of [social comparison](#) [[→172](#)] and [learning and designing collectively](#) [[→166](#)], but also, and importantly, the need for privacy as part of a personal learning journey [[→104](#)] and the development of [identity](#) [[→94](#)] and [expertise](#) [[→90](#)].

Public and private space emerges through activity and function

A physical studio might consist of a single open-plan space configured to accommodate multiple types of spaces within that main volume. Thoring et al. (2018) identify five types of spaces for creative work: 1) a personal space

for deep, concentrated work; 2) a making space given to experimentation; 3) a collaboration space for group work or discussion; 4) presentation space where communication is often one-directional (lectures) and/or used to exhibit work and; 5) intermission spaces, which are connecting spaces like hallways, or in-between spaces that are co-opted into ‘creative workflows’ (Thoring et al., 2018).

Although Thoring et al. don’t explicitly explore the dimension of public and private space, this is implied in the space types described and is critical to how they function practically, psychologically, and socially. For example, in design practice, having private space to enable focused or creative thinking is critical and studios that provide personal spaces can help to deal with the many distractions that result from the unenclosed, unprotected spaces of open-plan settings (Murphy Paul, 2022, p. 121). Conversely, having public spaces to engage in collective activity, such as sharing work through presentations, offers different opportunities for interaction, such as serendipity [→212], social comparison [→172], reassurance, and inspiration. And, of course, in between these extremes are various activities that depend on different degrees of private or public space.

Time is also an important factor that interacts with public and private space. Students learn through project cycles [→132], and creative work is generally initiated in private and exposed to increasingly public discussion and evaluation as the project progresses (Oh et al., 2013; Shaffer, 2007). This means as students move through their projects, studio must accommodate a set of changing needs along a trajectory that runs from private thoughts and ideas to increasingly public statements, critique [→79] and exhibition of project work (making visible [→34]).

Private space emerges through identity and boundary-making.

Several psychological and social factors encourage or require privacy in studio. Studio is a place of creativity [→222], experimentation, failure, nurturing, and trial, much of which needs to happen in private and away from the view of others. This is particularly critical in an environment where a student’s learning journey [→104] depends on uncertainty and ambiguity [→209] and risk and failure [→227]. To create privacy in studio, students and educators deploy various boundary-making strategies to protect work-in-progress from unwanted or premature critique (Siegert & Löwstedt, 2019; Farias, 2016).

Boundaries can be delineated physically (desks, pinboards, drawers), or through ‘identity marking’ (posters, personal objects, spatial arrangements) (informal learning spaces [→42]). While boundaries can bring privacy, they do not necessarily require isolation or separate rooms; they can come from

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a special space, a corner, a niche, or a span between two thick columns, as reflected in Corazzo and Gharib's (2021) idea of the formal nestled within the informal.

The creation of boundaries, particularly in open-plan studios, involve a level of self-presentation, and this is an important way for students to control their own [visibility \[→ 34\]](#) and [identity \[→ 94\]](#) in studio (Corazzo & Gharib, 2021). Indeed, a significant part of the formation of identity in studio comes from the organisation and personalisation of space around individual students, forming a part of the [habitus \[→ 265\]](#) of studio (Vyas & Nijholt, 2012). However, consciously having to make oneself public can be draining for some students, particularly students from underrepresented groups (Murphy Paul, 2022). This can be especially pronounced as the studio is a site of [social comparison \[→ 172\]](#). In the example that opens this property, we saw the strain of self-presentation and its potential to create feelings of exclusion through comparison. Murphy et al. (2018, p. 68) put forward the idea of 'prejudiced places' that 'unequally tax the emotions, physiology, cognitive function, and performance of some groups more than others'.

Private boundaries can be porous, creating semi-private space in studio

Boundary-making in studio occurs in a shared space and arises from socially negotiated interactions, creating degrees of private and public space. Boundaries can separate and protect but are also sites of 'interface and communication' (Madanipour, 2003, p. 55). Boundaries created for privacy can function as a two-way interplay – a public place of representation (posters displayed on partitions) and simultaneously creating a private workspace – the partitions shield studio members from being seen, while at the same time offering opportunities for display and visibility (Demirbaş, 1997).

Partitions intentionally enable students to shield aspects of their creative labour from others. At the same time, they are also porous in that they allow a certain amount of visibility. Jones, Lotz, and Holden (2021) refer to this as a semi-private space in online studio settings, where the student's work is not fully public but not entirely private, thus inviting engagement from students directly interested or who are part of a [social network \[→ 185\]](#) to engage in [social comparison \[→ 172\]](#). This links privacy to the idea of intimacy, where the essentially private nature of studio allows a type of intimacy between participants to arise, offering the chance for designers to 'engage with each other in a comprehensive manner, not reducing each other to specific public roles' (Fariás & Wilkie, 2016b, p. 11). This type of intimacy through privacy offers personal and social engagement with the [materiality](#)

[→142] and artefacts [→151] of studio, as well as the social networks [→185], identities [→94], and place [→198] of studio.

Semi-public space supports many forms of social learning and creating

An essential benefit of studio as a shared space (physical or digital) is the relational and social activity it supports. Most of this activity depends on other people and can be considered ‘semi-public’ (Jones, 2020), such as social comparison [→172], dialogue [→181], or learning and designing collectively [→166]. Properties like these are supported in two critical ways: proximity and visibility.

Students are brought together physically or digitally through proximity around some shared event, activity, space, or other catalyst (Jones, 2022a). In the crit [→79], students share and discuss work, activating secondary mechanisms such as listening-in [→170], social comparison [→172], or confidence to speak [→176]. However, these depend on students’ *proximity* to one another, either in physical or digital spaces. In that sharing, there is a chance to tacitly compare or acquire knowledge and information. Serendipity [→212] also depends on proximity (physical or digital), where productive collisions and collaborations can happen in the ‘unstructured space of potential’ (Murphy Paul, 2022, p. 119).

Visibility, which we define as *being visible* and *making visible* [→34] is another important factor in creating or mediating semi-public spaces. Studio is also a place for *making visible* [→34] processes, methods, collaborators, and learning, so other studio members can view this (Shreeve, 2011; Orr & Shreeve, 2018). Being visible arises in large open spaces, where lines of sight are possible across the sub-divisions and layering of space and activity. This, in turn, supports secondary activities, such as creative aural and visual eavesdropping (see listening-in [→170]). Similarly, the visibility of people and activity in studio is critical to active teaching [→71] as well as the interaction of peers through learning and designing collectively [→166]. Like proximity, the background visibility of studio encourages certain types of interaction and engagement.

Public and private boundaries are created internally and across studios

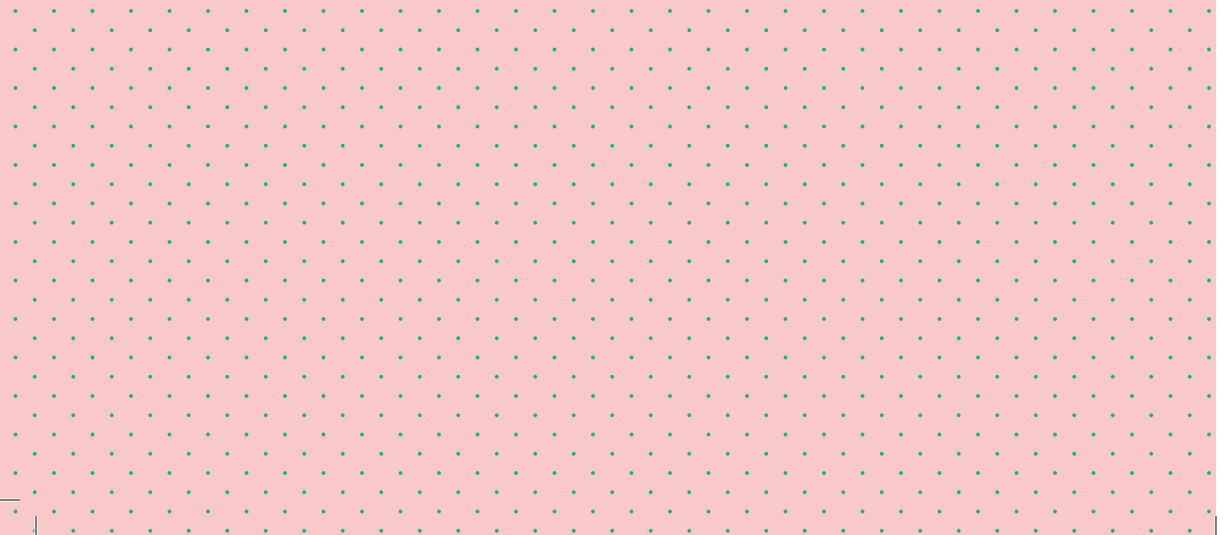
Studio can offer spaces for creative experimentation that may need to be private and shielded from early judgement (personal), but also spaces where ideas can be sparked through serendipity [→212] in collaboration with others and then developed independently or away from distraction. It is important that students exert some control over these spaces and

interactions as they learn how they can be used as part of their design process. For example, creative design methods using convergent and divergent thinking and activity benefit from alternating shared (divergent) and personal (convergent) activities (Osborn, 1953; Guilford, 1967), which in turn benefit from being supported by public and private spaces (Couger, 1994).

Ownership and control are critical aspects of the public and private space axis, and the physical studio has historically accommodated ownership in various ways – from maze-like warrens created by boards between desks to open-plan spaces and, in some instances, standard classrooms that are temporarily repurposed (Radzikowska et al., 2019). Each offers different ideas of ownership and control. Ownership is performed differently in open-plan spaces and the opportunities that may be restricted or selected are marked subtly, such as things that might be left on tables. With private spaces, there are different opportunities to manage design processes, gather inspiration and demonstrate identity (Vyas & Nijholt, 2012).

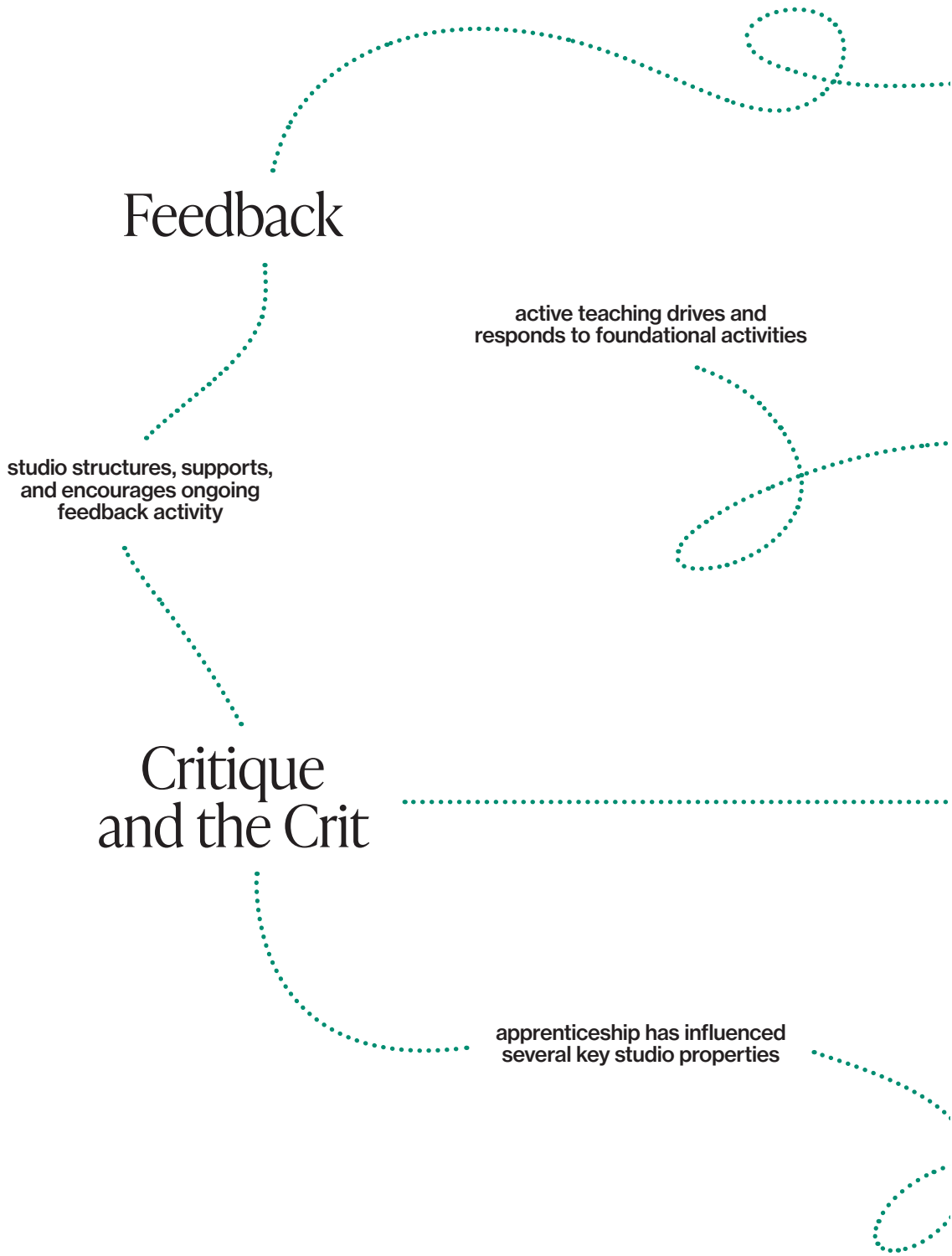
Urban studies emphasise the need for ‘ambiguous boundaries’ that act as interfaces and flows between public and private spheres (Madanipour, 2003). They allow individuals to move between these spaces at different times for different needs. Hard boundaries can prevent the movement of people between spaces. The educational studio is a setting for individual and social learning, requiring the ability to oscillate between experimenting privately, sharing early iterations, or engaging in productive (sometimes serendipitous [→ 212]) conversations that can lead to new insights. The informal exchanges that can occur in open-plan studios can be generative. However, the power of these exchanges also relies on students being able to act on them, requiring the provision of secluded and private space (Murphy Paul, 2022).

Foundations and Methods



The roots of studio are in the novice/apprenticeship model, where a limited number of apprentices learn under the supervision and authority of an expert **apprenticeship**. In contemporary Western-influenced higher education studios, the expert has been replaced by the expert-educator and the expert's studio replaced with the simulated environment of the educational studio. Entering this studio, the expert-educator may be seen launching a new design project for the whole cohort – setting design problems which will frame students' work **design brief** and constraints for their creative responses. This expert-educator will be actively responding to students and their work in progress, often one-to-one, continuously adjusting their actions in response to the learning needs of those students **active teaching**. Groups of students, an educator, and possibly a guest expert, gather around a table to engage in formal, scheduled conversations about the ongoing project work **critique and the crit**. Students and educators, as well as students and peers, will have conversations about this work multiple times **feedback** as the expert-educator sets up conditions for students to consider their actions as they engage in design and after completion of their designs **reflection**.

A map of the Foundations and Methods cluster showing possible relationships and connections between properties.



feedback and reflection are continuous and pervasive

Reflection

Active Teaching

repeated, ongoing reflection on feedback feeds forward into future student work and development

Design Brief

active teaching acts as a proxy for aspects of apprenticeship

Apprenticeship

Apprenticeship

In a workshop, the skills of the master can earn him or her the right to command, and learning from and absorbing those skills can dignify the apprentice or journeyman's obedience. In principle.

(Sennett, 2008, p. 54)

The apprenticeship model is a mode of learning and teaching centred around the relationship between master (expert) and apprentice (novice). In this model, relationships form around particular needs, practices, or associated traditions in craft and making practices (Petricone, 2019). Historically, the novice learned from the expert. In turn, the expert was compensated through the novice's service, meaning apprenticeship was as much a socio-economic model of employment as a pedagogical one (Souleles, 2013). Later, in the *École des Beaux-Arts* tradition in France, architecture students would form associations and their own studios, or *ateliers*, by directly employing experts (architects) to tutor them, retaining elements of the master-apprenticeship relationship. With industrialisation, this model evolved into the types of specialism seen in contemporary design practices and as a way to replicate patterns of making as well as controlling and guiding a discipline (Sennett, 2008).

The traditional model, with the educator in the role of expert and the student acting as novice, is still evident in contemporary studios. The relationship has significantly influenced curricula and pedagogical forms (Webster, 2005; Lyon, 2011) and it remains a pervasive pedagogical model in the studio (Cuff, 1992; Orr & Shreeve, 2018). In institutions today, part-time educators are still sometimes employed on temporary or short-term contracts that make direct use of their expertise in design practice to engage students, perpetuating the apprenticeship model.

Apprenticeship in studio is expressed through specific moves

In his influential work, Schön (1987) refers almost exclusively to the apprenticeship model, clearly linking the relationship between novice and expert to effective learning and the development of artistry (expertise [→ 90]). This relationship is constructed around a series of interactions, most obviously the desk crit, and, for Schön, the learning takes place through the student's reflection on the expert's input. Goldschmidt et al. (2010) expand on Schön's work to include other forms of crit [→ 79] (wall crit, pinup, degree

show) and place greater emphasis on dialogue [→181] and not only on the reflective component offered by Schön.

The way in which this property interacts with others is most relevant to understanding apprenticeship as a learning and teaching method. For example, the apprenticeship model involves tacit transfer of knowledge and knowing [→248], where experts demonstrate something for students to learn from, rather than explaining it in abstract terms. Similarly, observations and criticism provided by experts in feedback [→74] are considered particularly valuable in studio as they are distinct from other forms of feedback. And, of course, the development of expertise in students (offering opinion, judging, commenting) is the act of them acquiring expertise [→90], through immersion [→118] in studio and the enculturation [→285] of a student into a practice community.

Apprenticeship is based on certain assumptions

The apprenticeship model is built on several assumptions, two of which are worth considering in contemporary education. First, the master knows more than the novice, which is often conflated with the idea that apprenticeship is based on *transmitting* knowledge from the former to the latter (Freire, 1970/2000; Fernández-Cárdenas, 2014). Educators ‘occupy powerful positions in relation to students because as “full vessels,” they embody and control access to what students require to become “full” themselves’ (Crysler, 1995, pp. 210–211). While this may be true in some instances, other apprenticeship relations can and do exist (see critical pedagogy [→276]; general education concepts [→242]). Peer student apprenticeship, for example, happens regularly in studio, whether this involves casual sharing of skills or tips (informalities [→204]), or through longer-term, pedagogical relationships in a social network [→185]. Similarly, the transfer mechanism in the traditional apprenticeship model is superficial and incomplete if it is the only one considered to operate in studio. The transfer of tacit knowledge [→248], one of the critical mechanisms in apprenticeship, is a far subtler mode of learning and teaching than a purely transactional model (Sennett, 2008).

Secondly, the assumption that the apprenticeship model is the most effective, or even only, way to educate novice designers persists (Mewburn, 2012). This assumption likely arises from historical and habitual practice: it has worked in the past and should, therefore, continue to work. Again, this assumption is incomplete and ignores many other learning opportunities in studio, not least between students through learning and designing collectively [→166], peer interactions like listening-in [→170], or taking part in a crit [→79].

Importantly, the discussion of these assumptions highlights that the *unit* of educator-student is not necessarily the simplified one traditionally

described as the expert and novice alone, and that more complex or nuanced interrelations of experts and novices exist in any studio.

The apprenticeship model is a power relationship

The power relationships between expert and novice in the apprenticeship model are historically imbalanced and generally depend on power transactions [→ 282] and control (Sennett, 2008). It is perhaps unsurprising that control is still evidenced in contemporary studio. This is not necessarily a problem if it is recognised as part of a curricular or pedagogic need, such as enculturation, acculturation, and indoctrination [→ 285]. When and where the expert clearly has knowledge required by the apprentice, there is a need to relay this knowledge in some way from one to the other. How this interaction takes place, however, does not have to conform to traditional power models – that is, the power of the expert’s knowing can be ‘decoupled’ from the power of educating. Goldschmidt et al. (2010) identify that design expertise does not correlate to teaching or coaching ability, a point expanded on by Dorst (2006), who observes that ‘Being a tutor is playing a very specific role, which doesn’t correspond very well with the normal behaviour of a designer in practice.... This means that in the role of a tutor you should not say everything that comes into your designer’s mind’ (pp. 88–89).

Webster (2004, pp. 108–109) takes this idea further, identifying a series of educator (expert) types – ‘the entertainer’, ‘the hegemonic overlord’ and ‘the liminal servant’ – to understand what form of apprenticeship relationships are effective (or not) in studio (see performance [→ 107]). Webster observes that the ‘liminal servant’ is considered by students to best support their learning, not the more traditional relationships offered by the other types.

Design Brief

A good class project is combustible, it is the fuel that powers the creative engine; or put less metaphorically, it is the beginning, not the end, of an experience.

(Heller & Talarico, 2011, p. 13)

On a surface level, the design brief is a written artefact outlining a creative [→222] challenge and may include objectives, the intended audience or stakeholders, details about the project's scope, background and contextual information, clarification of the deliverables, and/or relevant timings (Phillips, 2004). In educational contexts, however, the design brief is much more than a list of requirements and instructions. In the literature, the brief is described as the *backbone* of studio education (Dineen & Collins, 2005, p. 107), a 'primary curriculum vehicle' (Blair et al., 2008, p. 81), and even 'combustible ... the fuel that powers the creative engine' (Heller & Talarico, 2009, p. 12). The design brief (or simply 'brief') is a vehicle for project-centred learning which guides, but doesn't dictate, students' creative processes, making it critical in shaping the learning experience and developing students' creativity [→ 222].

Different types of brief support different approaches to learning

Different types of briefs take on different roles in nurturing the judgement [→98] and expertise [→90] of students. Orr and Shreeve (2018, pp. 109–112) identify six common types found in studio:

1. *process-focused briefs* focus on the processes: methods of designing, including drawing, making [→147], or prototyping [→158]. As students progress, process-focused briefs can become more open-ended, allowing them to take on the responsibility of writing part or all of their own briefs and articulate their own processes.
2. *immersive briefs* typically run over a short period; they can be intentionally intense and involve sustained short-term engagement with a focus on immersion [→118] or simulation [→232] – for instance, a 24-hour design challenge or charette – and might involve suspending other learning.

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3. *group briefs* emphasise collaboration and can be used to develop community, interpersonal relationships, project management, and teamworking capabilities, or to encourage interdisciplinary approaches, focusing on learning and designing collectively [→166], and forming or nurturing social networks [→185].
4. *live briefs* are typically created by individuals external to the teaching studio. These briefs are often aligned to a real context and the client may use the outcomes. The negotiation of client needs and aspirations can form a fundamental part of developing students' interpersonal and project management skills (Butterworth, 2013; Butterworth & Care, 2014). The *competition brief*, a subset of the live brief, provides a simulated [→232] external setting and a critique [→79] by external stakeholders.
5. *'no-brief' briefs* require students to create their own brief, relying on (or pinpointing a lack of) expertise [→90] within a student's personal journey [→104]. The Global Free Unit is an example of a transnational multi-site architectural studio initiative in which students write their own briefs (Mull, 2020).
6. *dystopian or utopian briefs* use speculative design or design fiction-inspired methods in which students explore contemporary ideas to propose alternative futures. These briefs focus on engagement with design activities through play [→155] with encouragement to reflect [→83] on otherwise unknown critical and/or social impacts.

Orr and Shreeve's (2018) typology illustrates how different types of briefs can appear similar by having common components, but may offer varied approaches to learning depending on how the components are utilised pedagogically. Briefs can: 'give instructions, present a problem, set out rules, describe an exercise, initiate an activity, propose a game, stimulate a process, or simply throw out questions' (Gisel et al., 2016, inside front cover). By attending to broader characteristics such as length, complexity, openness, authorship, and orientation (Sosa, 2019) all briefs can develop students' creativity [→222] and learning in distinct ways.

The design brief provides clarity and ambiguity

Briefs can provide both clarity and certainty, but are also often intentionally ‘unspecific or ambiguous’ (Garner & McDonagh-Philp, 2001, p. 60). Educators should create a brief that defines the design challenge while maintaining enough ambiguity for unanticipated outcomes (Sosa, 2019). The educator Mitchell describes a radically under-determined design brief that can be ‘as short as two sentences. I define the outcome to be achieved, and the initial approach from the outset, but the “direction” of the project is determined by the work the students actually do and bring into class’ (2006, para. 7). Such an approach aims to encourage students to move beyond problem-*solving* to *define* problems themselves (Cennamo et al., 2011) although this can be an uncomfortable experience. Sas and Dix (2009) note that ‘while educators try to provide just enough details to leave room for the exploration of the design space, students prefer a more articulated and structured problem definition’ (p. 176).

It can be helpful, therefore, if both educators and students think of the brief as either a ‘catalyst that activates learning’ (Orr & Shreeve, 2018, p. 109), or a ‘set of signposts’ (p. 108) that guide a student, or a ‘trigger for a learning journey’ (Sadowska & Laffy, 2017, p. S1383). The brief should support multiple interpretations (Oak, 2000), different responses, and unexpected outcomes. As Orr and Shreeve (2018, p. 109) explain, whilst the project brief ‘launches’ them, students learn ‘to fly by themselves’.

The brief can trigger different approaches

Writing and setting the brief is a core ritual [→ 262] of studio; the brief is the ‘mediating artefact that transforms the studio into a learning space’ (Orr & Shreeve, 2018, p. 14), and studio is the fulcrum by which learning is activated through the work that students create in response to the brief. The way a problem is framed in a brief can invite new and innovative explorations (Dorst, 2015), and the orientation of a brief can trigger particular approaches. Sosa (2020) identifies a range of orientations found in design briefs. Importantly, these different orientations can significantly affect how students approach and experience the project and their learning:

- by defining a desired scenario or outcome: ‘to design a playground for a fictitious neighbourhood’ (Atman et al., 2005, p. 329)
- by referring to a concrete situation: ‘a concept for a litter disposal system in a new Netherlands train’ (Dorst & Cross, 2001, p. 426)

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- by naming a theme for problem-setting: ‘think about what human transportation will be like in 2050’ (Vasconcelos et al., 2018, p. 105)
- by selecting a target user with a specific condition: ‘eliminate the need to have multiple bikes as people grow up’ (Vasconcelos et al., 2017, p. 4)
- by instructing discovery: ‘each team must interact with the client/sponsor to define their needs’ (Jain & Sobek II, 2006, p. 61)

While the brief remains critical as students progress through their courses, its role can change. In the early stages, the brief is a means of building skills. Later the brief is a key component in scaffolding students’ journeys [→104] towards increasingly complex projects (Shaffer, 2007) and towards the development of students as autonomous creative [→222] practitioners who can write and address their own briefs. Lee (2009) has developed a typology of briefs that range from *directed* to *guided* to *independent*, with a second axis of focus from *activity-centric* to *project-centric* to *inquiry-centric*. In Lee’s typology, briefs are more likely to be directed and activity-centric at the start of a course, becoming increasingly guided and project-centric, then independent and inquiry-centric at the end of the course. In practice, this is not a perfectly smooth progression. and briefs might be re-adapted frequently during a project run in response to active teaching [→71].

In any responsive design curriculum, briefs will change, and it can be surprising how significant the impacts of such changes can be. Sadowska and Laffy (2017) examined the impact of a brief on learning, running the same brief two years in a row, but presented differently each year. One iteration versus the other led to students producing better ideas, engaging more with the design process, and being less focused on outcomes, which suggests the importance of further research on how the project brief can impact student learning. In fact, given the primacy of the design brief in the learning process, critics have questioned why its use and impact remain under-theorised in studio literature (Meron, 2021).

The brief is not neutral

The brief may be open to interpretation but that does not mean it is neutral. While briefs can be broad, leaving scope for a wide range of positions, they remain ideological documents: value-laden, and imbued

with assumptions regarding the purpose of design and how a designer should behave (Gisel, Paim & Bergmark, 2016). Tunstall's (2011, p. 97) analysis of design briefs written and delivered within a single communication course identified two underpinning orientations which she called *art* and *business*:

An Art Orientation reflects a bias towards having the student's own personal expression and artistic authorship determine the majority of studio courses' design briefs
... A Business Orientation reflects a bias towards having external business clients, whether for-profit, non-profit, NGO, or governmental, determine the majority of studio courses' design briefs.

If these orientations of design briefs are implicit rather than explicit, they and the brief itself form part of the hidden curriculum [→ 271] of studio.

Active Teaching

There is a paucity of language to articulate the skills and approaches deployed by the artful studio lecturer.
(Orr & Shreeve, 2018, p 116)

Active teaching is the responsive and opportunistic teaching activity that educators engage in regularly and habitually in studio. It identifies and acts on learning opportunities arising from student needs in a studio. These opportunities, similar to 'teachable moments' (Woods & Jeffrey, 1996), occur when a student's need to move forward is affected by their current level of knowledge or experience and where a positive intervention *at this time* might have a significant impact on that student's progress and learning.

Seeking out and responding to such opportunities using formal and informal teaching strategies is a significant part of studio education requiring a diverse set of activities on the part of the tutor. As an example, Boling (2016, pp. 97-98) describes a range of such activities, including 'cruising the studio', making decisions about when to intervene, monitoring student progress in action, responding to queries, making comments, offering opinions and responses to work in progress, and a myriad of other ongoing activities.

Note that active teaching in studio, as framed here, is much more than 'teaching that encourages active learning' (The University of Edinburgh,

2023); it depends on a particular teaching *stance* grounded in interaction between tutor and student, and resulting in variable learning and teaching approaches and even outcomes. Boling et al. (2013) describe the studio tutor as a *sensitive instrument* in a pedagogically complex system, highlighting the contextual responsiveness required. It is the degree to which active teaching occurs in studio, and is relied on as part of a design curriculum, that distinguishes studio from many other pedagogies.

Active teaching is responsive and emergent, not predefined or preconfigured

Active teaching does not rely on specific, predetermined learning outcomes but on learning *aims* and teaching *strategies* or *approaches* (Orr & Shreeve, 2018; Boling et al., 2020). That is, the general learning and teaching goals that studio supports do not usually have specific conditions attached, such as a particular time by which a concept is taught or learned. A studio might support the overall learning aim of developing students' confidence and experience in working with uncertainty in design processes, but individual students will develop this over different periods of time [→121] and within disparate project cycles [→132]. Moreover, what constitutes success for each student can also vary significantly, meaning the teaching approach also has to vary according to learning needs (Orr & Shreeve, 2018, p. 116).

Active teaching, then, relies on the educator using different teaching tactics and approaches (not just activities) that actively respond to the learning situation. The desk crit [→79], for example, may have a planned starting point but also draw out other learning opportunities as the dialogue [→181] continues. Less formal activities (see informalities [→204]), such as an educator *cruising* the studio, can act as starting points for learning opportunities, and being visible in studio as an educator can be an important invitation to identify those opportunities. The immediate follow-on activity to these starting points is focused on the student learning need in that moment, not on the teaching requirement. Orr et al. (2014, p. 41) refer to this as '*reverse transmission*' teaching, where the educators's role is to ensure 'the answer is brought about from within [the student]' (p. 32).

Active teaching depends on particular dispositions towards students

A general body of literature focuses on the *ways* in which educators interact with students and the stance, or disposition, a given educator takes towards the student. Some refers to intentions behind educator-student interactions, such as 'following, not leading' the student (Orr & Shreeve, 2018, p. 118), or aiming to provide the 'right sorts of experience' (Schön, 1987, p. 93).

Most literature refers to roles that educators take, such as the coach (Orr & Shreeve, 2018), the guide (Harman & McDowell, 2011, p. 43), the facilitator of student creativity [→222] (Belluigi, 2013), or the orchestrator of learning experiences (Cennamo et al., 2011). Finally, some authors refer to identities that educators can take on with either explicit or implicit, negative or positive, impact on the learning experience, such as ‘entertainer, hegemonic overlord, or liminal servant’ (Webster, 2004, p. 101).

It is commonly noted is that an educator’s disposition is not necessarily static; that educators can change their stance (or even identity) depending on need and/or context. Llewellyn and Williamson (2015) summarise this responsiveness and adaptability by describing educators as acting variously as educators, mentors, exemplars, agitators, or demonstrators. This responsive approach to the learning situation sets active teaching apart from other approaches and, whilst not unique to studio education (consider early years education, for example), the extent to which space in the curriculum is given over to this mode of teaching is a defining characteristic of many studios. Active teaching may also be a defining tension in an era of resource management as it typically requires a low ratio of students to educators and this contributes to the cost [→51].

Active teaching depends on tutor judgement and reflexivity

The need to adjust many variables on the fly in studio requires a reflective [→83] teaching practice, if that practice is to be effective and responsive to student needs. More specifically, decisions around when and how to intervene (or not) in the studio require constant and careful consideration. As Boling (2016, p. 99) observes:

This studio teaching requires me to monitor myself all the time I am teaching, as well as when I am assessing my students’ performance. Have I modelled and demonstrated design thinking to scaffold their development, or have I usurped their position in our partnership?

Such reflexivity is required in studio teaching practice if it is to respond fully to the complexities of student need in each moment. Whereas some curricula may solve this dilemma by defining discrete, extrinsic, and explicit learning outcomes, what a student learns in studio is, in many ways, resolved continuously through active teaching and learning that takes place; therefore ‘lecture-based teaching can be tiring, but studio teaching can be exhausting’ (Boling, 2016, p. 98).

This same effort is required in online and distance studio settings, where active teaching is just as important, if not more so (Simpson, 2008), and in these settings it is still usefully framed using the above conditions and observations. For example, Lotz et al. (2019), document how responsive feedback (timely, relevant, and authentic) is critical in fostering appropriate levels of social and disciplinary learning in an online studio. Essentially, the same responsiveness to student need is required but the opportunities to identify need, in context, and at the right time, become more difficult, simply because the proximities [→128] are different (Jones, 2022a). This means that particular attention and effort are required online in making visible [→34] student activity and presence, creating interactions through serendipity [→212], and even creating the right sense of place [→198], all equally important in online and distance settings.

Feedback

What we have is a very Kafkaesque situation where you really don't know where you are, and you have no basis for evaluation. You hang on the inflection of the tone of voice in your crit to discover if something is really wrong.

(Anonymous student, quoted in Schön, 1987, p. 82)

The evolving definition of feedback

A common definition of feedback is that it operates on the difference between *actual* and *desired* levels of performance and that the feedback must contain some information describing this difference (Ramaprasad, 1983; Sadler, 1989). In studio, such information relates to skills, actions, behaviours, work-in-progress, sketchbooks, drawings, conversations, and even absence. Each of these gives insight into performance and can appear in feedback. But this comparison between actual and desired performance describes only part of how feedback is activated in studio. An important definition in recent pedagogical literature characterises feedback as participatory, complex, and reciprocal (Lipnevich & Panadero, 2021; Langer, 2011), highlighting a more complex process when observed in context and action. Importantly, this shift places increased emphasis on formative feedback and assessment [→234] (Sadler, 1989; Black & Wiliam, 1998) during the *process*

of learning or making, in contrast to purely summative feedback occurring at the end.

Over time, conceptualisations of feedback have also shifted from feedback as something a student *receives* from another (usually the educator) to the student being a central and active figure in how feedback happens. This means that students ‘generate internal feedback as they monitor their engagement with learning activities and tasks and assess progress towards [a] goal’ (Nicol & Macfarlane-Dick, 2006, p. 200). Further, some authors argue that feedback itself is a *sense-making* process (Carless & Boud, 2018) and there is a growing awareness of the role of other actors and actions in the feedback system, including peers, objects, social media, body language, and tone (Hattie & Timperley, 2007).

Characteristics of feedback in studio

In studio, students are asked to be original, transgressive, and innovative (Orr & Shreeve, 2018); to make the ‘yet to be thought’ (Bernstein, 2000, p. 31); and to ‘yield behaviours and products which are unpredictable’ (Eisner, 1983, pp. 554–555). Consequently, students experience high levels of uncertainty and ambiguity [→ 209]. Immersion [→ 118] in regular and continuous feedback [→ 74] is a key way of supporting students as they manage both. Studio is a place of continuous, regular, and ongoing feedback [→ 74], where peers and educators are constantly on hand to observe and comment on students’ work. Studio offers surfaces [→ 48] for displaying work in progress over which to engage in dialogue [→ 181], and most institutions dedicate spaces or walls for crits [→ 79]. Time [→ 121] and rhythms [→ 124] in the curriculum offer opportunities for feedback through social networks [→ 185] or opportunities for social comparison [→ 172].

Learning results from actionable, forward-looking feedback. To *close the assessment loop* refers to ensuring that learning does not simply conclude with summative assessment, but that students are able to act on the feedback provided and then assess the effectiveness of their actions. Appropriate design and delivery of feedback are essential in helping the student do this and the practice of using *feedforward* is one example of how closing the assessment loop can be achieved (Higgins et al., 2001). At its simplest, feedforward offers explicit guidance on how to change an approach, action, or process and happens in a timely enough way that the feedback can be applied. This feedback approach that has been shown to be especially effective in some studio settings (Jones & Hilton, 2022).

Educators are not the only sources of feedback. Nicol and Macfarlane-Dick (2006, p. 201) position the student – and not the educator – as central to the feedback process: ‘they are always actively involved in

monitoring and regulating their own performance.' In this view, feedback is not only *given* but is also actively *sought*, and not just from educators; feedback can be exchanged between educators, peers, professionals, and others. It can even be detected (experienced) when it is not sought (Hattie & Timperley, 2007), for example, in a brief conversation, a glance of approval or disapproval from the audience in [crit \[→79\]](#), or a compliment made by a student passing another's workspace.

Both informal and formal feedback is important in studio. Formal feedback is typically scheduled into the pattern of [project cycles \[→132\]](#) in studio, including tutorials and/or critiques (the [crit \[→79\]](#)). Educators may be expected to deliver formal feedback at certain moments, and students may expect to receive it in a form that allows them to review and act on it. Informal feedback happens as part of the day-to-day [informalities \[→204\]](#) of studio and is often initiated through [serendipity \[→212\]](#). Comments made by educators between scheduled tutorials can provide students with constructive feedback, a form of regular, heterarchical communication as compared to feedback according to a schedule or hierarchical structure. [Dialogue \[→181\]](#) between students in studio can also provide valuable moments of informal peer-to-peer feedback, even a form of peer critique if it is directed towards the improvement of specific [artefacts \[→151\]](#) or processes. Gray (2013a) shows how peer feedback that happens outside of formal studio teaching allows students to make sense of, reflect on, or even challenge formal feedback.

Feedback is responsive to each student

Not every student in studio gets the same feedback or even the same level of feedback (Boling & Schwier, 2016). Educators regularly respond to the perceived, and variable capacities of individual students: what they need and how that might be best imparted to them. This is called ipsative feedback, and is based on the personal growth and progress of each individual student (Malecka & Boud, 2023). In addition, pedagogical encounters between educators and students are often open-ended conversations reflective of the [informalities \[→204\]](#) of studio rather than explicitly framed around the transfer of knowledge.

The [design brief \[→67\]](#) is created to encourage a diversity of responses (Orr & Shreeve, 2018), and there is an expectation, even an implicit requirement, that each student's response to a project will be different. Educators must, therefore, tailor feedback to the project and its intentions, but also to a student's character and temperament (see [active teaching \[→71\]](#)). There is an 'expectation that feedback will be responsive to a student's ability to receive and use that feedback' (Boling & Schwier, 2016, p. 16),

because processing feedback requires both cognitive and emotional effort (Langer, 2011). Importantly, educators must be aware that students have the potential to react differently to different types of feedback and that the levels of trust students have with tutors can impact the effectiveness of feedback (Michela & McDonald, 2020).

Types of feedback in studio

Scholars have offered several typologies of feedback. Barrett (2019) identifies three types of feedback in creative education. First, feedback on creative work describes what is seen in words. Here, meaning can be inferred from a piece of work; for example, ‘I can see you have used the colour red to differentiate this text from the rest of the text.’ Second, feedback on creative work can focus on interpretation; for example, ‘I can see you have written text in red, which suggests urgency.’ Third, feedback on creative work can be judgemental and assign value; for example, ‘the red text is too aggressive for this context.’ Barrett recommends we exercise caution when making judgements because they are often founded on unspoken values or ideas about what constitutes *good*. Scagnetti (2017, p. S784), meanwhile, identifies five types of feedback: three ‘meaning-making quality feedback’ types, (interpretation, exploration, and comparison); and two ‘error correction feedback’ types: (direction and judgement). Scagnetti expresses caution about these two kinds of error correction feedback since they depend on power differentials between educator and student and can be demotivational to students (see also [power transaction \[→ 282\]](#)).

Read together, Barrett and Scagnetti’s feedback types highlight the important difference between interpreting student’s work through feedback (inferring what you have seen) and judging student’s work through feedback (assigning value to what you have seen). While Barrett teases interpretation and judgement apart, he reminds us that they are interdependent: for example, our values and tastes can colour how we interpret and judge something. What is most important about feedback is to make visible the different mechanisms and assumptions for each type of feedback. These approaches can support students in active *meaning-making* around feedback.

Different types of feedback may be employed at specific stages of [project cycles \[→ 132\]](#). Formative feedback early in the project will likely be more explorative, and summative feedback will likely be more interpretative and judgemental. [The crit \[→ 79\]](#) might include more than one feedback type, which might occur interdependently, descriptively, and exploratively. Feedback is not only differentiated between students but also differs for each student depending on where they are in a project cycle.

The tensions and risks in feedback

There can arise tensions between formative and summative feedback. Educators work alongside students to provide feedback that helps them develop their work. But when work is submitted, the same educators become gatekeepers and classifiers of quality through [assessment \[→234\]](#), a significant but difficult shift in their role which can be uncomfortable for many educators (Orr & Shreeve, 2018).

The [crit \[→79\]](#) is intended to provide an opportunity for structured feedback and assessment. However, crits are also moments when students learn to become members of a disciplinary community. More than just providing formative or summative commentary on a student's performance, feedback in a [crit \[→79\]](#) is also part of [enculturation, acculturation, and indoctrination \[→285\]](#) into a community of practice, in which the student learns what that community values and how its members communicate with one another.

As a studio practice, delivering feedback is also a [power transaction \[→282\]](#) that can include and exclude students. Feedback is never neutral, primarily since authority and expertise are ascribed to educators and critics with more experience than students. Feedback usually comes from a position of power and is imbued with the values of the person delivering it. These values can be systematically and negatively (or positively) affected by the hidden curriculum, or by personal biases and prejudices, for example, the 'awarding gap' between white students and students from ethnic minoritised backgrounds in degree classification achievement in the UK (Underwood & Conrad, 2021).

Critique and the Crit

Central to education in design is the critique. The critique methodology and practice is how design skills are developed around the world within a studio. It is there that work is presented by the designer, criticized by the learned and other learners, and its virtues and failures are debated.

(Hokanson, 2012, p. 71)

Critique refers to both the act of giving formative and summative feedback, and the word *crit* refers to specific activity types used to explicitly engage in critique. Critique both relies upon and informs the pedagogical and social practices of students and educators (Zollinger & Nyboer, 2021) as students engage with critique of their developing design work.

The crit is a key component of what Shulman (2005) called the *signature pedagogy* of studio. It is not a simple, codified method of assessment or feedback, nor is it a set of habits and rituals [→262] that are only invoked in formal design pedagogy. Instead, Oh et al. (2013) describe multiple dimensions of crit that relate to the audience (asking: who is involved?; how many interlocutors are engaged, and taking on what role?), the type of interaction (how is the crit begun, sustained, and concluded?; how public or private are the interactions?), and the level of formality (is the crit framed as more or less formal?; is the crit collectively experienced or overheard?). The roles of crit and critique include forming a space for iterative assessment and evaluation of work (Anthony, 1991; Hokanson, 2012), defining disciplinary and design knowledge (Uluoğlu, 2000), and enhancing the sociality of a studio across different interlocutors, artefacts, and performance of design moves (Shaffer, 2003; Gray, 2013a).

Critique and crits take many forms

Whilst it is core to studio pedagogy, the crit is just one form in which critique is manifested. Multiple forms of critique are practised across a range of design disciplines (Gray, 2014a), as well as within those disciplines (see Parnell et al. (2012) for one of the most comprehensive reviews of critique types). A study of critique practices in architecture by Blythman et al. (2007) describes the following types: peer crits, desk crits, online crits, formative crits, seminars, reviews or group crits, industry project crits, and summative crits. Hokanson (2012) distilled Blythman et al.'s types into critique events

that are ‘structurally central to the use of critique in design and education’ (p. 75), resulting in the four broad types of critique now outlined (using Hokason’s use of ‘critique’):

Formal critique is summative evaluation of project work involving student presentation of the completed design project, and intensive and public feedback and assessment (Anthony, 1991; Blair, 2007). A common format is the design jury in which educators, and sometimes external design professionals, ask the student questions and render a final evaluative judgement.

Seminar/Group critique describes instances where students in a course and one or more educators or external design professionals engage in a formative or summative evaluation of project work in a small or large group setting (Day, 2013; Wolford et al., 2021).

Desk critique describes a range of critique activities undertaken between a single student and an educator or knowledgeable other, encompassing formative and summative reviews of design projects (Choi & Rhoades, 2020; Yorgancoglu & Tunal, 2020). Schön (1983) used a second-hand observation of a desk crit in an architecture school to form the basis of much of his theory on reflection [→ 83].

Peer critique describes informal interactions between students that are often embedded in other social activity, such as social comparison [→ 172], or identity formation. Peer critique can develop the student’s ability to validate and understand design choices in the context of a specific design (Gray, 2013a; McDonald & Michela, 2019).

Critique can happen in-person, in the physical studio facilities, or it can happen online. It can use wholly analogue practices, or technology can provide digital augmentation of in-person critique events, as with purpose-built critique systems (Easterday et al., 2014; Jones & Lotz, 2021) or adaptations of existing distributed team organisation services or shared document authoring tools (Gray, 2019; Wolford et al., 2021).

Critique serves many purposes

In its formal manifestations, the crit is used to defend, articulate, and redefine ideas, with assessment as its core purpose. Critique is therefore a core element of instruction and assessment [→ 234], with the aim of iterative improvement in student work (Anthony, 1991; Dannels & Martin, 2008; Adams & Siddiqui, 2016). The crit is also used to engage with material qualities of studio culture, including comparing work among peers or identifying points of inspiration that may inform future work (Vyas & Nijholt, 2012). Other framings foreground the metacognitive practices that critique stimulates, such as reflection-in-action and reflection-on-action (Schön, 1983). Students might also be encouraged to engage discursively, making

critique a space to try out and refine one's designerly language and identity (Gray & Howard, 2014; Michela & McDonald, 2020). More broadly, critique is a set of ubiquitous interactions across combinations of dimensions with the purpose of enculturating students into their discipline. This includes facilitating the construction, performance, and maintenance of disciplinary knowledge practices by invoking judgements, knowledge, and attitudes that are consistent with design work in their given discipline (McDonald & Michela, 2019; Uluoğlu, 2000).

Critique frames different ways of being

Engagement in critique not only takes on different modes of performance but also takes on different purposes with underlying *ways of being* that make these purposes coherent. Most prominently and visibly, critique is organised around process and the development of designerly capacity – taking on the purpose of evaluation, [feedback \[→74\]](#), and [assessment \[→234\]](#). Within this purpose, critique participants engage through their educational roles as students and educators, with feedback primarily flowing from educator to student in an apprenticeship relationship that assumes an expert/novice configuration (e.g., Schön, 1983). In this mode, the power invested in the educator dominates the critique event, and the kinds of feedback provided can have a dramatic impact on student wellbeing and outcomes (e.g., Blair, 2007) as well as [influencing identity \[→94\]](#). Generally, there is a broader expectation of critique as a principle method of engaging students in the [habit and ritual \[→262\]](#) of the crit as part of [enculturation, acculturation, and indoctrination \[→285\]](#) to design work and of *being* a designer (Anthony, 1991; Dannels, 2005). More generally still, critique is a means of socialisation, interaction, and [performance \[→107\]](#) of one's developing design identity [\[→94\]](#) (Gray, 2014b). Critique is a means for design students to practise talking to each other like designers and using 'designerly talk' (Gray & Howard, 2014). These are important means of [identity \[→94\]](#) formation that exist beyond the formal pedagogical structures of the studio (Gray, 2013a).

Critique reifies knowledge, rhetoric, and praxis

Critique practices can also be described in relation to knowledge that is conveyed, referenced, or framed by broader routines of studio design praxis. Uluoğlu (2000) has classified the design knowledge conveyed through critique as both declarative and procedural, using four different topics: categories, structuring, representation, and content. This classification describes combinations of knowledge as propositions (declarative) and practical how-to (procedural), which can then be related to design artefacts in-progress. Scagnetti (2017) has also described a dialogical model for

critique practices, identifying five main categories for engagement. These are interpretation, exploration, comparison, direction, and judgement, the last two of which are cautioned against as having the potential to hinder student learning. Dannels and Martin (2008) describe a range of ‘feedback types’ evident in critique and variable in analytic framings and expectations of next steps. These types include: judgement, process, brainstorming, interpretation, recommendation, investigation, association, comparison, and identity. In another example from Watts (2020), students are encouraged to engage with the broader rhetorical situation through critique, using the knowledge that comes from this to promote seeing, reflection, and action. McDonald and Michela (2019) also use critique as a way of understanding the *moral goods* of the studio, describing the crit as a site where social practices relating to studio are instantiated and sustained as a praxis (see enculturation, acculturation, and indoctrination [→ 285]). Overall, the kind of knowledge that is shaped, used in, or acquired from engaging in critique practices is influenced by how critique is carried out, and by the expectations of those involved.

Critique can (re)produce harm

Critique has value in reproducing a sense of studio culture, but it also has historically produced learning environments that take on qualities of cruel *firing squads* (Anthony, 1991; Day, 2013) or demoralising events (Blair, 2007). In these, students serve both as victims and conduits for reproduction of harmful norms (Gray & Smith, 2016) rooted in the asymmetrical power relations through which most critique is accomplished (Webster, 2006). Multiple evaluations of the harm perpetrated through critique practices exist, including Anthony’s (1991) withering review of the formal architectural jury, Blythman et al.’s (2007) investigation of harmful critique practices in art and design education, and Webster’s (2006) identification of the role of power in the critique event. While most criticism has focused on formal instantiations of critique such as the design jury, similar criticisms have also been made of other large group critique events where students can be similarly vulnerable and open to harm (e.g., Ochsner, 2000; Webster, 2006; Day, 2013). Left unchecked and uninvestigated, these critique practices can be perpetuated as they are *experienced* by students, then *reproduced* as those students become jury members or educators themselves.

Reflection

The deeply rooted, intuitive, affective and nonverbal processes of creative practice have to be translated. This places students in a sticky position, learning another language to make their learning transparent. However, reflecting through the act of writing could be posited to offer another means of creative practice to extend a repertoire of practices.

(Orr & Shreeve, 2018, p. 144)

Reflection is a part of learning and studio provides opportunities for reflection. Socrates, Plato, Aristotle, and other philosophers promoted reflection – deliberate thought or consideration of a given subject – as a means of critical introspection and of contemplating the nature of existence, ethics, and knowledge. Reflection can be conceptualised as thinking about thinking, and it is a field of study which can helpfully illuminate studio pedagogy (see Casakin & Wodehouse, 2021; Kavousi et al., 2020).

A socially constructivist theory of reflection as a pedagogical practice emerged as a component of John Dewey's theory of experiential learning (1939). Dewey's theory was later applied to the context of the design studio by Donald A. Schön. Schön drew on ethnographic studies of the design studio in an architecture school after a period of studying professional effectiveness in the workplace (Schön & Argyris, 1974; 1978; Schön, 1983). Citing an example of a desk crit between an architecture student and a professor, Schön argued that the design studio was the site *par excellence* for the formation of the reflective practitioner, albeit one in which Schön illustrates an educator demonstrating reflection rather than actively supporting the student to develop her own reflective practices.

Differentiating reflection-on-action and reflection-in-action

Reflection takes place both *during* an activity and *after* it. This distinction was famously differentiated by Schön (1983) as *reflection-in-action* and *reflection-on-action*. During *reflection-in-action*, action and reflection take place almost simultaneously, when the processes of working and revising flow seamlessly together (Csíkszentmihályi, 1990). *Reflection-on-action* takes place after the action itself and is the process by which an individual reflects critically and constructively on what has already happened. *Reflection-on-action* can be motivated by a desire to make sense of something one has done, 'to discover how our knowing-in-action may have contributed

to an unexpected outcome' (Schön, 1987, p. 26). In the context of studio pedagogy, Orr and Shreeve (2018, p. 144) describe the role of this kind of reflection as 'surfacing student learning.'

The lasting influence of pedagogical theories of reflection

The idea that a designer obtains and holds knowledge through doing, as a form of embodied knowledge, has been central to contemporary design theory since the 1960s (Archer, 1968; Cross, 1982). Schön (1985; 1987; 1991) built on this earlier work arguing that a key learning mechanism was the designer's *reflective practicum*, a learning environment which provided practitioners with the necessary devices, processes, and tools to develop and maintain reflective capabilities (Bruno & Dell'Aversana, 2018). For Schön, the studio appeared to provide the framework for just such a reflective practicum in a design discipline.

The Schönian paradigm of design studio pedagogy remains influential, but not without criticism (Stevens, 1995; Webster, 2008). Helena Webster (2008) notes how 'architectural education remained un-theorised until the 1970s when Donald Schön, following his studies of the design studio, put forward the notion that design studio learning simulated real professional action' (p. 63) (see [simulation](#) [→ 232]). Schön's work remains one of the most frequently cited justifications for the effectiveness of design studio pedagogies, yet Webster highlights an inherent contradiction between Schön's epistemology and method: 'his ideas sit in an unresolved position between the pre-1980s behaviourist/cognitive (enlightenment) and post-1980s social/situational (post-enlightenment) orientations to student learning' (p. 72). Yanar (1999) acknowledges that Schön opened pedagogical research about studio to new assumptions, but warns us that his methodology was still rooted in a positivist epistemology. Schön's continuing influence in studio pedagogy must be viewed in the light of these concerns.

A consequence of the positivist legacy is the tendency to approach reflection as if it were a pathway to some sort of objective truth. In design practice, however, reflection exhibits a subjective element, albeit one that depends on disciplined [expertise](#) [→ 90] and [judgement](#) [→ 98]. Nelson and Stolterman (2003) identify ten distinct types of designerly judgements, all of which can be developed through reflection-on-action. Jones (2015) argues that it is the utility of reflection as part of a design student's formation of expert opinion and judgement that matters more than any objective truth the reflection may hold. In other words, the *usefulness* of reflection is in the process itself, not necessarily in the outcome. On the other hand, Wetzstein & Hacker (2004) demonstrate how the explicit articulation of

reflection during a design process could also be shown to have improved the evaluated design output.

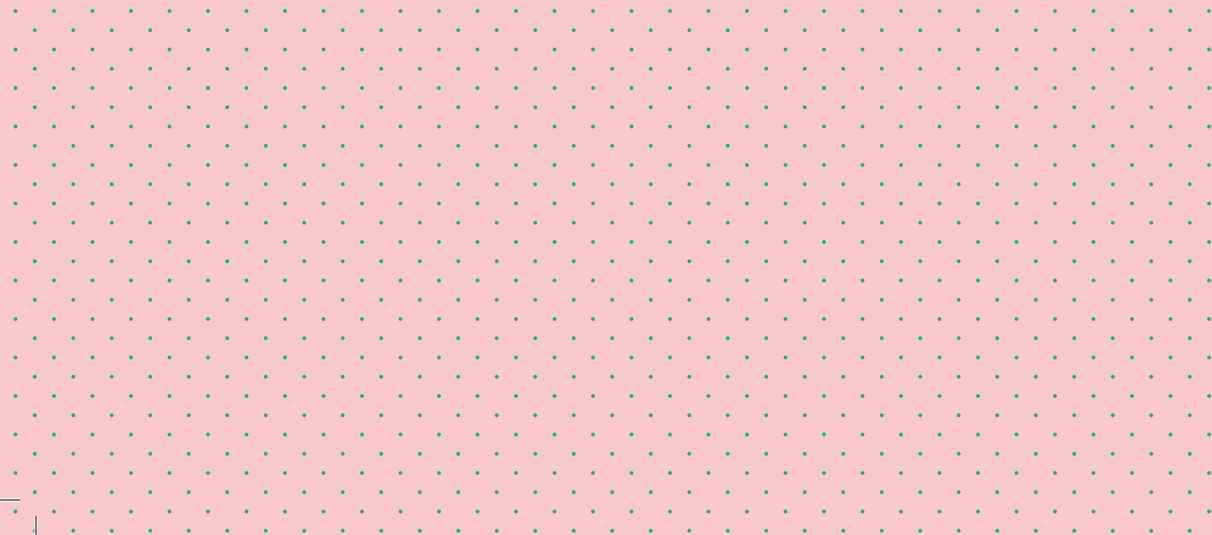
In studio, products of the design process, including sketchbooks and supporting materials submitted alongside or as part of assignments, can be sites of reflection. Reflection in studio pedagogies can also be supported by the use of reflective writing tasks and assignments (see McCarthy, 2011). Ellmers (2015) provides a critical framework and some useful models for reflective writing exercises in studio including a variety of means to support students with preference for non-textual or non-verbal media to creatively and critically capture their own reflection.

Studio as a place for reflection

Studio is an environment which supports reflection and ongoing reflective practice, where artefacts, activities, or interactions are themselves reflective actions or elements. These things invite reflection by the design student, whether this is mulling over ideas pinned on a wall surface [→ 48], or deriving inspiration from the artefacts [→ 151] designers surround themselves with. Online or non-synchronous studios can also include affordances for this kind of reflection, such as spaces for sharing work and commenting between students. Reflection can also be serendipitous [→ 212], something that studio and the informal learning spaces [→ 42] around it can afford in the wider development of expertise [→ 90] and design character [→ 101].

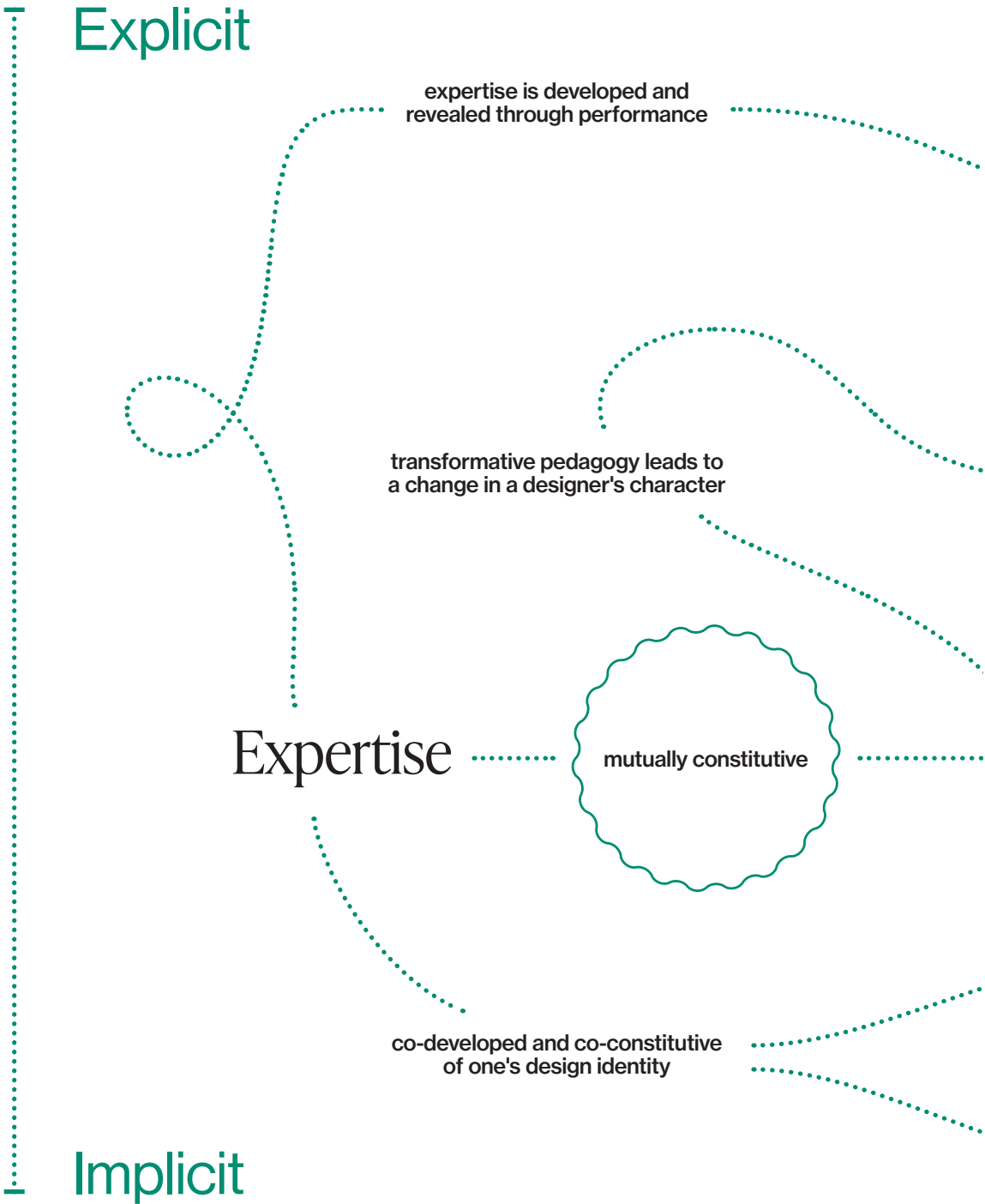
Finally, it is worth observing that studio is not only a place for students to reflect on learning, but also for educators to reflect on their teaching. The ways in which educators can employ reflective practices on studio teaching is necessarily different than for lecture or laboratory-based courses: the creative processes and products of studio teaching can provide different means for educators to critically evaluate their teaching (see Barnett & O'Mahoney, 2006 for a range of examples). However, just as for students, so for educators: reflection on teaching does not occur automatically. It must be promoted and supported by educators, peers, and leaders.

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Much of what happens in studio is only observable through indicators and traces, not directly in the scene that confronts us when we enter a physical or an online studio. What students know and what they are capable of doing **expertise** is being developed here alongside, and intertwined with, who each one considers themselves to be as design students and as future designers **identity**. Watching what students do in the studio as they communicate, make, and interact **performance** can signal how they are learning to use design knowledge **judgements** and what their individual starting points may be in terms of who they are when they enter studio, as well as who they become **character**. Watching them interact with educators and an environment that are both geared towards changing them, and which are potentially open to being changed *by* them **transformative pedagogy**, it is clear that each student experiences studio differently over time **journey**.

A map of the Expertise and Identity cluster showing possible relationships and connections between properties.



Journey

journey provides a frame
for performance

Performance

identities are evoked and become
visible through performance

Transformative
Pedagogy

identities are transformed by
(and transform) studio pedagogies

Identities

Judgement

character informs and
shapes one's normative
stance, concretising identity
commitments

Character

Expertise

Design seems to be an activity that requires a certain level of maturity to be practiced well. To qualify professionally in architecture throughout the EU now takes about 8 years on average. Most product designers will have studied for 4 years and many for 5 or 6 if they have done a master's. For a designer to be known individually by name in these two fields before the age of 40 is exceptional ... This already hints at one characteristic of design expertise. It is to a significant extent dependent on gathering experience.
(Lawson, 2004a, pp. 443–444)

Expertise is a productive lens through which to view a student's journey [→104] towards developing design competence. It is generally recognised that the professional practice of design depends on experiential and specialist knowledge [→248] built up over time *through designing*. Design expertise, a subset of knowledge and abilities relating to professional or disciplinary practice, is acquired over time in ways involving both the individual student and the broader social environment of a studio (**Interactions and Sociality** [→162]), through which the student can compare and assess their progress (social comparison [→172]). Importantly, expertise is not a monolithic state, but a constellation of competencies, skills, and abilities that are unique to each developing designer. Expertise, viewed from the perspective of an individual design student who is a proto-professional in their design discipline [→238], requires certain conditions to develop and leverage for continued learning.

Lawson and Dorst (2009) propose a framework of expertise based on Dreyfus, which serves as a rough guide to differing levels of expertise. While students in studio will not reach all these levels, this framework is a useful point of reference:

Naive:	Result focused
Novice:	Convention-based
Advanced Beginner:	Situation-based
Competent:	Strategy-based
Expert:	Experience-based
Master:	Developing new schemata
Visionary:	Redefining the field

Expertise is personal and relational

Expertise is not a static or abstract state, but a professional judgement of a designer's competence in relation to social, disciplinary, professional, and skill-based reference points (Crismond & Adams, 2012; Cross & Cross, 1998; Lawson & Dorst, 2009; Tollestrup et al., 2023). While expertise is often assessed on an individual student level, these assessments are frequently comparative (e.g., common abilities that are achieved by a third-year student), relating to one's future discipline [→ 238] (e.g., habits of mind consistent with practising designers in a certain field), connected to specific workforce development goals (e.g., the ability to work in a team or use specific technologies), or even distributed across multiple individuals in a social network [→ 185] in ways that are difficult to disentangle (e.g., distributed expertise; Svihla et al., 2007). Therefore, one's level of expertise is inherently relational as evidenced in the kinds of questions educators might ask themselves: *Is a student's expertise consistent with others in their year? What aspects of expertise make a student stand apart from their peers as a future member of their profession? What are appropriate thresholds of expertise that indicate whether a student should or should not progress in their field of study?*

Expertise involves complex and personal constellations of salient competencies, skills, and abilities

Framings of expertise proposed by design scholars include a framework of informed design behaviours proposed by Crismond and Adams (2012), a series of metamorphoses that students go through described by Siegel and Stolterman (2008), and thresholds that students may cross over as proposed by Kharrufa and Gray (2020). Each of these framings (see table 1) break down expertise in different ways. Each includes acknowledgement of different facets of expertise, with the metamorphosis and informed design framings focused on phases students move through; *pre-emergent*, *transitional*, and *designerly thinking* (Siegel & Stolterman, 2008) or *beginning* versus *informed* (Crismond & Adams, 2012). In contrast, Kharrufa and Gray (2020) identify characteristic aspects of expertise that designers achieve without assigning these thresholds to specific phases or patterns of emergence.

Studio Properties

Source	Framing of Expertise	Example Facets of Expertise
Crismond & Adams (2012)	Informed Design Strategies	Build knowledge Generate ideas Represent ideas Troubleshoot Revise/iterate Reflect on process
Siegel & Stolterman (2008)	Metamorphosis	Idea loyalty Critique culture Me and we Technology-centred vs. human-centred
Kharrufa & Gray (2020) (building on Osmond, Bull, & Tovey, 2009)	Threshold Concepts	Methodological fluency Design failure Narrowing and problem framing Design process as flexible and situated

Table 1. Approaches to framing expertise in the literature.

To complicate design expertise further, every aspect of a design student’s set of competencies is not developed to the same levels of expertise (see different ‘performance dimensions’ in Crismond & Adams, 2012, for instance). It is entirely possible to imagine a student who makes exceptional use of their experience in order to learn (*expert*, in the Lawson and Dorst model); however, that same student may not be able to apply this level of expertise to other aspects of the design identity [→ 94] they are expected to perform. A student that comes to formal design education after having deep experience in their community doing design-related tasks (cf., *funds of knowledge*; Svihla et al., 2022), for example, might be able to make use of this experience to produce pragmatically useful outcomes resonant with knowledge from their community, but may lack the expertise to connect these outcomes to formal expectations of quality set out by their discipline [→ 238]. Expertise can be framed by expectations that relate to hierarchy and power transaction [→ 282], such as differences between a first year and third year student, or the contrasts between a student, an experienced tutor, and a member of a design jury.

Because constellations of expertise are unique to the individual – including different levels of expertise across a range of performance dimensions (e.g., a student being expert in generating ideas but relatively unsophisticated in framing a problem) – monolithic binaries such as expert/novice often fail to capture nuances of judgement [→ 98] used by designers to inform their work, and therefore how expertise may vary by student. Expertise is strongly related both to a designer’s judgement [→ 98]

Expertise and Identity

(knowledge that is inseparable from the knower; Nelson & Stolterman, 2012) and a designer's use of design knowledge [→248] to build, augment, or activate their expertise (Lawson, 2004a). Expertise in any specific area is also not a static state, but is temporally and contextually bound (**Time and Structures** [→114]). Exposure to new ideas, technologies, situations, or types of design knowledge, in individual or group settings, may all impact the ability of the designer to engage their expertise (Gray, Toombs, & Gross, 2015; **learning and designing collectively** [→166]).

Expertise requires certain conditions to develop

To support the development of expertise in most curricula, it is considered necessary that some deep learning by doing [→145] is required, whether this is through reflective practice [→83], online interaction, or other forms of authentic participation in a community of practice (**general education concepts and theories** [→242]) (Cennamo, 2016b; Schön, 1987). These experiences are often linked to professional accreditation or external recognition by members of industry or professional disciplinary [→238] communities, and design scholars have posited that such *bridges* between academic studio and professional practice contexts are critical in maintaining the currency of studio-based design education (Brandt et al., 2013). To strengthen this bridge, it is possible to import expertise into the studio from external sources – for instance, through collections of design knowledge, design juries, masterclasses, or incorporation of industry projects and experts in design briefs [→67].

Expertise development also requires attention to the pedagogical conditions through which students are expected to learn and develop as designers. In order to nurture students' development of expertise, Coso-Strong et al. (2019) advocate for design educators to employ a broad and flexible set of pedagogic *moves* – shifting from design educator (which implies hierarchy and stability and an implicit power transaction [→282]) to design coach (which implies flexibility and improvisational capacity in providing feedback [→74]; see also active teaching [→71]). As Smith (2015) describes, the conditions that influence a student's development of expertise extend beyond personal development and cognitively-focused measures of learning, outward towards the broader pedagogical culture (*habitus* [→265]), resources available to students, and interpersonal relationships through which expertise can be extended (**enculturation, acculturation, and indoctrination** [→285]; **social comparison** [→172]). Students' awareness of these drivers for expertise development can be meaningfully scaffolded through reflective [→83] activities, where students are asked to consider and evaluate their progress and imagine new pathways forward (see Atman, 2019; Dorst &

Reymen, 2004; Gray, 2014b; Siegel & Stolterman, 2008 for examples that include written, verbal, and pictorial or diagrammatic forms of reflection).

Identities

[Students] were not merely solving problems; they were engaged in an iterative process of expressing – and thus shaping – their identities.

(Shaffer, 2007, p. 121)

Studio is an important site where a student's *personal* identity is extended to inform the creation, testing, and evolution of their *professional* identity – preparing them for a future career as a designer. A design-focused identity is not monolithic, singular, or stable, but rather one of many identities that a designer might take on. These identities act as lenses through which they view the world, enabling them to see and act wisely while making intentional change in the world (cf., Nelson & Stolterman, 2012). A student's self thus consists of multiple identities that are personally held, contextualised through cultural and collective norms, and shaped through membership in particular communities related to or adjacent to studio that give these identities meaning (social networks [→ 185]). Importantly, one's identity also has disciplinary [→ 238] and contextual moorings that relate to enculturation [→ 285], prioritising certain kinds of seeing and acting in the world, with a focus on the development of each student's design philosophy and judgement [→ 98].

Identity is plural and personally held

Developing one's identity as a designer occurs as one outcome of studio education (Gray, 2013c; Gray et al., 2020). Ethnographic studies demonstrate that studio *is* a site for both expressing and shaping students' design identities (Gray, 2014a; Shaffer, 2003). The identities of educators, professionals, and others engaging in studio influence the kinds of experiences students can have, laying the groundwork for future ways of being framed by disciplinary [→ 238] identity, core judgements [→ 98], or other combinations of performance [→ 107] and artefact [→ 151]. While students develop their design identity, frequently linked to their future-oriented professional design identity (Tracey & Baaki, 2022) in the context of studio, more generally humans take on many identities as they exist and perform

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within the world (cf., Goffman, 1956; Farnham & Churchill, 2011). Studio can support the development of both disciplinary and personal identities, supporting a student's professional identity formation (cf., Kunrath et al., 2020), *and* their personal identity through what Baha et al. (2020) describe as 'a dynamic entanglement' (p. 1898). Each individual design student incorporates their multiple professional and personal identities in different ways that are personally held.

Identity is collective and culturally-normative

A professional identity is situated within cultural and other intersectional commitments. For instance, critically-oriented design scholarship has encouraged designers to prioritise commitments relating to the Black experience (Berry et al., 2022), feminism (Bardzell & Bardzell, 2011), transgender individuals (Haimson et al., 2021), and design justice (Costanza-Chock, 2020), to name a few. Identity is also forged and shaped in relation to other social norms and actors (**Interactions and Sociality** [[→ 162](#)]). Ashton and Durling (2000) position studio as a space where groups, rather than individuals, learn to design. They describe the primary function of studio as a setting for students to establish if they are *doing the right thing*. The *right thing* implies a set of norms – for example, what constitutes *good design*. However, the *right thing* is not simply established through formal interaction with educators but emerges from a broader social process where knowledge is co-constructed through daily interactions between people, curricula, and learning environments – whether they be in person or digitally mediated (Gray, 2014a).

While one's design identity is personally held, it is also fundamentally relational and normative. Tracey and Baaki (2022) note, a 'designer professional identity will emerge from the student's education, professional development, and career progression' (p. 1) – involving components shaped by the expectations of the academic programme the student is enrolled in, the nature of their design discipline [[→ 238](#)], the cultures they connect with or are embedded within, and their expectations of a career trajectory relating to their professional design training. This design identity exists in relation to features of the online or physical studio, including highly visible pedagogical practices, surface features that afford certain kinds of actions and interactions, and epistemological commitments that shape the hidden curriculum [[→ 271](#)] (Brandt et al., 2013; Gray, 2013a; Shaffer, 2003).

Students and educators also enact their identity commitments in how they relate to communities or groups within a studio (social networks [[→ 185](#)]). This includes the permeability of their identity commitments, for example, their openness to change or alternative perspectives (play [[→ 155](#)];

risk and failure [→ 227]). Identity commitments also link to deeply held philosophical commitments, for example, the elements of identity that are part of the designer's core judgements [→ 98]). How identity supports or restricts membership in a community of other designers, for example, groupings of designers that share a philosophy of engagement, personality, or other type of relational bond; learning and designing collectively [→ 166]).

Identities frame the student's goals and expectations of their discipline [→ 238] within common pedagogical activities of a studio. In a study of critique practices by Dannels and Martin (2008), one genre of critique [→ 79] feedback was identified as *identity-invoking statements* which 'suggest that students consider the larger picture of themselves as designers in a future professional community' (p. 146). Björklund, Keipi, and Maula (2020) have identified four different narrative *types* that relate to a designer's identity. These describe a relationship between identity commitments and outcomes, including: loving your work, learning everyday, building something unheard of, and succeeding together. Notably, these narrative types exclude economic drivers and tend to focus on aspirational, individually-focused design identities. Finally, Kunrath, Cash, and Kleinsmann (2020) position the professional identity formation and performance of designers as including both personal attributes and design skills that are distinct yet related to each other. Personal attributes include factors such as confidence, creativity, emotions, empathy, ethics, leadership, motivation, openness, responsibility, and social abilities, while design skills include elements such as cognitive abilities and strategies, personal and interpersonal communication, education and practice-based knowledge [→ 248], managerial competency, and project management.

Identity is disciplinary and contextual

Design disciplines [→ 238] may prioritise different constellations of personal attributes and design skills, which lead towards ways of being and performance (e.g., Dykes et al., 2009; Faiola, 2007; Kunrath et al., 2020). For instance, design disciplines such as architecture or industrial design exert physical influence over the environment and may prioritise materially-focused actions and identity commitments (e.g., Loschke, 2016) by asserting the primacy of physical making [→ 147] and focusing on artefacts [→ 151] and activities that are made visible [→ 34]. Other design disciplines such as interaction design or user experience design have the power to rapidly shift group communication and forms of expression *en masse* through digital technologies, thereby rapidly shaping popular culture (e.g., Murray, 2011).

All design disciplines will necessarily involve some intersection of cultural, personal, and design identities (Gray, 2013b; Tracey & Baaki, 2022).

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However, these overlaps in identity claims and performance may vary by student, the specific formulation of a design discipline [→ 238], the composition of a studio environment (**Foundations and Methods** [→ 60]), and the relative strength of particular individual identity components. Students in studio may be able to exert some level of influence over the identities that they hold and perform, but expectations of studio may reduce that agency. Rather than adding a designerly identity to their incoming identity, they may experience forced enculturation, acculturation, or even indoctrination [→ 285] that displaces other identities a student might wish to hold (cf., Gray, 2022a). At the same time, this complex overlap of identities can reveal aspects of each design student differently based on contextual cues, stages of development, or comfort expressing aspects of their personal identity in professional contexts (e.g., confidence to speak [→ 176]), presenting in some cases opportunities for emergent diversity of disciplinary expression (Crabbe et al., 2022; Kunrath et al., 2020).

While there have been substantial efforts to diversify design disciplines and facilitate diverse identity expressions, many studios continue to be dominated by white heterosexual males. This can cause students with diverse intersectional characteristics of gender, race, sexual orientation, and more to feel the need either to suppress their identity expression in professional settings or to confront these identity expectations and work towards a diversification of the discipline (e.g., Berry et al., 2022; Miller, 2019). A studio educator might productively leverage perspectives such as critical pedagogy [→ 276] to consider which additional forms of diversity might need to be supported, creating a space where many different identity characteristics can be actively celebrated.

Judgement

Design judgments are formed continuously as a means of understanding the design space – sensemaking – and design judgments support subsequent actions. The student's statements revealed their implicit design judgments. For example, when a student says, 'I thought ... maybe ... it could be a workbook? I used a lot of math[s] workbooks in school!' they evoke a deliberated off-hand design judgement, bringing previous designs to mind to match current circumstances. Another student says, 'I think we need to visit an after-school program instead of a schoolteacher,' a navigational design judgement – choosing an intentional path intended to move toward satisfying the design problem. Note that these judgments are shaped by core design judgments – values or thoughts that are buried deep within each individual in the form of personal beliefs.

(Boling, Gray, & Lachheb, 2022, pp. 24–25)

Studio is a place [→198] where design students develop and hone their ability to recognise the complexity of a design situation, consider ways of surfacing and reconciling design complexity, and identify potential paths forward – all manifestations of *design judgement*. Judgements are required by studio students early and continuously, in whatever stage of expertise [→90] development each of them has attained. Judgement is what Stolterman (2008, p. 61) refers to as 'the primary "tool" [for] dealing with design complexity in a designerly way'. The judgements of designers are bound to the self, only emerging through indirect observation, and appearing as constellations, versus individual judgements, that are complex, layered, and multi-faceted.

Judgement informs, but is distinct from, design action

Judgement is one manifestation of both tacit knowledge [→248] (Vickers, 1984) and practical knowledge (Dunne, 1997). The judgements that a designer makes are complex, layered, and ubiquitous in design activities (Gray, Dagli, et al., 2015; Parsons et al., 2020); they serve as a precursor to potential action and are made discernible by that action, but are not the same thing as the action itself. Instead, design judgements 'are the means to achieve "wise action," or [...] good design decisions. The range of different judgements [...] demonstrates that the designer's engagement in judgement is continuous

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and layered, with non-deterministic links between judgments and decisions' (Boling, Gray, & Lachheb, 2022, p. 23 quoting Nelson & Stolterman, 2012, p. 139). For instance, a design decision that results in the selection of a certain style or medium will have been shaped by numerous other preceding judgments regarding aesthetic qualities, fidelity of available tools, or approaches to framing the design brief [→67].

Judgement is inseparable from the knower and can only be indirectly observed

Design judgements are difficult to identify, describe, or assess since they are often a form of tacit knowledge [→248] that is only visible through dialogue [→181] (see also learning and designing collectively [→166]), online interactions, manifestation in design artefacts [→151], and reflection [→83]. Judgements describe 'knowing based on knowledge that is inseparable from the knower' (Nelson & Stolterman, 2012, p. 141), a form of knowledge therefore both tacit and subjective – only directly accessible to designers themselves, and only through intentional reflection and deliberation. Over time, a designer increasingly engages in automatic forms of judgement which are a manifestation of the deep and carefully curated constellation of judgements informing their expertise [→90] and their ability to understand the complexity of a design situation.

While judgements are inseparable from designers themselves and can only be indirectly observed, 'designers can reflect on the nature of their own judgement making and begin to improve on their ability to make good judgements as an essential key to gaining access to design wisdom' (Nelson & Stolterman, 2012, p. 142). Developing and sustaining the capacity for design judgement requires continual learning – taking in many forms of design knowledge [→248] and using this knowledge to inform how the individual views and is able to manipulate design complexity in useful and creative ways.

Judgement is complex, layered, and multi-faceted

Design judgements provide a vocabulary to describe multiple aspects of design activity. Judgements can aid a designer in describing sensemaking that is implicit in design work, prior to the making of explicit 'decisions', where a designer is considering multiple factors of complexity and how they might choose a next step to pursue. Judgements can also reveal implicit or hidden aspects of design work, such as the value orientations which guide or shape what motivates designers to make certain kinds of decisions, including 'core' judgements that speak to the 'why' and not just the 'how' or 'what' (Boling et al., 2017; Nelson & Stolterman, 2012).

Different types of judgement are more and less accessible or visible, appearing in varied combinations. These types were originally presented in Nelson and Stolterman (2012) and were later operationalised for design research in Gray, Dagli, et al. (2015). *Framing* and *deliberated offhand* judgements are the most likely to be observed directly; *appreciative, quality, appearance, connective, compositional, instrumental, and navigational* judgements can be inferred by means of other explicit activities or dialogue [→ 181]; whereas *default* and *core* judgements can only be identified indirectly. Judgement types are also layered and multi-faceted, appearing in combination rather than in isolation. This interconnectedness is described by Gray, Dagli, et al. as ‘clusters’ that are ‘so blended, you cannot separate them’ (p. 40).

Although few types of judgement have been deeply investigated in the context of studio education (e.g., Demiral-Uzan, 2015), emerging work on *instrumental judgements* illustrates the utility of viewing knowledge [→ 248] and expertise [→ 90] in studio through the lens of design judgement. Instrumental judgement – defined by Nelson and Stolterman (2012) as ‘a process of mediation that considers not only technique and which instruments to use, but [also] proportion and gauge’ – allows access to the designer and their tools, providing insights into how design methods are taken up, controlled by the designer, and later discarded or retired. As described by Gray and Boling (2017) in the context of a professional design studio, ‘judgments taken in relation to methods are largely instrumental in nature, involving questions such as: “What method will give me the information I need next?”; “How will I know when the method has produced the right sort or amount of information to proceed?”’ (p. 193). Murdoch-Kitt et al. (2020) later extended this inquiry into instrumental judgements in the context of design education, focusing on teaching design methods as an instance in which educators need to consider students’ acquisition of both the *content* of a tool and the *mindset* or instrumental judgement to know how to engage meaningfully with that tool.

Character

Character is one of four contributors to core judgments – inborn character, life experience, creative experience, experience of the sublime – and core judgements which fundamentally influence all design action.

[...]

Good design is dependent on good designers as much as on the best information or know-how.

(Nelson & Stolterman, 2012, pp. 155 & 188)

Design character refers to the foundation from which designers leverage their knowledge [→ 248], skills (expertise [→ 90]), and capacity for judgement [→ 98], and to the ways in which they do so (Senova, 2023). One's professional design character is related to, but distinct from, one's moral character, and can be observed and shaped through interactions in studio. The character of a designer can be thought of as indicative of the 'kind of person they are' or the person they aspire to be, encompassing components such as one's design philosophy, ethical standpoint, sense of responsibility, and personal values.

Character is value laden, inescapable, and integral to design work

Design disciplines are service-oriented (cf., designers as 'in service', Nelson & Stolterman, 2012). Therefore, developing design character in studio education centres on the fact that designers and their creations must serve the needs of other human beings (Boling & Gray, 2015a). Verbeek (2006) holds that design outcomes shape the world, so the tangible and concrete consequences of an individual designer's character play a significant role in shaping our futures. Consequently, the design profession (discipline [→ 238]), and by extension, the collective character of designers, carry a great deal of inescapable responsibility which each designer takes on in their professional capacity as well.

One's character is composed of values that inform design action and leave a trace in resulting design outcomes. These values include individual morality, professional value, and critical or culturally-oriented values (cf., Friedman & Hendry, 2019; Gray et al., 2020). Values related to the position and purpose of design in the world, and action in accordance with those values, form the foundation of a developing designer's character which is built, in turn, on the individual character of the student – part of a broader moral

education in service of society that has been described as one of the mandates of formal education (Dewey, 1925; enculturation, acculturation, and indoctrination [→ 285]). Importantly, values are grounded in particular cultural contexts; cultural norms might relate values more strongly to an *individual's* character (as in most individualistically-focused cultures) or towards one's character as a *member of a social group or society* (as in many collectivist cultures) (Alshehri 2020). Ultimately, these values are not just individual – they result in the shaping of cultures of design production and societal outcomes that far exceed the perspective of only an individual designer.

Examples of these values as applied to the design education context include *humility* in apprehending and appreciating a human reality that the designer is proposing to change or influence (Nair & Bulleit, 2020), *a sense of discipline and wisdom* in the way that design knowledge is used or design actions are executed (Lachheb & Boling, 2021), or a goal of *inclusion* or *equity* that informs design decisions and selection of methods (Rittner, 2020). These elements of one's character are personally held – part of one's *design philosophy* (Nelson & Stolterman, 2012) and design identity [→ 94] – but maintain strong relationships to disciplinary and educational values, alongside other personal moral commitments. Values can be linked to habits and rituals [→ 262] in studio that reinforce and call attention to aspects of character (e.g., acceptable behaviours in the crit [→ 79]; Willenbrock, 1991), and serve as a backdrop for what kind of moral character is implied when a student is successfully enculturated [→ 285] into studio and their design discipline (Boling et al., 2020). A designer's character is shaped over time in relation to an overall development of expertise [→ 90], with wise judgements [→ 98] informing design decisions that are grounded in particular values (Nelson & Stolterman, 2012).

Developing and shaping character is morally fraught

Shaping character is pedagogically challenging and morally fraught. The actual business of shaping character is, by definition, intrusive and subject to potential abuse (Boling et al., 2020; critical pedagogy [→ 276]; hidden curriculum [→ 271]). Values may be contested as moral issues: in the interactions between an individual and the discipline [→ 238], between an individual and society, between educators and students, and between design disciplines [→ 238] (Exter et al., 2020; Gray & Boling, 2016; Chivukula et al., 2021). Further, the moral character of the individual studio educator is integral to shaping students' professional character and foregrounding matters of ethical concern in student development (McDonald & Michela, 2019). Shaping character requires attention to the purpose and content of critique [→ 79] practices, to which elements of the rhythm [→ 124] of studio

are prioritised, and to whose voices are celebrated in selecting design materials and texts.

The development of a design student's character is influenced by the character of their design educators and fellow students

The value systems of design educators and fellow students impact both the pedagogical decisions made in studio and the assessment of the quality of outcomes that design students produce (artefacts [→151]). A range of pedagogical practices shape or inform the character of design students. These practices could include explicitly valuing inclusive and equitable methods that impact ethical awareness and the ability to act (e.g., Gray & Howard, 2015; Gray et al., 2023), creating opportunities for visibility of diverse thought in online or offline contexts (e.g., the crit [→79]; Gray, 2019), reconsidering systems known to be abusive, such as the design jury (critique and the crit [→79]; hidden curriculum [→271]; critical pedagogy [→276]), and highlighting how these systems can perpetuate downstream abuses in industry or academia (e.g., Anthony, 1991; Webster, 2007). Other socially-oriented studio practices could include identifying how values such as inclusivity or social impact could be made more central to the critique [→79] of design work (e.g., Mercer & Moses, 2023; Papanek, 1971; Tunstall, 2023) and highlighting value framings that students bring with them in different social configurations which impact their work as a group (McDonald et al., 2021; learning and designing collectively [→166]).

The design educator's value system enables them to engage students in dialogue [→181] around different appreciative systems which inform design decisions and the coherence of design outcomes for specific contexts or audiences (Schön, 1984). Such dialogue has the potential to prioritise societal impact (e.g., Costanza-Chock, 2020), but can also highlight instances where consideration of values clashes with either the consensus of peers or the desires of educators. For example, Gray and Howard (2015) describe an instance where a student's interest in the environmental impact of laundry products was dismissed due to a lack of interest by peers and the educator, leading to development of a product that contradicted findings from the student's research. The value system of the design educator and students in the context of their specific design discipline may also amplify or discourage certain excesses, such as Papanek's (1971) description of planned obsolescence, *phony fads*, or the *do-it-yourself murder* of industrial design.

Journey

The studio students with whom I work are on an adventure that lasts multiple years. They may work with me for only one studio (often in the middle of their journey), and have come to recognize certain patterns, but have quickly learned that individual studio instructors all interact with them differently. In narrative terms, they encounter a series of diverse characters along the path of their journey.

(Boling et al., 2013, p. 183)

A journey is a metaphor to describe studio experiences

Northcote and Fetherston (2006) find widespread evidence of educators and students in higher education using the metaphor of the journey to describe educational development. In each case, the journey is both personal and situated in a precise context. For instance, Logan (2006) found that the journey was a prevalent metaphor used in graphic design education to describe the *ground covered* over time. Logan refers in turn (p. 335) to Schön and his description of design students needing to envisage ‘a map of the path’ (1987, p. 38) from their studies to independent practice. Logan also refers to Dias et al. (1999) who studied individual project progression in architecture and the journey metaphors employed by students in their logbooks. These examples indicate that one’s journey through any studio is an important dimension of the experience of learning and teaching in it.

Students undertake a personal journey

If this metaphor is applied to education, every student undertakes a personal journey (Boling et al., 2013), irrespective of whether they are studying science, humanities, or creative subjects or in what constellation of spaces (lecture theatre, classroom, lab, studio, or an online version of these spaces) they study. A student’s journey through education is unique (identity [[→94](#)]; expertise [[→90](#)]). No other student, even in the same class, will have the same combination of learning experiences nor will they produce the same work (Hill, 2017). Journeys have multiple, sometimes conflicting, dimensions – with a shifting sense of protagonist and antagonist over time as each student constructs their own identity [[→94](#)] as a person (character [[→101](#)]) and as a member of their discipline [[→238](#)] (Boling et al., 2013).

Student educational journeys that touch or pass through a studio provide the student with a particular opportunity to witness, reflect on, and understand that journey differently to how they may have in the lecture theatre, classroom, or laboratory. The physical studio is a space which students occupy in different ways over a course and over a programme (**Visibilities and Proximities** [→30]). Students and educators move through studio differently than in other classrooms (e.g., **no front** [→46]), sometimes occupying one workspace for an extended period, and sometimes moving through a building as they progress from year to year. This spatial dimension of a student's journey through the design studio provides them with a unique environment in which to see the **artefacts** [→151] and objects building up over time through which they can conceptualise their progression and learning.

The multiplicity of influences that act upon a student contribute to their development as a student, designer, and collaborator (**expertise** [→90]; **judgement** [→98]). The changes that the student goes through become manifestations of the transformative pedagogy [→111] of studio (Boling et al., 2013). Lave and Wenger (1991) describe how this reconstruction and transformation of a student's **identity** [→94] occurs in situated learning: 'the identity of learners becomes an explicit object of change' (p. 112).

Pedagogical research can employ the metaphor of the journey (and narrative structure) as a means to understand student experiences of studio. Boling et al. (2013, p. 179) use two archetypal narrative structures to gain insight into the idea of students' educational progress through the design studio: 'stranger comes to town' bringing novelty and conflict, and 'student goes on a journey' forcing that person to face novelty and conflict. Coyne, Snodgrass, and Martin (1994) talk about journey as a metaphor for the design process itself. They break down the metaphor to its component parts, writing that 'entailments of the metaphor of design as a journey are direction, purpose, and progress' (p. 117). Using these three components as lenses or prompts can help students to use the personal journey metaphor as a means to **reflect** [→83] critically on how they have approached and addressed design problems in studio. They can also help students to address the implicit – and sometimes harmful – properties of studio which act upon them, including the **hidden curriculum** [→271] and assumptions latent in the expert-novice relationship (**apprenticeship** [→64]). Tools such as reflective journals or diaries can instrumentalise these properties.

Educators conceptualise, reflect upon, and enact journeys

For educators, conceptualising one's educational development as a journey recognises the way in which our skills and our **characters** [→101] develop over time. In studio-based design disciplines, especially those in

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which a studio extends across an entire programme and several years, there are multiple opportunities for development. Boling et al. (2013, p. 185) remind us that the educator is also a character in the student's journey, taking on different roles and responsibilities at different moments:

I see myself as a character in the story of each student's journey – each of them encounters me, but each is the protagonist of her own story and to each, therefore, I am a different character. The mix of mentor and monster is always present in me, but it varies dynamically as it intersects the narrative of the student.

Educators and students might meet in only one or in several courses over several years. The immersive nature of the design studio, in both physical and digital contexts, increases the possibility for students and educators alike to engage in critical reflection on these intersecting *journeys* – as in the logbooks and sketchbooks referred to by Logan (2006).

Educators also have opportunities for formal reflection [→ 83] on their personal journeys in studio, through professional development or educational training. Narratives of learning and critical reflection on the act of teaching are often included in logbooks and assignments for such pedagogical courses. Promotion and tenure guidelines also invite educators to write narrative summaries of their personal and professional journeys. For educators, 'developing the narrative impulse in studio instructors may well help to develop a deeper awareness of the roles we are playing in the studio [...] enhanc[ing] the aesthetic, and hence the transformational, quality of design education' (Boling et al., 2013, p. 191).

Conceptualising learning as a journey invokes familiar metaphors from literature, film, and music. Parrish (2009) provides a framework for applying aesthetic principles to studio, including the notion that educators are authors, supporting characters, or even model protagonists who can prompt students to consider the value of the metaphor of learning as a journey. The narratives included in *Studio Properties* are examples of how individuals can understand their personal journey in this way.

Performance

Yet, when an individual enters into a new position in society and applies for a new part to perform, seldom he or she is told in depth how to act.

(Karabulut & Çerikoglu, 2019, p. 3)

A studio can be usefully viewed through the lens of performance, reflecting the nature of studio as a stage for activity and interaction. Performance also refers to the visible and public nature of studio, a key property referred to in many descriptions of studio in literature.

Performance is a form of rehearsal

Performance supports students to engage with the complexities of a discipline [→238] over time (Shulman, 2005; Shreeve et al., 2010) and is a key feature of studio. Performance is a way for students to act *like* a designer (Simmonds, 1980 in Cross, 1982) in a simulated [→232] environment, and over time, that performance is replaced by the student's own design capability and expertise [→90]. Cossentino (2002) refers to this as 'purposeful movement toward artistry' through performance and criticism (p. 42). The process is summarised nicely by Shreeve et al. (2010): 'Learners perform as practitioners, developing their own creative processes and critical judgement with decreasing amounts of support and increasing insight and development of identity as an artist or designer' (p. 132).

Students perform disciplinary and designerly identities in studio

Performing a discipline in studio is often simplified to specific actions and behaviours associated with that discipline [→238] with a number of examples found in literature.

Dannels (2005), Oak (2011), and Cennamo and Brandt (2012) all identify studio as the place to try out and learn the language of the designer, including words and meanings, uses and contexts, as well as noting that studio is a particularly effective place to do so because it involves listening-in [→170] and an audience, as well as performers (**Interactions and Sociality** [→162]). For Logan (2006), the use of language in studio is a way to perform the discourse or dialogue [→181] of professional practice, deliberately rehearsing design language and the use of specific metaphors (journey, sponge) to acknowledge the tacit, hard to articulate nature of design knowledge [→248]. Gray and Howard (2014) expand further, referring to 'designerly talk' through listening-in [→170] and dialogue [→181] in online studio contexts, where

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students interact using actions and behaviours *beyond* formal pedagogical structures as a way to negotiate the curriculum (power transaction [→282]; critical pedagogy [→276]; informalities [→204]).

Regularly performing the actions and moves associated with designerly behaviours also leads to deeper understanding and applications of them. Lave and Wenger (1991) note the necessary differences between imitation (activity) and participation (application of experience) as part of a participant's progression from novice to *old timer*. One mechanism enabling this progression is the development of habits and rituals [→262]; Hokanson and McCluske (2016) identify *performance of creativity* as a way to develop creative practice through enabling behaviours that become habits. Over time, these habits themselves develop and socialise habitus [→265] in and between students, an important aspect of developing design expertise [→90] and character [→101].

Performance includes both communication and exhibition

One of the obvious forms of performance in studio is the display and presentation of design output. Often this is formalised as the crit [→79], whether interim crit, wall pinup, end of project show, or some other semi-public presentation of work in physical or online studio spaces. In fact, Dannels (2005) and Cennamo and Brandt (2012) both explicitly link many of the learning components of performance to the crit [→79], including how both performers and audience learn in these settings.

The performance expected in the crit [→79] is usually associated with the development of professional competencies around articulation, communication, presentation, and rhetoric of design ideas (Engbers, 2013; Lyon, 2011) (dialogue [→181]; learning and designing collectively [→166]; confidence to speak [→176]). Dannels (2005) extends this idea, arguing that presentation in the crit [→79] functions as a ritualistic performance based on oral traditions emerging from the social and situated nature of the design studio (Interactions and Sociality [→162]; habitus [→265]).

Both presenters and observers participate in performance

Cossentino (2002) argues that reflection-in-action [→83] during the performance of project crits [→79] makes partners of educators and students. Students carefully and professionally present their ideas to an expert coach (power transaction [→282]), working in partnership with that coach to refine design iterations and resolve design problems in the context of performance and criticism in studio. Other students listen in [→170] and observe their peers as they negotiate the project crit (Rogoff et al., 2003) in anticipation of their own crit, making audience participation an active and expected

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part of the performance. Student observers are expected to comment on the project crits of their peers, what Rogoff et al. call ‘intent participation’ or more generally listening-in [→ 170] (Rogoff et al., 2003; Cennamo and Brandt, 2012; Jones et al., 2017).

Studio is a performance space

Dannels (2005) observes that educators and students use the metaphor of theatre quite explicitly in terms of *setting the stage* for presentations, its choreography, and the audience and their involvement. Stage setting is perhaps most obvious when presentations are made during crits or for display and exhibitions.

Studio is also a place of improvisational and ongoing performance and can be considered as a stage for the performance of creative labour, a place of making visible [→ 34] which inevitably involves an audience, giving studio an oligoptic quality (Armstrong, 2015). Additionally, as Nesper observes, the shared studio space can be a ‘stage for the display of one’s embodied corporate competence’ (Nesper, 1994, p. 119). The semi-private, semi-public, and public spaces created in studio afford different degrees of observation (Jones, 2022a), making a studio an important space for social comparison [→ 172] of performance and artefacts [→ 151] and a space of boundary-making to ward off premature judgements [→ 98] (Farias, 2016) or enable the rehearsal of ideas before they are made more public.

Students and educators take on roles in studio

It’s the theatre part of this ...
there’s both an art and a science to this.
(Dannels, 2005, p. 153)

Karabulut and Çelikoglu (2019) extend the performance metaphor, utilising a dramaturgical approach to identify other roles students play as learners in studio: Favourite, Latecomer, Backside Loner, Extra, or Mainstream. These roles hint at the variety of other identities [→ 94] and performances [→ 107] that occupy studio. Two serious considerations arise from this. First, the personalities and identities of students do not always align with expected performance identities (Cultures and Power [→ 258]; identities [→ 94]). For example, students less likely to speak (confidence to speak [→ 176]) or engage in face-to-face settings may appear to ‘fail’ to perform, whereas they may speak up quite readily in an online setting (Gray, 2021; Jones, 2020). Secondly, there are always identities [→ 94] – including behaviours and actions – that students take on in response to expectations from

educators, regardless of their benefit or authenticity (Corazzo & Gharib, 2021). The expectation of being seen (and performing) in a studio is often so implicit that educators are unaware of its effect on student behaviour as a facet of performance and identity [→ 94] (**Visibilities and Proximities** [→ 30]).

Educators (tutors, lecturers, demonstrators, technicians) can also be viewed through the lens of performance in studio. Notably, Webster (2004, pp. 108–109) updates work by McLaren that identified three types of tutor behaviour, roles which McLaren (1999) characterised as ‘the entertainer’, ‘the hegemonic overlord’, and ‘the liminal servant’. The extent to which these are truly performative or genuine encounters may be debated, but the effects on students can be very real regardless of this. As well as outlining the problems that can arise from these behaviours, Webster identified that only the ‘liminal servant’ was perceived by students as a positive role in supporting them and their work (enculturation, acculturation, and indoctrination [→ 285]).

Some performances in studio are hidden

No stage would be fully functional without technical experts backstage, and their supporting role in some studios is important to note. Lyon (2011) refers to the demonstration in some studio settings as a performance, noting ‘some people [technician demonstrators] – they really are performers.’ (p. 135).

A final hidden aspect of performance is that unspecified expectations surround it. The hidden curriculum [→ 271] is often composed of expectations of behaviour and performance, such as presentee-ism in studio or preferences towards certain behaviours or dispositions (Lyon, 2011). For many students, performance can be challenging for a variety of reasons and the normative expectations of performance can tend to favour certain personality traits and behaviours: extroversion, confident disposition, articulation (enculturation, acculturation, and indoctrination [→ 285]; habitus [→ 265]; identities [→ 94]).

That someone may not have confidence to speak [→ 176] in specific public settings, such as a wall crit [→ 79], is not necessarily indicative of their design expertise [→ 90].

Transformative Pedagogy

Like a well-plotted and well-executed novel or film, everything fits together toward a meaningful expression of the intended theme. It is at this level that experience can become memorable and transformative for a learner. Learning experiences at this level may be limited in number, but they can colour one's attitudes toward learning for some time to come.

(Parrish et al., 2011, p. 18)

Mezirow (1978; 1991) proposed the idea of 'perspective transformation' as the permanent change in thinking that arises when a learner becomes aware that they are part of the creation of their own learning. In this transformation students are not considered to be passive, uncritical recipients of learning; they have agency in transformative pedagogies using critical and constructivist methods. Ukpokodu (2009) argues further that transformative pedagogy is an activist pedagogy 'that empowers students to examine critically their beliefs, values, and knowledge with the goal of developing a reflective knowledge base, an appreciation for multiple perspectives, and a sense of critical consciousness and agency.' (p. 43)

Ideas regarding student empowerment through critical reflexivity have been applied directly within design education (cf., [critical pedagogy \[→276\]](#)), and scholarship at this intersection is quite advanced (for example, see Salama, 2021). Transformative pedagogy as a property of studio manifests as two distinct but related phenomena: 1) a pedagogy which seeks to transform the learners engaged within it; and 2) a pedagogy which is itself transformed by acts of learning. Both of these framings of transformation are consistent with the underpinnings of [critical pedagogy \[→276\]](#) in which [multiple knowledges \[→248\]](#) and the active participation of learners and educators are valued.

Transformative pedagogy leads to change in the learner

In the first understanding of transformative pedagogy, change is effected within the individual student, particularly in terms of their fundamental perspectives towards design and practice. The object of transformation here is the student rather than the studio, as when the purpose of studio is viewed as engendering a *metamorphosis* (Siegel &

Stolterman, 2008) or transforming a student into an emerging designer. Building on Meyer and Land (2006), Smith (2013) frames this process as the acquisition of ‘threshold concepts’ (**Theories and Knowledge** [→ 218]) as ‘potentially troublesome’ and functioning as ‘portals to professional expertise’ (p. 37). Troublesome concepts by their nature require that students confront previous **knowledge** [→ 248], revising or replacing it as part of a transformation of both **expertise** [→ 90] and **identity** [→ 94]. Transformative pedagogy becomes, therefore, an important contributor to the development of students’ **judgement** [→ 98] and **character** [→ 101], which are unique to each student, and which change over time.

This understanding of transformative pedagogy addresses a student’s cognitive transformation leading to a shift in **identity** [→ 94], as opposed to pedagogy focused primarily on acquiring knowledge or building skills. A personal transformation requires a learning situation or environment which *encourages* change to occur versus one in which a discrete series of learning experiences are targeted towards learning outcomes involving acquisition of knowledge and/or skill but otherwise leaving the learner unchanged.

Transformative pedagogy leads to change in the discipline and society

In the second understanding, transformative pedagogy is viewed not as fixed in traditional or existing patterns, but rather as self-changing or changeable, responding to how learners make sense of a subject. That is, as learning takes place, understandings of the **discipline** [→ 238] are (re)created by students, thus shaping and changing them slightly (see also **habitus** [→ 265]). This evolution of studio can be contrasted with modes of learning where reaching objective agreement and limiting the bias introduced by individual students or educators (e.g., in **assessment** [→ 234] practices) is paramount, as might be found in the natural sciences. Many design disciplines have changed over time, both through explicit expansion and professionalisation (e.g., interior design, industrial design) and through the creation of new disciplinary perspectives (e.g., UX design, service design) anchored in other forms of knowledge (e.g., Kou & Gray, 2019).

Transcending a focus on individual identity change and formation, this view of design disciplines is ‘transformative in the sense that the pedagogy sets up the conditions to investigate deeply [...] the nature of design education itself, especially with regard to how knowledge and meaning are produced and disseminated [...] and how students come to see their roles in these activities’ (Dutton, 1987, p. 16). Salama (2021) similarly connects personal development with broader moral commitments regarding a designer’s

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character [→101], claiming transformative pedagogy is ‘about balancing the creative act required for successful design and the social and environmental responsibilities that should be embedded in this act’ (p. 20). Positioning studio as related to and bridging the student to their eventual field of practice (cf., *studio bridge*; Brandt et al., 2013) implies that a critical orientation to design and designing is, or should be, pervasive in the pedagogy of studio, having the potential to shape both the discipline and society at large.

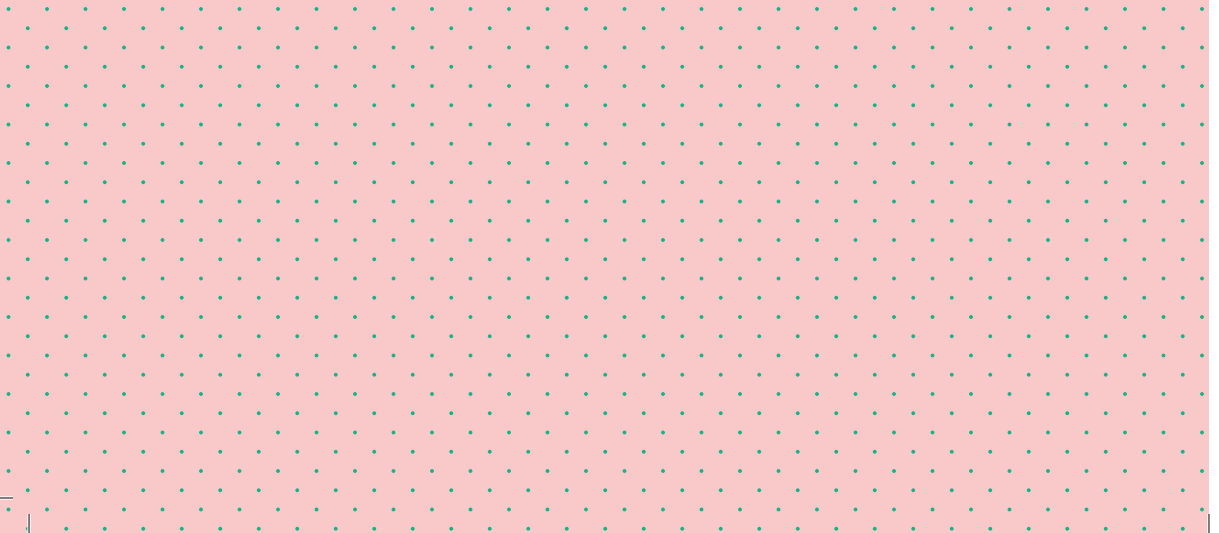
Transformative pedagogy can be supported by particular studio conditions

Meyers (2008) offers five considerations for supporting transformative pedagogy in online settings, all of which come from ideas developed in other non-studio face-to-face educational settings, but which may be usefully considered in virtual and face-to-face studio contexts:

1. creating a safe environment (simulation [→232]; confidence to speak [→176]; risk and failure [→227])
2. encouraging students to think about their experiences, beliefs, and biases (reflection [→83]; critical pedagogy [→276])
3. using teaching strategies that promote student engagement and participation (dialogue [→181]; active teaching [→71]; critique and the crit [→79])
4. posing real-world problems that address societal inequalities (design brief [→67]; simulation [→232])
5. helping students implement action-oriented solutions (learning by doing [→145]; making [→147]; prototyping [→158]).

This list suggests the ideas behind transformative pedagogy and the types of properties found in studio are well-aligned towards the goal of transforming both the learner and the broader field of design in which the learner and educator practice.

Time and Structures



What is happening at any given moment in a physical or online studio is evidence of the multiple and repeated activities and behaviours which have occurred there already **time**. Students have undertaken their work in response to a brief, have often spent significant amounts of time in the studio working **immersion** with, or near, others **synchronicity and proximity**. Their efforts can be seen to build towards the interim and final critiques, then level out into reflection before the next brief is assigned **project cycles**. In a given studio, the activities ebb and flow across longer periods of time (terms, semesters, modules), complicated for students by the ebb and flow of their own lives, their physical and emotional beings, and the societies in which they live **rhythms**.

A map of the Time and Structures cluster showing possible relationships and connections between properties.

immersion in studio takes place over extended periods of time

Synchronicity and Proximity

studio depends on synchronicities and proximities to operate

Rhythms

Time

Immersion

Immersion in design curricula
is a core purpose of studio

time in studio is broken into rhythms
of activity and interaction

Project Cycles

project cycles are a key
rhythm of activity in studio

Immersion

[A] reflective practicum demands intensity and duration far beyond the normal requirements of a course. [...] Students do not so much attend these events as live in them. Indeed, nothing is so indicative of progress in the acquisition of artistry as the student's discovery of the time it takes [...] time to live through the learning cycles involved in any design like task.

(Schön, 1987, p. 311)

The design studio is a place of extended activity, interaction, and engagement over long periods, offering participants immersion in that place. This is often reinforced by repeated activities (e.g., repeated [crits](#) [[→79](#)]), behaviours (e.g., [enculturation](#) [[→285](#)]), and structures (e.g., [project cycles](#) [[→132](#)]), leading to other properties of studio emerging, such as a place of [identities](#) [[→94](#)] or [belonging](#) [[→189](#)].

In *Flow: The Psychology of Optimal Experience*, Csíkszentmihályi (1990) articulated the concept of a state of being in which creative or critical engagement in an activity develops a sense of total immersion in the task, detached from the normal passage of [time](#) [[→121](#)], often to the exclusion of other considerations. In studio this immersion is experienced, determined, and defined by individual students themselves, albeit supported by the contexts and settings within which it takes place (Williams, 2013). In project work, students engage in [project cycles](#) [[→132](#)] that contain both creative work and critique, the former of which is often immersive, creative flow. The personal experiences of designers in states of immersion and flow have been linked to specific forms of design activity in the literature (Rieuf et al., 2017). Such immersion has a purposive quality and can contribute, over time, to some wider goal or aim.

Immersion takes place over time, leading to deep and extended learning

A key feature of studio is its continuity and presence over long periods, often throughout an entire qualification or programme of study. This continuity supports deeper learning that takes place through repeated, continued, and sustained activity, critical to the development of design competencies such as [expertise](#) [[→90](#)], [character](#) [[→101](#)], and [judgement](#) [[→98](#)] (Schön, 1987; Cennamo, 2016b).

Time and Structures

Schön (1987) refers to the studio pedagogy as centred on learning-by-doing and reflection-in-action, where design expertise is built over time through engagement in immersive, authentic activities and regular reflection both on-action, retroactively, and in-action, in the moment. (Cennamo, 2016b, p. 251)

The ‘spiral approach’ to learning was proposed by Bruner (1977) and used in professional education domains such as medicine (Harden & Stamper, 1999). In this model, students are repeatedly exposed to elements of the curriculum that increase in complexity over time, providing both a familiarity and learning challenge with each repetition. Four conditions for spiral learning are summarised by Harden and Stamper: topics are revisited; students experience increasing levels of difficulty; new learning is related to previous learning; and the competence of students increases (p. 141). These conditions can be readily applied to the activities and curriculum found in studio. For example, the repeated use of design projects and project cycles [→ 132], where the repetition of project cycles builds on previous experience and is often accompanied by an increase in the difficulty and complexity of the design brief or challenge (Sosa, 2020). Over time, this aims to develop the overall competence of students as designers.

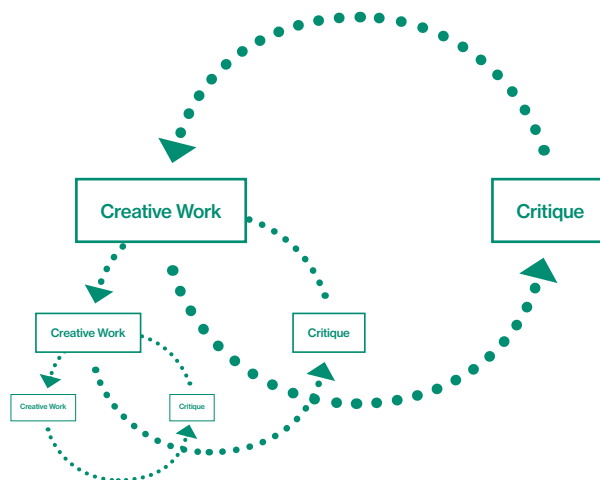


Figure 1: Repeated uses of project cycles as a spiral of increasing difficulty and complexity.

This development of student expertise [→90] is itself a *progression spiral*, over time, of personal and professional qualities and competencies, such as judgement [→98] and character [→101]. Critically, these qualities have significant qualitative aspects, requiring judgement, assessment, and reflection to negotiate them as part of the learning journey [→104] (see expertise [→90]), representing the difference between *being* and *becoming* a designer (Nelson & Stolterman, 2012). Hence, the conditions for spiral learning are often a negotiation between the personal development needs of students and the broader goals of the curriculum, and the need for enculturation, acculturation, and indoctrination [→285]. This negotiation often takes place using familiar frameworks of activity, such as the repeated challenges offered by design projects. The familiarity of the repetition allows students' personal learning needs or drivers to be the other focus of activity, offering a unique mechanism for constructivist learning and the development of expertise.

A further structure at work in many studios is a shared space where the work of students at different levels of learning and expertise is made explicitly visible. This sharing can allow social comparison [→172] to take place between stages of study, providing a longitudinal or temporal perspective for students as well as immediate ones. This type of longitudinal interaction and immersion can be found, alongside other components, in the idea of a *vertical studio* (McClellan & Hourigan, 2013). Nottingham (2017) argues that the affective relationship between studio and human bodies is how a range of immersive and vertical aspects of design education are conveyed.

The personal and professional judgement [→98] of students is a quality that is developed – like expertise [→90] – in different ways, in different intensities, and at different speeds over time. Immersion in studio offers a critical way to sustain and support such development.

Studio supports immersion in subject, community and culture

The amount of time spent in studio is linked to the degree of immersion experienced by a student (Schön, 1987; Cennamo, 2016b). A studio does not need to be a physical place [→198] to provide students spending time on task with the experience of immersion in its atmosphere and culture(s) (Jones et al., 2021). The formal immersion in cultures, behaviours, and norms of disciplines and professions can lead to enculturation, acculturation, and indoctrination [→285]. Less formally, immersion can also be found in social and pastoral interactions involving culture(s) of student identities [→94], habits and rituals [→262], belonging [→189], and boundary-making, all of which highlight the importance of studio as a place of informal learning [→42].

Both disciplinary and pastoral forms of immersion just outlined can have positive and negative effects depending on how power transactions

[→282] are manifested, made visible, and given agency in a studio. Immersion in the form of belonging [→189] to a group is often premised on inclusion and exclusion, leading to potential isolation and issues around who decides *in* and *out*.

Time

Education cannot be separated from life in institutions, and ... thinking about education cannot be separated from the spaces and times in which we produce knowledge.
(Neary & Amsler, 2012, p. 109)

A common assumption in design education curricula is that students require sustained exposure to designerly activities, habits, and cultures of practice, in a shared space or community. This exposure over longer periods, or immersion [→118] (Schön, 1987; Cennamo, 2016b), is linked to the development of design expertise [→90] (Lawson & Dorst, 2009). Time is also required for the individual activities and experiences particular to design, especially those that require certain types of cognitive attention and engagement, such as play [→155], risk and failure [→227], creative flow (Csíkszentmihályi, 1996), or simply *diverse wanderings* commonly found in student centred studio activity (Orr & Shreeve, 2018).

In such cases, a necessary condition is that the activity undertaken over time is not simply repetition without effect but also requires some deeper learning or thinking. Smith (2015) refers to this in design education as *deliberate practice*, where the activity develops the learner beyond their existing capacities, not simply repetition. There is, then, a particular relationship between time, context, and purpose that is worth exploring in studio education – across multiple scales and pedagogical purposes.

Time structures a studio at different scales

Time in studio is usually planned and structured at different scales (see rhythms [→124]). For example, students may undertake small design activities (over short periods of time) that contribute to a larger project (longer period of time). It is the ongoing relationship between scales of activity and time that offers what Boling and Schwier (2016) term a *sustained experience* in a studio. Larger time structures, such as projects, offer a more open framework for learning and teaching to take place and are critical

Studio Properties

in supporting emergent learning opportunities and [active teaching](#) [[→71](#)]. In contrast, short, focused activities in studio offer very different learning and teaching experiences, as found in the ‘Many Projects’ studios highlighted by Boling and Schweir (2016), where they can be employed to offer repetition, set a particular pace, or keep students moving (see [design brief](#) [[→67](#)] and [project cycles](#) [[→132](#)]).

Studio projects tend to place greater emphasis on student-directed activity than other forms of learning and students are expected to manage their own design process as well as practical time management in addition to the particular requirements of the project itself. This independent learning entails professional competencies – such as project management – which can often go unstated as learning outcomes (Duer, 2016). Importantly, this self-directed time is also applied to activity not directly associated with specific curricula or project outcomes, aligning with other personal or collective goals, such as [developing habits and rituals](#) [[→262](#)], [constructing belonging](#) [[→189](#)], or the [creation of place](#) [[→198](#)].

Time in studio can be considered objectively and subjectively

The ancient Greek concepts of *kronos* (measured time) and *chytos* (experienced time) refer to the difference between objectively measured and subjectively experienced time. Objectively, time can be a useful mechanism in learning and teaching. Obvious examples of this might be scheduled studio activity or the project submission deadline. The project deadline, for example, *teaches* time management, often as an unstated goal (Pable, 2016), and, where this remains implicit, the chances to directly influence learning are reduced if not handled well (Duer, 2016). Subjectively, [flow and immersion](#) [[→118](#)] in studio depend on experienced time, requiring the right sorts of conditions to support this – or, at least, to avoid the conditions that can break flow.

Similarly, time is also required for the many experienced informalities found in the physical space of a studio, including [serendipity](#) [[→212](#)], [peer critique](#) [[→79](#)], [play](#) [[→155](#)], and [social comparison](#) [[→172](#)]. Both the physical opportunities and the time required for their experience are necessary to support [informalities](#) [[→204](#)] in studio, inviting a discourse about the value of dedicated studio spaces which students inhabit instead of spaces utilised according to a schedule (see [cost](#) [[→51](#)] and [synchronicity and proximity](#) [[→128](#)]).

Time supports flexibility and deep learning

Not all students learn in the same way, at the same rate, or even at the same time (see [journey](#) [[→104](#)] and [expertise](#) [[→90](#)]), and [semi-structured rhythms](#) [[→124](#)] allow these differences to be accommodated in studio.

Time and Structures

Individual student interactions can be planned according to differing requirements and vary in time according to student needs. For example, regular check-ins in studio will vary in intensity per student, with educators (ideally) adjusting the time spent with students depending on need. This allows a more responsive approach to teaching, where the time allowed overall can be used in specific ways to suit individual student needs (Duer, 2016). (See also [active teaching](#) [→71].)

Time is also essential in facilitating deeper learning associated with [immersion](#) [→118] or [enculturation, acculturation, and indoctrination](#) [→285], where each of these methods of instruction depends on experience(s) over time in studio. For many researchers and educators, thinking time in studio is central to the design process. For example, the time required to engage in design thinking, particularly for incubation in creativity, is critical to developing design skills (Antes & Mumford, 2009; Cohen & Ferrari, 2010). Similarly, other informal activities in studio require time invested in them: that is, time spent on them as *deliberate practice*, such as activity in [informal learning spaces](#) [→42], [listening-in](#) [→170], and even [serendipity](#) [→212]. Even boredom might have a valuable place in studio (Anderson, 2004).

Expectations lead to cultures oriented around time

It is not unusual for a significant amount of time in a design curriculum to be given over to activities in a studio setting (Brown, 2021). An assumption behind the amount of time allocated to studio-based activities is that this *time spent on task* is required for learning to take place, with a consequential expectation that physical presence in studio is required for learning to happen (Logan, 2006). In some specific subject areas, expectations of time in studio are seen as a necessary part of [enculturation, acculturation, and indoctrination](#) [→285] into that discipline's cultures and norms. But at its very worst, indoctrinated and unhealthy assumptions around time can propagate negative behaviours that damage [wellbeing](#) [→214]. Cultures of presenteeism in studio have been criticised, for example by the Studio Culture Task Force of the American Institute of Architecture Students which was formed to address negative studio working cultures after the death of a student who had spent two consecutive sleepless nights working in studio (AIAS, 2002, p. 7). In online studios, cultures of presenteeism are no less problematic but may manifest themselves differently, depending on the visibility of students' participation and activity.

It is perhaps worth ending with a reality check: the idea that the perfect student is one constantly attending to the practice of design is persistent and dominant but deeply flawed. Orr and Shreeve succinctly express this criticism: 'The idea of the ever present student is a masculinised idea of the

student unencumbered with children, financial constraints, or responsibility' (Orr & Shreeve, 2018, p. 51).

The quality of time spent on an endeavour matters just as much as the quantity of time spent. The popularised relationship between 10,000 hours of practice and expertise often misses the original study's critical application of deliberate practice (Ericsson et al., 1993). For the development of a designer, whether it is playful or serious, individual or collaborative, formal or informal, it is the deliberate (Smith, 2015) or intentional (Nelson & Stolterman, 2012) practices that develop expertise, requiring that educators 'carefully craft how this time is spent' (Smith, 2015, p. 81).

Rhythms

Neither captures the richness of time as experienced by students or tutors – a richness that we rely on in all studios but rarely acknowledge or articulate. Without this we would not have the stress of a deadline, reflective moments of simply staring at a blank page, or the complete loss of time felt when we are in flow.

(Jones, 2022a, p. 8)

Within the dimension of [time \[→121\]](#) in the design studio complex patterns intersect with one another. The particular environment of the design studio adds a further layer of complexity (when compared to the classroom or lecture theatre) due to its properties of [immersion \[→118\]](#), [synchronicity](#) and [proximity \[→128\]](#) and the many overlapping opportunities for [listening-in \[→170\]](#).

Educators also experience rhythms, and these matter a great deal when involved in the [active teaching \[→71\]](#) of studio. Educators in studio bear responsibility for establishing the rhythm of [project cycles \[→132\]](#) and *cycles of design* (Shaffer, 2007), but they often fail to take into consideration the lived experiences of the student. The concept of rhythms in the design studio can account for and help to conceptualise the many overlapping patterns acting on individuals. They can also support educators to recognise the ways in which they themselves may create unique micro-rhythms through the narratives of their own studios.

To help clarify the concept, we explore in more detail below the particular characteristics of three scales of rhythms: macro-rhythms,

meso-rhythms, and micro-rhythms. We conceptualise these in Figure 2. These can be explored as ways of interrogating more rigorously the widely accepted notion that time is required for students to engage in meaningful thought and creativity (Antes & Mumford, 2009; Cohen & Ferrari, 2010).

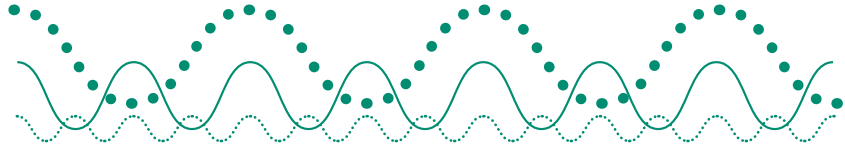


Figure 2: Conceptual diagram of intersecting macro-, meso-, and micro-rhythms.

Macro-rhythms describe cycles, seasons, and events

In both the northern and southern hemispheres, the academic year normally has a seasonal rhythm. These seasonal macro-rhythms, familiar to every discipline within the educational institution, can be felt differently depending on the degree of immersion [→ 118] in the learning environment. It might be argued that students who move between different learning spaces according to a schedule of classes experience these rhythms differently to students working in the quasi-residential environment of the design studio. Where studio projects align with the different seasons, starting in autumn and ending in summer, for example, students and educators may perceive various sensations and emotions of renewal, fresh opportunities, anticipation, effort, and celebration.

Macro-rhythms are also felt through pedagogical or curricular structures. The project, for example, will often align with the macro-rhythms of term or semester structures and administration. Some studios may span multiple seasons to use the entire academic year for a single, large project, what Boling and Schwier (2016, p. 10) refer to as ‘Big Project’ studios. In portfolio-based curricula, Big Project studios can even span multiple years.

Both students and educators may be obliged to adapt to religious and cultural events in order to balance the demands of their lives inside and outside studio. Students of different faiths will have different obligations which will influence their experience of the academic rhythms of a studio. Students with caring responsibilities, for example to the very young, the aged, or the infirm, will also experience potential clashes between rhythms external to themselves and those of the studio.

Meso-rhythms provide structure and meaning to project cycles

Within the annual rhythms of the academic calendar are many overlapping meso-rhythms related to the patterns and cultures of the programme of study.

Meso-rhythms are often the operationalised and structured aspects of courses or even individual projects (see [design brief](#) [→67] and [project cycles](#) [→132]). Formally planned meso-rhythms can be created by dividing a project into phases, each having a review checkpoint or evaluation; other studios may operate less formal checkpoints to review progress, such as weekly check-ins or regular desk reviews (see [critique and the crit](#) [→79]). The impact of these meso-rhythms and checkpoints, which all students are expected to meet, can be significant, as found by Nielsen and Ulriksen (2021).

Various other studio activities can imply additional meso-rhythms, such as project introductions, exploration, development, presentation, and assessment. Within the academic calendar, from the beginning of courses or projects, there is a growing intensity that culminates with end-of-semester crits, exams, or assessments. These can be followed by periods of relative tranquillity or recuperation in the design studio. Clayton (1999) has shown how architecture students describe and report rhythms of varying intensity around project deliverables.

As online studio teaching becomes more widespread, educators have the opportunity to interrogate how their teaching addresses the rhythms of synchronous, asynchronous, and even semi-synchronous teaching. Online meso-rhythms are not necessarily the same as those experienced in the proximate studio (Brown, 2020). There is emerging post-pandemic evidence to suggest that students of design prefer studio teaching to online or blended models (Peimani & Kamalipour, 2022; Grover & Wright, 2023). It may become relevant for longitudinal studies to critically compare whether students feel they can manage these intersecting rhythms better in proximate, hybrid, or online studio environments, and to what extent the quasi-residential nature of the proximate studio contributes.

Micro-rhythms relate embodied and individual experiences to instructional environments

Intersecting with these macro- and meso-rhythms, individual students experience additional micro-rhythms that relate to their bodily experience of studio, about which there is limited or inconsistent research. Across different student groups, research points to the importance of educators and institutional leadership being sensitive to these varied lived experiences. To give just three examples:

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- A review of the qualitative and quantitative research on students' menstruation found widespread evidence of negative impacts on their education, pointing to the need for institutions and policymakers to develop strategies to support and improve students' wellbeing [→ 214] (Munro et al., 2021).
- A recent study found that while higher education institutions are legally obliged to provide students with chronic illnesses equal opportunities to study, many educators may hold negative views against these individuals (Hamilton et al., 2023).
- Young adult (18–25) carers experience significant challenges balancing the competing demands of their roles as carers and students (Day, 2021).

In addition to the kaleidoscope of personal circumstances, an individual's circadian rhythm can be further disrupted or changed by the immersive environment of the design studio, particularly the peer pressure associated with the competitive nature of studio and the social comparison [→ 172] that goes on in studio (AIAS, 2002). Students who commute daily between their home and their place of study will experience the daily rhythms of the worlds inside and outside their studio differently from those who are not obliged to travel so far, waking earlier and getting home later, but also potentially being exposed to and immersed in a wider variety of non-academic rhythms, such as the flow of people in and out of a city.

The intensive routine of pedagogical actions and habits of studio, such as tutorials, lectures, and interactions, build up a complex and unique micro-rhythm of learning moments and interactions experienced by each student. Educators can refer to the tactics and strategies of active teaching [→ 71] to consider how they contribute to these micro-rhythms and to invite learning.

Synchronicity and Proximity

The 'perfect' studio is traditionally thought to be one where there is a confluence of space, time, and being; students and tutors, in the same space, at the same time, all engaging fully and being present. This state of perfectly overlapping proximities rarely exists and, even when it does, the intensities and intersections are far less homogenous [as] evidenced in what happened for many educators during the pandemic...

(Jones, 2022a)

Much of studio pedagogy, particularly historically, is premised on students and educators being in the same place at the same time. This synchronicity and proximity support pedagogical strategies that often rely heavily on active teaching [→71], particularly those that focus on student development and meaning-making (Orr & Shreeve, 2018). Such strategies can then make use of instructional moves, such as regularly scheduled desk crits [→79] or project cycles [→132], with the expectation that further unplanned or emergent events will emerge, such as peers listening-in [→170], supporting a student on their journey [→104], or the myriad informalities [→204] that might lead to some extended dialogue [→181]. It is this interaction between structures, planned activities, and unplanned opportunities (serendipity [→212]) that synchronicity and proximity support in studio.

Critical to synchronicity and proximity is that both time and space are adequately provided as part of the curriculum (cost [→51]). Studio in contemporary universities regularly faces pressure to justify the time and space it requires and such pressures can have an impact on the student experience. For example, treating studio space as just another classroom and a resource shared across subjects and student cohorts can impact the effectiveness of the emergent and responsive events studio depends on (Radzikowska et al., 2019). That said, it should not be assumed that providing proximate and synchronous spaces will automatically lead to the best learning experiences and outcomes: increasing educator-student contact time does not necessarily correlate perfectly with effective learning (Güler, 2015).

Different combinations of synchronicities and proximities operate in studio

Synchronicity and proximity are often conflated in studio pedagogy. Consider how Schön's (1991, pp. 76–104) description of a desk crit [→ 79] between an architecture professor and a student explores the close proximity of the professor (Quist) and student (Petra) over a set of drawings. The educator takes control of and draws over the student's work, a methodology that is perhaps the quintessential instructional studio move, both proximate and synchronous at the same time. This very traditional proximity and synchronicity are often assumed to represent the *ideal* studio (Jones, 2022b).

However, synchronicity and proximity are not necessary co-conditions to support learning. In fact, combinations of both have always operated in traditional studios and further variations are becoming more common in distance and online studio spaces (Jones, 2022a). Dialogue, for example, can take place face-to-face or online, as well as synchronously or asynchronously. All four combinations are possible (see table 2).

	Synchronous	Asynchronous
Physically Proximate	dialogue during and in-person desk crit	dialogue through shared artefacts
Physically Distant	dialogue in an online tutorial or project review	dialogue over time using shared surfaces in an online virtual studio

Table 2. Examples of possible combinations of proximity and synchronicity in studio

Each combination is explored in the academic literature regarding its pedagogical value in general education (for example, see Kear, 2011; Donelan et al., 2010; Thomas et al., 2016). Less well documented until recently are how proximity and synchronicity intersect with design education, an area that expanded rapidly following the Covid-19 pandemic. This more recent scholarship now offers interesting and important findings, such as Hepburn and Borthwick's (2021) comparison of two online design studios differentiated by the synchronicity of their delivery, finding that the synchronous (live) online design studio better reflected the values of a traditional, proximate design studio. Similarly, Corazzo and Gharib (2021) demonstrated that a key difference between a physical studio and its online version was how the physical infrastructure of the former afforded opportunities for informal learning that underpinned the formal teaching taking place and that such cues and opportunities were not present in the online version,

no matter how this was compensated for by online synchronicity. What both examples demonstrate is the complexity and challenge of replicating the experience of learning from a physical studio to an online one.

Degrees of synchronicity and proximity operate in studio

Just as there are combinations of synchronicity and proximity, there also exist degrees of each. It is easy to consider the binary extremes of synchronous or asynchronous but in pragmatic terms, it can be more useful to consider how a studio makes use of different synchronicities. For example, [project cycles](#) [[→132](#)] depend on synchronous moments of potential interaction, but also periods of time between these points that are neither synchronous nor asynchronous. As Jones (2022a, p. 6) summarises ‘a project may have clear synchronous fixed points but may have asynchronous, or flexible, points in between. The project could be described as a semi-asynchronous entity in studio.’

Hence, in terms of thinking about studio at a curricular or strategic level, it is perhaps more useful to think in terms of [rhythms](#) [[→124](#)], [project cycles](#) [[→132](#)], and even [immersion](#) [[→118](#)] over long periods of time.

Synchronous interactions offer immediacy but variable opportunities for deep learning

Synchronous events in studio, whether face-to-face or online, usually depend on emergent activity and interactions, [active teaching](#) [[→71](#)], and constructionist forms of learning. The advantage of synchronicity is in the immediacy of the interaction. For example, clarification questions can be posed at the point of them being raised, shared sketches can be updated at the same time as they are discussed, or responses can be mediated to suit the tone or level of interaction. It is perhaps unsurprising, then, that if a student receives immediate help at the point of needing it, this tends to be perceived as a positive experience (Peimani & Kamalipour, 2022; Lotz et al., 2015).

The disadvantage to such types of synchronous interaction is that they are often transient and, unless they are recorded or acted on in some way, might not offer a record of what has happened beyond the memory of it. Students can experience significant *learning moments* and the memory of these may suffice. However, when the entire learning experience consists only of such moments this can be challenging for students to recall, make sense of, or put together as part of a [learning journey](#) [[→104](#)]. An example of supporting such situations is given by Wolford et al. (2021), where online digital services are used to support [crit](#) [[→79](#)] by offering a brief record of the interaction. A digital *assemblage* helps structure dialogue in the moment

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and can then support recall at a later date, an example of different synchronicities and proximities working to support the student experience.

Asynchronous interactions offer an ongoing record but can lack immediacy

Asynchronicity, particularly in online or mediated spaces, can solve the problem of transience by keeping a record such as a chat log, forum posts, and submitted or returned assessment feedback. This allows both educators and students to review an interaction at different points in time after the events took place. Conversely, it is the very immediacy of interaction that can be missing in asynchronous interactions. When a student faces a crisis, they often need assistance at that moment or, at the very least, within some known timescale. Lotz et al. (2015, p. 20) have identified that in an online studio ‘a comment that is not responded to in time (no matter how valuable) will not lead to conversation.’ This highlights the critical link between offering the flexibility of space and time, but also ensuring that potential *moments of teaching/learning* are not wasted.

Project Cycles

[T]he design process continued: a student expressed his or her design ideas; a critic responded with feedback to those ideas to help the student achieve a higher level of design; the student incorporated that feedback in a new expression; and finally, this epicycle of design and desk crit culminated in a public presentation at the end of each assignment.

(Shaffer, 2007, p. 118)

Project cycles are fundamental patterns of studio education

One way to consider studio is to reduce it to a basic core consisting of two stages: the production of work (by students), and the reflection on that work (by students, peers, and educators) that form the cycles of design.

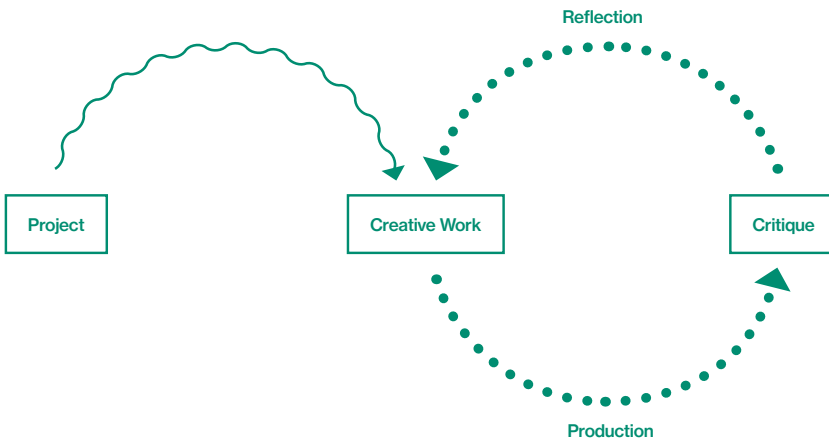


Figure 3: Cycles of design (after Shaffer, 2007).

While Shaffer (2007) refers to this process as the *cycles of design*, we will use the term *project cycles* because it emphasises the importance of the project design brief [→ 67] to in the cycle.

Project cycles begin when an educator or external visitor assigns students a project (also called an assignment or brief) for consideration and resolution. Orr and Shreeve (2016, p. 109) offer a useful metaphor for launch of the project brief:

We might think of the project brief as a human cannon at a circus that has been calibrated so that students, when loaded into the same cannon, all get pushed out in different directions and different velocities. Crucially, the student is more than a passive body being propelled by a human cannon. Once released the students need to learn to fly by themselves.

Their metaphor emphasises the importance of the project brief and how it is designed to enable a range of student responses. However, it also implies the momentum from a project is pre-loaded. In fact, studio education has many frameworks to help students 'learn to fly by themselves'. Project cycles are one such framework that can provide a different way to think about what happens when a student is fired from the project cannon.

Students begin to produce work in response to the brief – research, early ideation, or experimentation – thereby initiating the production stage of the project cycle. These early responses are then shared – typically as work-in-progress – to educators and/or peers and feedback is generated (see crit [→79]). Sharing and feeding back constitutes the reflection stage of the project cycle, and the feedback educators and peers provide is intended to encourage reflection [→83] on the work that will, in turn, enable students to further improve their work.

Brocato (2009) describes this cycle as *propose, critique, and iterate*; students propose their ideas, receive critique, and then reflectively iterate their proposals based on the critique. Students' practical and conceptual iterations lead to further feedback and critique – thus emphasising the cyclical nature of the project cycle – from production to reflection to production to reflection and so on (Shaffer, 2007). This cycle emphasises the experiential nature of learning design – action followed by reflection (Ashton & Durling, 2000; Schön, 1987; Brandt et al., 2013) – and can be contrasted with disciplines where students apply a body of knowledge; 'instead, they learn about design while doing design' (Cennamo, 2016, p. 256; citing Lawson & Dorst, 2009; Nelson & Stolterman, 2012). Critically, project cycles operate on the assumption that students' work is 'always on a pathway toward better iterations' (Brocato, 2009, p. 142). This cyclical process – from action to reflection – is revisited repeatedly in studio and is part of the longitudinal development of designerly expertise [→90].

Epicycles are cycles within cycles

So far, we have described the large outer loop of the project cycle (see Figure 3); however, the stages of production and reflection are augmented by a series of ‘epicycles’ or smaller cycles within cycles (Shaffer, 2007; see Figure 4 and the crit [[→79](#)]).

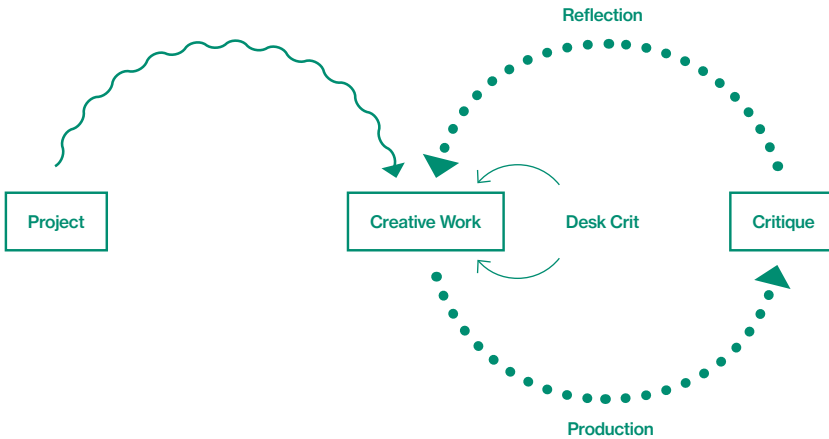


Figure 4: Epicycles are cycles within cycles (after Shaffer, 2007).

These epicycles operate within the larger project cycle and have an important support role. Unlike the larger cycles of production and reflection, where the reflection is often part of a formal group crit, epicycles provide space for informal reflection. These epicycles are often referred to as desk crits [[→79](#)], and they typically take the form of a one-to-one conversation (Shaffer, 2007; Brocato, 2009; Oh et al., 2013). Therefore the epicycles can offer a haven from higher stakes and power-laden moments in the formal critique [[→79](#)] and play an important role in helping to sustain students as they travel through the formal cycles of production and reflection (Blair, 2007; Shaffer, 2007).

Project cycles generally move along different trajectories.

In broad terms, the project cycle is an educational structure that houses a messy and uncertain design process. The cycle, comprising stages of production and reflection, is intended to keep students on a path towards improving work. This process is further supported by a series of *critique settings* (Oh et al., 2013) that can be adjusted as students move through the project cycle (see Figure 5).

Time and Structures



Figure 5: Project cycles adapted from Oh et al. (2013).

From sharing work with one to sharing work with many people:

In the early stages of a project, students' responses are typically shared privately and informally, perhaps in a one-to-one desk crit [→79]. As the project cycle progresses, their responses are exposed to a larger audience. There is a shift from the private space of the desk crit to the public space of the formal review involving more people and sometimes a broader range of stakeholders – practising designers, expert consultants, stakeholders, clients, peers from other classes, educators, and students.

From work being hidden to work being visible: Exposing work in progress to more people as the project progresses serves several purposes. It exposes students to different perspectives on their work; it can also enable a studio community to see the broad range of appropriate responses a project can invite. This increased visibility means students learn from the feedback their work receives and from listening-in [→170] on the feedback their peers receive. By making students' work more visible, the project cycle extends the opportunity for social comparison [→172] and supports the formation of a socially shared understanding of what *good* looks like (Ashton & Durling, 2000; Nottingham, 2017).

Feedback moves from non-judgemental to judgemental: As students move through the project cycle, the nature of the feedback [→74] can change. In the early stages of a project, it has been shown to focus on constructive and non-judgemental feedback (Shaffer, 2007) and become increasingly evaluative and judgemental as the project progresses (Oh et al., 2013).

Projects grow in complexity: Project cycles are typically designed to increase complexity as they unfold and this can happen in different ways. A single project can be broken into smaller chunks that increase in complexity as students progress through them. This is typically seen in architecture – where each chunk contributes to a larger project cycle while forming smaller production and reflection cycles of its own. Alternatively, a curriculum, module or unit may be composed of multiple discrete projects and, therefore, multiple project cycles. The sequencing of these projects is typically intended

to enable students to ‘transfer’ learning into the next cycle as each project grows in complexity.

From prescribed projects to open-ended: As students progress through their course, the project briefs typically become more open-ended. Projects are frequently scaffolded in the early stages of a course, where discrete activities and outcomes are designed to build confidence, competence, and understanding. This opening up of project briefs is intended to invite students to follow their own interests, map their own intentions, and devise their own goals (design brief [\[→67\]](#)).

Studio needs the flexibility to support cycles of production and reflection

Studio accommodates the various requirements of the project cycle. Physically, studios are often flexible, walls move, and you will frequently find furniture on wheels (Crowther, 2013), with educators describing how much they move things around (Shreeve et al., 2010). This flexible studio infrastructure (no front [\[→46\]](#)) accommodates the production stage of the project cycle characterised by open-ended play [\[→155\]](#), risk and failure [\[→227\]](#), and generating ideas. Yet the studio can also be quickly altered to accommodate a reflection stage with surfaces [\[→48\]](#) to pin work up and make it visible to others through activities such as the crit [\[→79\]](#) and dialogue [\[→181\]](#).

Challenges of thinking with Project Cycles

Students’ design expertise [\[→90\]](#) is developed through experiencing and cycling through the stages of production and reflection. In the process, students iteratively develop work and expertise as part of their immersion [\[→118\]](#) in studio. Given the nature of experiential learning, students may progress through the cycles at different speeds (time [\[→121\]](#)) based on several factors such as prior knowledge, current ability, personal circumstances, and their approaches to learning (Marton & Säljö, 1976a, 1976b). Ensuring that project cycles can accommodate this difference is important.

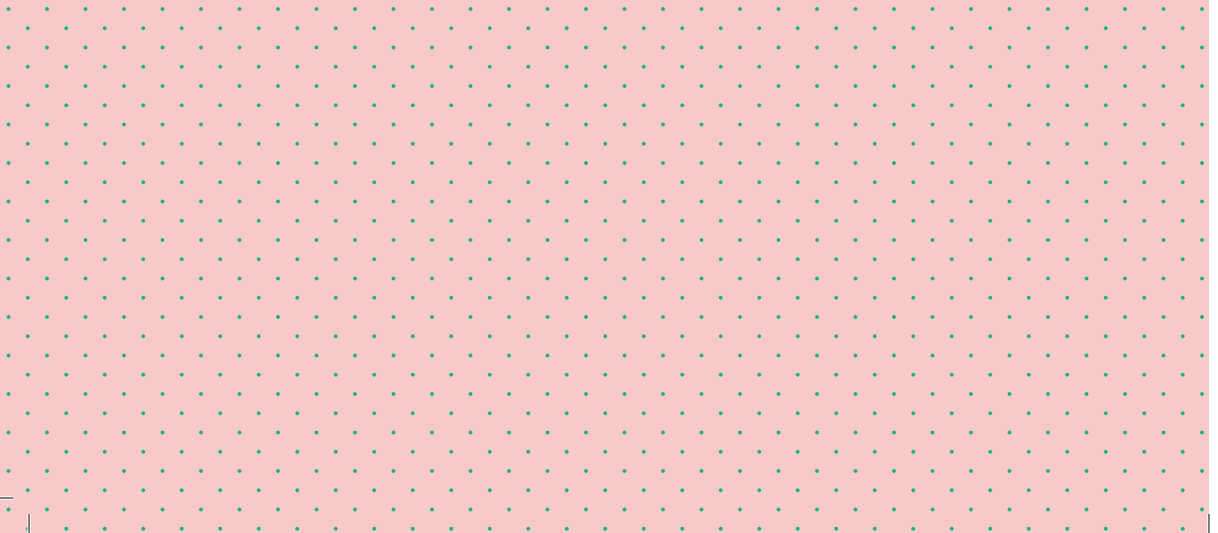
During the reflection stage, caution should be employed when assuming students always share work-in-progress they want to and do not withhold or produce what they think should be seen (hidden curriculum [\[→271\]](#)). It is also assumed that students understand the feedback [\[→74\]](#) given to them and reflect and act on it in ways that can lead to fruitful further iterations. Austerlitz’s (2007) work on the affective dimension of studio showed how students’ emotional responses to feedback in crits [\[→79\]](#) negatively impact their ability to process the feedback and actually hear what was being said.

It is important, then, to see the project cycle as a heuristic device – explaining a fundamental structure of studio. Paying attention to project

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cycles can help reveal the critical and continuous alternation between stages of production and reflection, the varied feedback settings, and how studio can be configured to support the sharing of work (public and private spaces [[→ 54](#)]).

Artefacts and Making



A peek into most studios reveals that they tend to be full of stuff; stuff students are working on, stuff they have finished, stuff they will use for future projects, sometimes stuff other people have made which is on display, and very often digital stuff within their laptops or the online sites where they are studying **artefacts**. Interaction with this stuff is a large part of what happens in studio **materiality** as students either fool around with physical and digital materials in exploratory, whimsical ways **play** or use materials with focused intentionality **making** to create propositional knowledge objects **prototyping** and those creations which they consider to be final **learn by doing**.

A map of the Artefacts and Making cluster showing possible relationships and connections between properties.

learning by doing is the pedagogical foundation for all active and experiential learning in studio

play and making are primary forms of learning by doing in studio

Making

prototyping is a particular form of making in design

artefacts are outputs from making and play

Prototyping

prototyping creates and requires artefacts

Learning by Doing

materiality is a useful lens to see the 'activation' of material and making

Play

Materiality

materiality can make visible 'intentional' aspects of artefacts

Artefacts

Materiality

Design manifests a certain kind of materiality, a popular understanding or experience of what sorts of truths material things embody.

(Drazin, 2020, p. 7)

Materiality is the idea of engaging sensorially and experientially with tangible things and substances. Materiality arises from interactions with the physical world to create perceptions, conceptions, and experiences, based on the idea that materials shape meaning through interaction, familiarity, and use. By this view, materiality is *experientially* inseparable from the experience of the material world or the construction and manipulation of it through forms, surfaces, and artefacts (Merleau-Ponty, 1962; Malafouris, 2013; Shapiro, 2014). This interdependence makes materiality ‘more than’ the physical properties of a material alone, albeit precisely what materiality depends on is still debated (Ingold, 2007).

Some authors consider materiality central to defining the character, state of being, and quality of design outcomes (Houdart, 2016; Drazin, 2020). In studio, this is realised through activities such as [making](#) [[147](#)], [prototyping](#) [[158](#)], and [using surfaces](#) [[48](#)], and then activated through [dialogue](#) [[181](#)], [collaboration](#), [learning and design collectively](#) [[166](#)], and [critique](#) [[79](#)] (Callahan, 2020). Beyond specific projects or activities, the materiality of any studio has an impact on the general identity of that studio as [place](#) [[198](#)], whether this is through the [affect](#) [[200](#)] experienced by individuals (Marshalsey, 2023), the material space of studio itself (Corazzo, 2019), or the collective materiality of [social networks](#) [[185](#)] (Leclair, 2022).

Materiality is intimately related to embodiment, artefacts, and experiences

Materiality relies on embodied, sensory interaction with objects and substances. Senses feed back the properties of the surface, object, technique, resource or material each educator or student comes into contact with in studio. Pragmatically, interacting with a material uses our senses to inform us about its mechanical properties, such as how it moves, deforms, or is able to support itself, its hardness, density, thermal properties, and so on (Lederman and Klatzky, 2009; Groth, 2016; Marshalsey, 2023). Knowledge gained in this way is often considered a form of [tacit knowledge](#) [[248](#)], gained, and often communicated, only from interaction with material, informing our understanding of the material world through experience (see [learning](#)

by doing [→145]). How materiality is used in teaching also varies significantly by discipline in terms of how it is emphasised, applied, or approached. How materials and objects are used in product design will have a different significance to how these can be applied conceptually in interaction design. Materiality can also be informed by (and inform) memories, cultures, contexts, and all the things that make people who they are; particularly how people organise themselves using material and objects (Malafouris, 2013; Mallgrave, 2013).

Materiality as a concept offers a lens through which aspects of studio pedagogy can be considered, mediated through physical materials and artefacts [→151]. For example, by some views, the ‘location’ of material knowledge is in the body as embodied knowledge, not separated through the Cartesian mind and body separation (e.g., Malafouris, 2013; Tanaka, 2013; extended and distributed cognition [→38]). Others would argue that the location of knowledge can be found in the artefacts [→151] themselves (Baird, 2002; Cross, 2006; Lawson, 2004a; Charbonneau, 2010), reflected in the simpler model of the intentional and technical properties of artefacts [→151] (Kroes, 2002). Yet other authors present alternative constructions and relations of materiality, for example as: assemblages (e.g., Farías & Wilkie, 2016a, 2016b); processual and relational (Ingold, 2007), or even spheres and atmospheres (Ash, 2016). Any of these broader framings of material and making can offer educators a useful lens to approach studio by offering different ways to approach engaging with materiality in studio.

A final, important framing is the materiality of digital artefacts. As many authors observe, digital and online spaces are also spaces of material and materiality (Jones, 2013; Orr & Shreeve, 2018, p. 94), and the discourse around the physical or digital nature of materiality remains an emerging one (see Pink et al., 2016 for a recent example) that will continue to be informed by experiences from the transition to online education (Jones & Lotz, 2021). One simple framing is to consider the digital as a form of physical representation: for example, a digital surface model can represent physical material in architecture or product design, or an online interface interaction can be presented as a physical analogue, such as a button. A more nuanced lens is the consideration of the materiality of digital artefacts in and of themselves and the *experiential* qualities they possess: for example, the digital qualities (interactive, function, performative, and so on) of an artefact in an online user experience (Jung & Stolterman, 2012).

Materiality supports deliberate idea generation, thinking, and designing in studio

In studio, materiality becomes visible through interaction and activity such as making [→ 147], play [→ 155], working with artefacts [→ 151], and learning by doing [→ 145], all offering the vital connection between ideas and physical objects or symbols. It is this ability to make ideas visible through materiality that is the pedagogical value of materiality in studio (Orr & Shreeve, 2018). Design artefacts [→ 151], arising from such activity, become instruments of thinking (Säljö, 2019) and, in the process of design, this embodiment of thinking is key to some theories of design thinking or cognition, where the material relates to articulation of ideas (see extended and distributed cognition [→ 38]).

For some authors the essence of materiality is a process, ‘a perceptual approach capable of foregrounding the intelligent eye’ (Küchler, 2020, p. 208). For others, it is the pragmatic or physical reality materiality offers the designer that enables the process, or, as the architect Richard Beel summarises: ‘If you reduce something to a singular material it suddenly becomes a lot clearer, its voice is stronger’ (Callahan, 2020). At this level, the materiality becomes part of the design process, as is the case in prototyping [→ 158], where the material knowledge and intention of the design act are interdependent (Lim et al., 2008).

Materiality has a social and cultural dimension, or ‘memory’

Materiality can be given value through the process of design, emerging through the affective [→ 200] encounters between artefacts [→ 151] and bodies, such as the materialisation of creativity [→ 222] in design (Leclair, 2022). This, combined with the public and visible nature of studio (public and private space [→ 54]; making visible [→ 34]), also gives materiality a shared, distributed, or social quality. For example, shared material cultures and intimacies in studio can foster collective memories in social networks [→ 185] and even nostalgia through belonging [→ 189]. Shared memory can be activated through materiality in the form of traces of those who have gone before: a build-up of paint in the sink, pinned art and design work on the walls, drawers filled with letterpress type. Malafouris (2013) describes this as the ontology of material signs and traces, and Fariás and Wilkie (2016b) refer to it as a ‘material intimacy’ gained through close attention to materials in the privacy and immersion [→ 118] of studio, an essential part of the student journey [→ 104] and development of expertise [→ 90].

Materiality, more broadly, can represent historical or cultural knowledge through the use of materials or the inclusion and treatment of them from particular contexts, backgrounds, or cultures. Students’ own sense

of materiality will exist prior to their entry to studio and can be explored meaningfully and plurally as a material practice in studio through, for example, the exploration and dialogue [→ 181] around plural perspectives on artefacts [→ 151] (Bower, 2019). Importantly, the suppression of prior material knowledge from student backgrounds can happen explicitly or implicitly and, in doing so, can remove agency from students as well reduce plurality and inclusion in studio (Jones, 2022).

Learning by Doing

Converging results from diverse fields suggest that a passive organism learns little or nothing. (Dehaene, 2020, p. 178)

Learning by doing is foundational to constructing human experience and knowledge (Reese, 2011). By manipulating, changing, and creating things in the world around us, we actively engage in iterative feedback processes, which are central to most contemporary cognitive learning theories (Dehaene, 2020). Learning by doing is near-ubiquitous in design education research and found in many constructions of core and signature design pedagogies (Broadfoot & Bennett, 2003; Shreeve et al., 2010; Lyon, 2011; Rowland, 2016). In fact, learning by doing is so common in studio that it is often conflated with other related methods and modes of learning, such as making [→ 147], and prototyping [→ 158].

Learning by doing is activity with a purpose

Students *learn* design by *doing* design and through the experience of designing and *being* designers (Lawson & Dorst, 2009; Nelson & Stolterman, 2012). This idea follows directly from historic definitions and purposes of studio as a simulation [→ 232] and site of apprenticeship [→ 64]: a place of practice and learning. For Boling and Schwier (2016), studio is necessarily ‘activity-centric’: students move about studio, socialise, participate in demonstrations, and talk in desk crits and beyond studio. This activity-centric approach continues through site visits and live projects. At the same time, learning by doing acts as a core pedagogy, or, perhaps more accurately, a mode of learning that underpins other learning and teaching activities, such as making [→ 147], prototyping [→ 158], creating artefacts [→ 151], using surfaces [→ 48], and so on. Boling and Schwier even refer to ‘signature *activities*’ (2016,

p. 12), highlighting the importance of learning by doing as a fulcrum for understanding studio pragmatically – regardless of whether it is face-to-face, distance, or online (Cross & Holden, 2020).

Learning by doing involves thinking and reflecting

Behind the activity visible in learning by doing are deeper pedagogic learning intentions, one of which is reflection [→83]. Schön refers to studio as a site for a ‘particular kind of learning by doing’ (Schön, 1984, p. 117), famously relating it to reflection [→83] and, in particular, how our awareness of action (doing) informs changes in that activity. It is the secondary step of *recognising* the value of the experience derived from the activity that is the relevant learning event. As Taneri and Dogan (2021, p. 12) conclude from their study of students’ perceptions of experiential learning:

the learning-by-doing paradigm in the studio, when not accompanied with critical thinking along and after design episodes in the form of reflection-on-action and reflection on reflection-on-action, fosters an impoverished implicit learning environment following the traits of hidden curricula often embodied in design instructors’ behaviours and preferences.

Learning by doing is relevant activity in context

For learning by doing to be successful, the activity in studio must be relevant. For example, in learning about uncertainty and ambiguity [→209] in design, it is often necessary to *become* uncertain – to experience what this feels like and then to develop ways of working with this feeling as a designer. Studio acts as a ‘scaffold’ to support the requisite experiences in ways that encourage students to engage in those experiences. If students can see the benefits of a certain activity in studio, this motivates them to try it themselves. This purposive motivation in an applied context specifically distinguishes learning by doing from other learning spaces in studio, underscoring the importance of simulation [→232], immersion [→118], habits and rituals [→262], and enculturation [→285] – all of which provide a meaningful and relevant context for activity in studio. This relevant activity and engagement are valuable characteristics of studio and ‘[n]one of these activities is designed to teach content explicitly or directly [...] Instructors are setting up circumstances that encourage habits of learning and action’ (Boling & Schwier, 2016, p. 13).

This type of purposive activity is found in online and distance studios, particularly where the sharing of both the process and outputs of activity

Artefacts and Making

occurs in a social space, offering [social comparison](#) [→172] or [listening-in](#) [→170]. In such socially-oriented spaces, students are often highly motivated to engage in studio activity, regardless of mode, when it is sufficiently engaging and relevant to their aims (Jones et al., 2021), and particularly when students can generate their own goals and motivations for active engagement (Lotz et al., 2018, 2019).

Learning by doing takes place over time

Archer (1979) originally proposed the idea that learning by doing is a form of knowledge construction in and of itself. This was extended to studio by Cross (1982), who positioned studio as a unique site for this type of knowledge construction and as a space where meaningful experiences accrued over time [→121]. The value of ongoing activity taking place over time in studio ([immersion](#) [→118]) can be considered a learning outcome itself, and almost all activity in studio has potential as learning material, confirming the constructivist nature of studio (**Theories and Knowledge** [→218]).

The fact that learning activity happens regularly, deliberately, and habitually supports student [immersion](#) [→118] in studio. This ongoing learning, or experience through doing (Pable, 2016), is perhaps the deeper benefit of sustained learning by doing, and that supports other longitudinal development, such as [identity](#) [→94], [character](#) [→101], and [expertise](#) [→90].

Making

Make it real. Make it now.
(Swanson, 2020, p. 103)

Making is the process of creating [artefacts](#) [→151] (physical, digital, or experiential) as part of a creative design process in studio (Swanson, 2020). Making is a purposeful activity and a form of knowledge creation – a form of [learning by doing](#) [→145] – where knowledge is gained from both making and the outcome of making. The things that are produced through making in studio or workshops can vary widely, from mark-making or form-giving, to annotation, to collecting or juxtaposing existing [artefacts](#) [→151]. Making can describe the temporal process of creation, the identity of the one doing the making – ‘the maker’ (Anderson, 2012; Toombs et al., 2014) – or refer to something that has been ‘made,’ whether it is digital, physical, or some

combination of representational forms. Making has been linked to meta-cognitive thinking in both design and design education (Kavousi et al., 2020).

Making is a form of embodied cognitive learning, or learning by doing [→145], and knowledge construction, made possible through material engagement (Seitamaa-Hakkarainen et al., 2014; Groth, 2016). An embodied cognitive approach de-emphasises distinctions between mind and body and assumes both are interdependent in some way (Shapiro, 2014). Such an approach also frames making as equally important in distance and online learning studio spaces (Jones, 2013; Jones, 2017). Whilst the precise nature of this interdependence is still debated (see extended and distributed cognition [→38]), the entanglement between mind, body, making, and the artefacts [→151] people create are referred to frequently in literature, particularly in terms of their entanglement as part of the design process (Aktaş & Mäkelä, 2019). As Groth (2017) summarises, '[m]aking may be seen as a way of negotiating meaning through interaction between the embodied mind and the material environment, thus it may affect intrapersonal growth and provide a useful platform in educational settings' (p. 74).

Making is a physical form of thinking (reflection in action)

Making is purposeful in nature: as we make, we also think, and use this thinking to inform what we do (see learning by doing [→145]). Thinking whilst making is usually framed in design literature as a type of reflexive thinking that occurs automatically or subconsciously (see reflection [→83]). Schön referred to reflexive, materially-oriented thinking as reflection-in-action (Schön, 1987; 1991). For example, the process of incremental change to lines during sketching is often cited as an example of reflection in action, where the regular, small changes made are constantly evaluated and iterated as part of the action itself (Garner, 2008). This type of reflexive thinking is a form of tacit knowledge [→248], meaning it can be overlooked in studio discussions. As Tan and Ong observe, '[f]or experts, such minute variation falls below the threshold of novelty and is merely passed off as repetitive' (Tan & Ong, 2020, p. 230).

Schön famously contrasted reflection-in-action with reflection *after* the activity, which he termed reflection-on-action. This is another type of thinking that can be applied to making, whether to the artefacts produced or to the process of making itself. For example, prototyping [→158] is a type of making associated with deliberate thinking or evaluation as part of a process with a particular goal.

Making is a physical form of knowing and knowledge construction

Two sources of knowledge and knowing [→ 248] arise from the process of making and the artefact [→ 151] produced. First, thinking during making is regularly referred to as a form of knowledge and knowing [→ 248] in the literature, which Ingold (2013) refers to as ‘thinking through making’. In design education literature, this is often associated with learning by doing [→ 145], where the intent, thinking, and reflection around making are critical aspects of the learning mechanism. Second, making leads to artefacts [→ 151]: material and intentional objects (Kroes, 2002) representing idea(s) and thinking as well as material knowledge.

For Orr and Shreeve (2018), it is this making visible [→ 34] of ideas, thinking, and knowledge that is a critical component of studio pedagogy because the artefacts [→ 151] that arise can be used as catalysts for further thinking, knowing, or doing, either between peers through learning and design collectively [→ 166], or between tutor and student, through dialogue [→ 181], crits [→ 79], or feedback [→ 74]. In particular, ‘[t]he thought made visible provides a trace, connections, diversions, and convolutions which are essential for creative thinking [...] Such reification is an important part of the learning process and fundamental to the pedagogic process’ (p. 93).

Making is argued to be a necessary condition for design practices and praxes and central to identity [→ 94] formation (Crismond & Adams, 2012; Hockey, 2003), and the studio plays a critical role as host to these conditions. This focus on the physicality of making does not depend only on physical studios; making is also central to many distance and online studios, often through the use of individual making shared in online or digital spaces (see Jones et al., 2021; Hepburn & Borthwick, 2021; Spruce et al., 2021). Even in traditional studios, making occurs mostly in different spaces, often ancillary to studio, rendering the relationship between the making and studio a slightly different one depending on how these are arranged.

Making can also involve the creation of digital artefacts [→ 151] with their own materiality [→ 142] as digital entities, distinct from any replication or simulation of physical properties (Jung & Stolterman, 2012). In other words, the concept of making or materiality is just as important as the physical act, and what is ‘translated’ from physical to digital is not necessarily obvious and does not just have to be a superficial relationship (Jones, 2013).

Making has a purpose but not necessarily a specific outcome or goal

Making can be intentional; however, it can also be an exploration, trying, practising, or creating activity. Here, the process of making becomes

the design process: ‘Make it real. Make it now,’ emphasises the explorative and emergent (Carter, 2005). Making takes priority, and the thinking and knowledge follow through a student’s embodied engagement in the activity. Hence, making can be a form of design inquiry through play [→155] instead of the predetermined, directed, or specific goal needed for prototyping [→158]. This idea challenges the assumption that the creative act means having an idea that is then imposed on a form. Instead, thinking through making happens in the flow of making with materials and tools, and that flow is how ideas, thinking, and knowledge emerge (Ingold, 2013). Whether making is a form of explorative play or deliberate prototyping, both approaches are important for designing in studio.

Making takes place in different contexts, not only ‘traditional’ studios

Making takes place in many settings, not all of which are considered studios but which can still exhibit studio properties and act as learning spaces (Litts, 2015; Alemán et al., 2022). As one example of environments that focus on making as a practice, makerspaces, hackerspaces, and fab labs are commonly defined by their support for material engagement (Toombs et al., 2014). Over the last decade, there has been a shift towards describing these contexts of making as central spaces for the expression of identities [→94] (Toombs et al., 2014), the development of social capital and access (Alemán et al., 2022), and the diversification of STEM disciplines (Buechley et al., 2008). Such environments do not always include explicit connections to pedagogy, and even in cases where makerspaces include commitments to specific disciplines (e.g., prioritising diversity in computer science, or encouraging innovation and creativity in engineering design), the outcomes anticipated by prioritising making practices tend to be implicit or informal.

Using studios in parallel with workshops is common in some design disciplines. These workshops (e.g., wood shops, fabrication labs, prototyping benches) are key spaces that connect disciplinary needs, design materiality [→142], curricula, and common instructional practices. However, the degree to which these workshops are connected to or integral to a studio can vary significantly. In architecture, workshops used for prototyping [→158] are often separate places of making, whereas fashion design workshops are often co-located with studios. How integral or ancillary places of making are depends on the cultures and norms of a discipline or its teaching. These norms can be usefully explored using the frame of habitus [→265].

Artefacts

It will be argued that they have a dual nature: they are physical objects on the one hand, and intentional objects on the other.

(Kroes, 2002, p. 287)

Studio is filled with artefacts of design, physical, and digital objects that result from design activity: sketches, models, prototypes, precedents, and so on. These objects are used for creation, communication, and thinking in practice domains (Lim et al., 2008), and as catalysts for learning in studio (Orr & Shreeve, 2018). Artefacts are critical in all modes of studio, whether physical or online, and, whilst the materiality [→142] might vary (Jung & Stolterman, 2012), the underlying purpose and value of their use remain the same. How artefacts are used in learning and teaching is often related to how they are created. For example, making [→147], prototyping [→158], and play [→155] (whether physical or digital) all lead to the creation of artefacts – but in different ways and for different purposes.

Artefacts can be objects of disciplinary and experiential knowledge

Artefacts in studio can assist the creation of knowledge as reference objects or through exploration and inquiry. As reference objects, they can be used as examples or precedents in studio because they offer a shared, objective reference point. A specific example is the design precedent, where the artefact is used to communicate some design characteristic, principle, or intent to a current design situation (Oxman, 1990; Oxman & Oxman, 1993), and where the design prototype offers some abstraction of an underlying principle, type, or concept. Using precedents to design, as Oxman summarises, is a ‘dynamic process of adaptation and transformation of the knowledge of prior experiences in order to accommodate them to the contingencies of the present design’ (Oxman, 1990, p. 18).

Artefacts can also be used to support open-ended exploration and learning. In many design disciplines, the embodied and sensory interaction with artefacts remains a key form of knowledge construction. Material libraries, historical reference objects, and technical libraries all offer opportunities for experiential and embodied knowledge to be constructed through students working directly with them. In product design, the experiential knowledge that comes from handling and sensing different materials directly influences design decisions in studio, underscoring why artefacts are

critical to that discipline's pedagogy (Ashby & Johnson, 2013). Similarly, the experience of engaging with digital artefacts, such as building information models in architecture, offers similar affordances, and can even improve the shared interactions of some complex aspects of the design process (Jones & Dewberry, 2013).

Finally, artefacts are used by educators and students to develop taste, judgement [→98], and expertise [→90] (Shreeve et al., 2010; Nottingham, 2017). This can be expressed formally, through assessments or crits [→79], or informally, through organising personal spaces and surfaces [→48] in studio.

Artefacts take a variety of forms and types in studio

Artefacts can be temporary or permanent, digital or physical, informal or formal. This variety reflects the range of object types used for different purposes and at different stages in the design process. The type of artefacts used to support ideas and thinking are often temporary or transient, or have utility at certain points in the process. Or these artefacts may have a more tangential relation to some design goal. Prototypes [→158] or maquettes, are necessarily incomplete artefacts, malleable and imperfect enough to enable or even encourage further change – what Hennion and Farías (2016, p. 79) refer to as ‘intermediary objects ... we can change it without having to break everything’. Conversely, a collection or moodboard (see surfaces [→48]) of artefacts may represent less tangible concepts and help generate ideas, as Vyas et al. (2013, p. 416) summarise:

studio walls and other less permanent vertical surfaces are full of post-it notes, sketches, posters and magazine clips for sharing ideas and inspiration [...] This ecological richness of design studios stimulates creativity in a manner that is useful and relevant to the ongoing design tasks.

In an online setting, the artefact is still a key learning and teaching catalyst similar to physically located studios (Jones, 2013). Digital artefacts are important ways of externalising, communicating, and sharing learning as a form of design output (Thomas et al., 2016; Lotz et al., 2018; Jones et al., 2021), as they are in the physical studios. Framed as learning objects, the materiality [→142] of online artefacts becomes an important consideration, whether this is through the representation of physical artefacts in online spaces (Lim et al., 2008), or the materiality [→142] of digital artefacts considered on their own terms (see Jung & Stolterman, 2012 for a discussion of this).

Artefacts represent and make visible ideas, thinking, and learning

Artefacts represent the ideas and thinking behind the objects themselves (Norman, 2014; Vyas et al., 2013) and this making visible [→34] of ideas and thinking remains central to studio pedagogy, as Shreeve et al. (2010, p. 14) note: ‘[w]hen the work is visible to more than one person and is primarily in a visual medium it is possible to subject the process, and the outcome to scrutiny and evaluation’. Artefacts in studio can catalyse, mediate, and support communication and discussion between people. The desk crit [→79] uses dialogue [→181] around artefacts (sketches, models, prototypes [→158]) to facilitate ‘a kind of exchange’ (Shreeve et al., 2010) through the communication, translation, and negotiation of ideas and knowledge between students and educators (Schön, 1984; Goldschmidt, 2002; Blair, 2007). This is a critical aspect of artefacts in the design process, where the ideas are incomplete or imperfectly formed (Ingold, 2013). By making ideas visible, they change, develop, and can be progressed in ways that would not be possible if they remained hidden; a key part of the creative work studio supports (Hennion & Farías, 2016).

This making visible [→34] through artefacts extends beyond the educator-student relationship to the social, public, and private [→54] spaces of studio, where artefacts often act as catalysts for interaction between peers or groups. The visibility of artefacts is considered a key driver of interaction in studio: because the work is material, tangible, and visible, it invites spontaneous and serendipitous [→212] (Uluoğlu, 2000) conversation as well as design critique [→79].

Finally, artefacts can be used explicitly as objects of feedback [→74] and assessment [→234], where they are assumed to represent student learning or knowledge directly. This takes various forms (desk crits [→79], wall pinups, portfolios, or exhibitions) and in varying modes (physical, online, public, private). But in all cases, having a tangible artefact to act as the object of assessment allows multiple forms of assessment to take place. For example, the drawings and models presented for a final project crit [→79] may result in a summative assessment and formative expert and peer assessment (Brandt et al., 2013; Shreeve et al., 2010).

Artefacts can be viewed as technical and intentional objects

A particularly useful framing of artefacts is that a designed object is both technical and intentional – that is, artefacts are materially and functionally describable (technical), as well as objects that have intent, purpose, or value(s) associated with them (intentional) (Kroes, 2002). Consequently, it is impossible to perfectly isolate a purely functional aspect

of a design without acknowledging its human value or purpose and vice versa. This framing can be useful to support students pedagogically in exploring artefacts from multiple perspectives. Akrich (1992), argues that designers make assumptions about users and the worlds which designed objects will enter to the point that the designed artefact is also a *script* for its use. Taking advantage of this perspective offers a way to explore the intentional aspects of an artefact for learning or even to ‘rescript’ alternative functions (Wilkie & Ward, 2009).

Artefacts can be viewed as boundary objects

Artefacts can be considered boundary objects (Bowker & Star, 1999) that can be used to negotiate and communicate across social, professional, and organisational boundaries (Carlile, 2002). For example, student portfolios are examples of artefacts that help negotiate boundaries between education and practice, novice and expert, or student and professional. In the design studio, different boundaries emerge between individuals through roles (educator-student), identities (cultural groups), responsibilities (expert-novice), and cultures (Di Marco et al., 2012).

Boundary objects used between expert and novice in teaching have two aims. First, they engage ‘knowledge in practice’, a form of tacit knowledge [→248] (Carlile, 2002), allowing expertise to be shared between expert and novice. For example, demonstrating something using an artefact can be far more efficient and effective than talking or writing. Second, and especially critical in an education setting, the artefact can be used to evaluate understanding of designs (Luck, 2007). The artefact can communicate the knowledge it represents, the assumptions behind it, and the processes that led to it.

Play

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)

Play is a foundational method of learning that involves development through acts of exploring and experimenting with the world around us. In doing so, we engage in direct forms of experiential learning (see [learning by doing](#) [[→145](#)]) by interacting with and changing things, informing how we see and understand the world around us. When ‘we play with something, we start to understand it in new ways. Often, we even transform that something into something new’ (Tekinbaş & Zimmerman, 2003, p. 20). Studio acts as a place for students to play and offers the right conditions, opportunities, and catalysts for play to emerge as a central mode of learning.

Play takes different forms for design purposes in studio

Several types of play are frequently incorporated into studio activities (Farivarsadri & Alsaç, 2006; Orr & Shreeve, 2018), and these can have different characteristics, purposes, and outcomes in studio. Lehtonen et al. (2021), building on Sicart (2014), outline seven characteristics of play to describe student behaviours in online studio settings: ‘contextual, carnivalesque, appropriative, disruptive, autotelic, personal, and creative’ (p. 23). The authors note that, whilst these characteristics are not exhaustive, they offer a useful and thought-provoking starting point for educators considering play in their studio.

Looking beyond characteristics and exploring fundamentals of play, Gore (2004) describes telic play, or serious play, which has a declared purpose (see [prototyping](#) [[→158](#)]), and paratelic play, or frivolous play (see [making](#) [[→147](#)]), which ‘permits one to operate in a protected zone of psychological safety, because the stakes are entirely different. In telic play, one might say that the end justifies the means; in paratelic play, the end is the means’ (p. 42). Gore demonstrates how repeated cycles of paratelic and telic play can reinforce one another to open unexpected avenues of design action and exploit discovery in a purposeful way, a process similar to that of [serendipity](#) [[→212](#)]. Lehtonen et al. (2021), building on Sicart (2014), add autotelic play, where the play has its own goals or motivations that direct the activity. This type of play relies more on individual creativity and exploration to maintain the

play and direct its course and, in many studios, is a particularly important form of creative exploration.

Play is a way to engage in risk and failure, exploration, and collaboration

In an educational setting, play is linked to risk and failure through the mechanism of learning from a failure (Nørgård et al., 2017, p. 273). Given that one of the fundamental notions of play involves breaking, or suspending rules (Bateson et al., 2013; París & Hay, 2020), play inherently carries an element of risk (Sicart, 2014; Choi et al., 2019). Studio, then, is a place where it is acceptable to play and take risks to deliberately learn from failure (see [risk and failure \[→ 227\]](#)), and this is often cited as core to studio pedagogy.

In addition to [risk and failure \[→ 227\]](#), París and Hay (2020), outline two further affordances of play worth noting: exploration and collaboration. First, play is a form of exploration because of its directional quality, regardless of the motivation behind the direction (frivolous, purposive, or personally driven). This idea of exploration as ‘play with direction’ is linked to design through creating new ideas (Nørgård et al., 2017) and its utility in design education (Miller, 2014). Second, play can initiate, enable, or be used as a means to support collaboration and social learning in studio ([learning and designing collectively \[→ 166\]](#)), whether the sharing of individual play or the act of shared play itself. Lehtonen et al. (2021), for example, outline the strong similarities between aspects of play and student behaviours in online settings, particularly the social and dynamic aspects that play affords in a virtual design studio. Expanding beyond interpersonal networks, Bennett et al. (2017) found that play is an effective mode of learning about social responsibility, highlighting the importance of play as a constructivist method of learning and exploring the world ([Theories and Knowledge \[→ 218\]](#)).

Play depends on particular conditions offered by studio

Play is not entirely unbounded or uncontrolled activity and depends on certain structures to guide it to allow exploration to occur. This balance between structure and free exploration is critical to successful play, and studio offers a place to create such a ‘free movement within a more rigid structure’ (Tekinbaş & Zimmerman, 2003, p. 311). In particular, studio supports students’ play by offering both structure ([habits and rituals \[→ 262\]](#); [rhythm \[→ 124\]](#); [project cycles \[→ 132\]](#)), and the conditions for free movement (e.g., [no front \[→ 46\]](#); [serendipity \[→ 212\]](#); [informal learning spaces \[→ 42\]](#)). This freedom to try things or to explore within some boundary, starting point, or other framework gives play its pedagogical value in studio.

Play, like creativity, is an example of an activity or state of mind that is easy to disrupt or suppress. Creative play can be readily suppressed (Williams, 2014), which is important to bear in mind when creating the atmosphere of a studio (see [place \[→198\]](#) and [affect \[→200\]](#)). The corollary also exists: asking people to be creative in particular contexts and under certain conditions is often difficult and does not lead to expected levels of creativity. For example, being forced to contribute to a ‘blue sky thinking’ meeting rarely leads to playful creativity (Robertson & Jones, 2014), and this carries a critical lesson for studio educators in that ‘[y]ou can’t design play directly – you only design the circumstances under which it might arise’ (Tekinbaş & Zimmerman, 2003, p. 27).

At a practical level, however, studio offers many ways to support play and creative exploration. The [artefacts \[→151\]](#) and [surfaces \[→48\]](#) in studio invite us to play, as do the circumstances that arise through [informalities \[→204\]](#) and interaction in the informal learning spaces and through [serendipity \[→212\]](#) (Lehtonen, 2021, p. 23). Bostwick-Lorenzo Eiroa & Jones (2014) outline several practical ways in which educators and students can provide ‘opportunity spaces’ for play and creativity to take place. In particular, they argue that it is the unfinished nature of studio that gives ‘permission’ (Bostwick-Lorenzo Eiroa, 2014, p. 230) to users to play: both within and with the space itself.

Play allows learning about intangibles and invisibilities

As we play, we also experiment with the boundaries of the play itself. As noted, play (especially autotelic) can be a self-motivated and personally creative act. This can limit play along certain dimensions because as we play, we also create the boundaries, conditions, or constraints for that play (Paris & Hay, 2020). This is noticeable in the early years of design education, where students often actively seek or bring their own rules to compensate for the uncertainty and ambiguity present in studio (Orr & Shreeve, 2018).

In addition to ‘self-censorship’, play allows us to discover extrinsic conditions, such as what we can and cannot do in a discipline, potentially revealing the [hidden curriculum \[→271\]](#) or aspects of [enculturation, acculturation, and indoctrination \[→285\]](#) in any discipline. As Zimmerman (2002, p. 29) articulates:

When we play a game [...] we are also beholden to these unwritten social and cultural rules [...] Who gets to play? Who has the privilege to join the game or to break the rules? Who is included and who is left out?

Prototyping

What matters is [...] finding the manifestation that in its simplest form filters the qualities designers are interested in, without distorting the understanding of the whole.

(Lim et al., 2008, p. 2)

Prototyping is a way of gaining knowledge through making [→ 147] and evaluating artefacts [→ 151] to progress a design process. Although the boundary between making [→ 147] and prototyping is not fully defined in the literature, certain characteristics can be generalised. Both are purposive activities, but they differ in intention and goals: making [→ 147] can be considered an explorative activity with open-ended aims and short-term intentions; prototyping can be considered as having explicit goals with a well-described intention set out prior to activity. These more focused and intentional aspects of prototyping are what distinguish prototypes, giving them particular value as part of the design process in studio. Specifically, the prototype:

- is a tangible (physical or digital) artefact representing the concept (Beaudouin-Lafon & Mackay, 2003; Lim et al., 2008)
- focuses on aspects, not the whole (Lim et al., 2008; Ulrich & Eppinger, 2012)
- both tests and creates knowledge (Yang, 2005; Berglund & Leifer, 2013)
- creates knowledge that is both contingent and explicit (Lim et al., 2006; 2008)

Prototyping produces a tangible artefact as an expression of a design

A prototype can vary significantly in form, detail (fidelity), operation, and purpose depending on the knowledge required, the design discipline, and the stage of development. This can also mean that the prototype can vary over time to meet the needs of a design process for a particular project or context. One aspect of prototyping often found in literature is detail, or fidelity: the extent to which the prototype is a simulacrum of the final

design output. In early design stages, low-fidelity prototypes (low detail, rough, or sketchy) are often considered more effective simply because they are quicker and easier to produce than detailed ones (Virzi, 1989; Lim et al., 2008). Massing models in architecture, wireframes in HCI, or functional sketches in product design are all examples of low-fidelity prototypes that can help early exploration of a design space, and support the progress of the design process (Lim et al., 2008).

Importantly, Lim et al. (2008) observe that simplistic binary or reductive distinctions (such as low or high fidelity) are not necessarily universally useful. In the early stages, it is often assumed that low detail, sketch prototypes should be preferred over high detail representations. However, there is some evidence that such simplification is not always best in supporting the design process behind prototyping (Lim et al., 2006; McCurdy et al., 2006). This highlights the importance of [judgement \[→98\]](#) and [expertise \[→90\]](#) applied to prototyping as a considered active process, hence the importance of studio in supporting learning around prototyping.

Prototyping focuses on aspects of a design, not the whole

The prototype does not represent the entire or completed design output, and most prototypes have a relatively narrow focus to avoid too many options being evaluated at any one time. This simplification can come from limiting fidelity and detail to simplify the object itself or can be achieved through partial or incomplete [artefact \[→151\]](#) production that allows some particular focus of evaluation. A prototype may only be part of a building to test some idea, or a limited mock-up of some aspect of an online interaction. Yang (2005) identifies the benefit of such limited or focused prototypes in product design, suggesting that those with fewer parts and fewer additions and complications in the design process correlate to better design outcomes.

The idea of simplification, or limiting, is reframed by Lim et al. (2008) as *filtering* and this underpins their fundamental prototyping principle, defining it as a process that ‘filters the qualities in which designers are interested’ (p. 7:4). Prototyping is selective as part of the design process and not an independent act. In other words, prototyping in studio retains the creative and emergent properties of [play \[→155\]](#) and [making \[→147\]](#), but its additional value is the explicit activity around the object that furthers the process or acts as part of the learning and teaching. Hence, prototyping necessarily has some critical, technical, or creative components besides other less well-defined aspects representing the overall design concept.

Prototyping both tests and creates knowledge

Prototyping is a form of making [→147] bearing some evaluative component that is often set out in advance of creating the artefact [→151]. This explicit evaluative component is distinctive to prototyping compared to other forms of making [→147], meaning that it necessarily leads to new knowledge (Berglund & Leifer, 2013). An architectural prototype, for instance, might be created to explore and test how light, shade, and shadowing will be affected by the design concept modelled. In this example there may be some specific evaluation in mind (e.g., what natural sunlight reaches this part of the building?) but may also have general evaluative intentions (e.g., what is the overall quality of light distribution?). In both cases, the evaluation is a necessary outcome of prototyping, requiring deliberate reflection on the outcomes (reflection-on-action).

Prototyping can comprise various methods, media, or modes to construct knowledge, often to suit disciplinary specific purposes. The architectural model example above can be physical (using card and lighting source) or digital (using a building information model and simulated light). The choice of prototyping method and mode is important in terms of what the learning intent might be. Hence, in a studio setting, understanding the distinct roles prototyping can take in learning is important, particularly whether the aim is learning to use prototypes to design, or learning about a design concept (Petrakis et al., 2021). Examples of prototyping used in learning settings, such as those given by Petrakis et al., can be useful in framing a definition of prototyping for students and as an organising principle to try different design methods, such as research or evaluative methods.

Prototyping creates knowledge that is both contingent and explicit

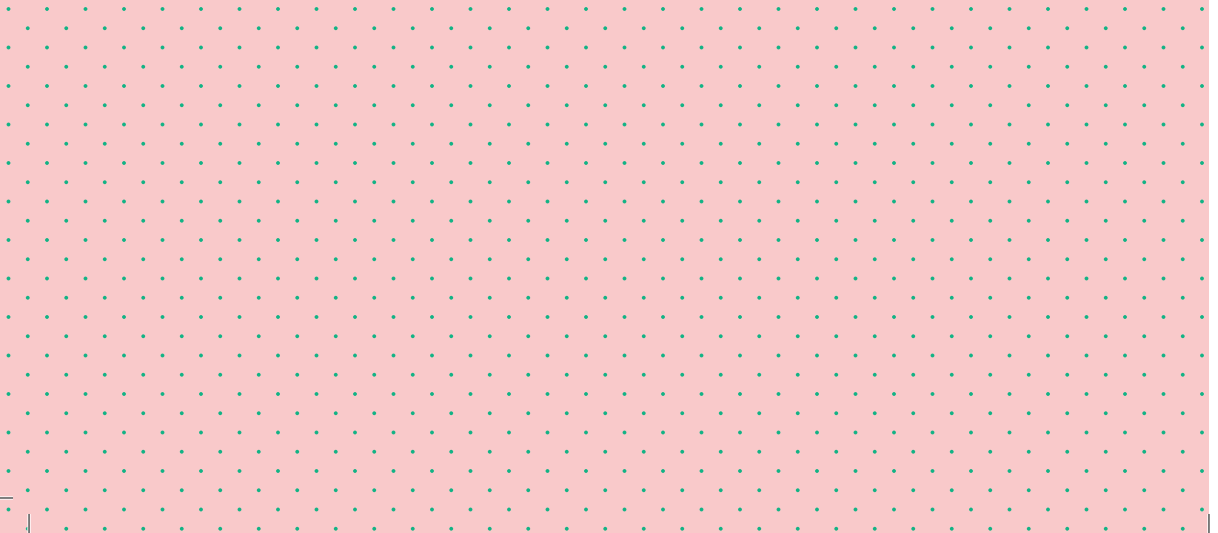
The examples in Petrakis et al. (2021) are helpful in a specific context but, by specifying explicit methods for knowledge construction, can exclude other affordances of prototyping. Lim et al. (2008) identify that a requirements-driven approach can limit the flexibility and openness required in creative design processes, meaning the prototype has an important role to play as an artefact [→151] that permits uncertainty and ambiguity through the activity and interactions that emerge around it (Hennion & Fariás, 2016). In a studio setting, these activities and interactions are visible in dialogue [→181], play [→155], and use of artefacts [→151], or in design crits [→79] and reviews.

In addition to the above, the outcome from prototyping is not only the artefact [→151] but also the knowledge derived from 1) the process of making [→147], 2) the evaluation (or judgement [→98]), and 3) the reflection

Artefacts and Making

[→83] during the process (Elverum & Welo, 2015). This means a prototype is a *boundary object*: an in-progress work or object without a complete or shared definition that has both technical and relational components (see artefact [→151]). This is similar to using the prototype to manifest ideas (Lim et al., 2008) in other studio activities, such as dialogue [→181] during desk crits [→79], where the knowledge from the idea being prototyped as well as the process of knowing are valuable for learning. This highlights the fact that prototypes have intrinsic learning potential that depends not only on individual cognitive activity but also the social interaction in design teams, with the prototype acting as a communication and translation tool in learning and design collectively [→166], not to mention that ‘Socialization occurs around prototypes as a means to build confidence in a project’ (Lauff et al., 2020).

Interactions and Sociality



The premise that innovation and creativity are supported when students connect with each other through social interactions ^{learning and designing collectively} is foundational to studio. What can seem like chaos to the casual observer of studio who sees students milling about, talking in pairs and small groups ^{social networks}, or chatting in hallways (or in online discussion groups) ^{dialogue} is evidence of the way that studio intentionally encourages sociality and interaction. Even a student working alone in studio overhears the one-on-one critique at a nearby table, or is invited to browse the online work-in-progress of peers ^{listening-in} and makes a self-check of their progress, of their design moves, and of their abilities through observing others ^{social comparison}. Developing professional skills like presentation and representation of one's work ^{confidence to speak} depends on elements of sociality and the relationships developed over time in studio ^{belonging}.

A map of the Interactions and Sociality cluster showing possible relationships and connections between properties.



dialogue promotes social comparison and vice versa

Social Comparison

the studio collective encourages social comparison

Learning and Designing Collectively

social networks emerge from studio collectives

Social Networks

social networks develop and strengthen belonging

Belonging

Learning and Designing Collectively

The studio collective experience provides a support network of shared experience and reflection with like-minded individuals engaged in similar activities.

(Hall & Barker, 2010, p. 5)

Studio is a collective, a place where students, educators, and *generations* of cohorts (Hall & Barker, 2010) interact and share knowledge collectively. The collective builds on the achievements of prior generations, which helps to maintain and build identity through enculturation [→285] but also transformation and change. This is underpinned by the core education theory of social constructivism (see general education concepts and theories [→242]). A shared environment and workspaces, shared assignments (assessment [→234]) or tasks (design brief [→67]), and shared materials and objects (materiality [→142]; artefacts [→151]) offer opportunities for interactions and learning. These social, material, and pedagogical dimensions of the collective offer opportunities for collaboration and competition. While viewing studio as a collective can reveal and problematise numerous aspects of student interactions, most literature has addressed these issues through parallel lenses of collaboration, teamwork, and competition. Thus, we address aspects of studio as a collective, and then move to integrate related *co*-practices commonly discussed in the literature.

Studio collectives create opportunities for design interactions

Pollard (2005) suggests coincidence can create opportunities. Simply being together in a collective, comprising students from different year groups and specialisations, increases students' awareness of the surrounding activities and prepares them to act on opportunities to design together. These serendipitous encounters (serendipity [→212]) can be achieved through communication and presence, whether in person or online (Gray & Howard, 2014). Studio encourages students to communicate, engage in dialogue, share information, and develop a shared language (Dong, 2005). Coincidences of interactions range from chance encounters (informalities [→204]) to fully planned encounters anchored in the Foundations and Methods [→60] of studio education, such as engagement in the crit [→79] or work on a shared design brief [→67].

Studio collectives support coordination, collaboration, and competition

The informal or formal coordination of design work in studio may involve collaboration, either through assessed [→234] project work, or in the general investigation or discussion of design norms. Seitamaa-Hakkarainen et al. (2016, p. 159) define collaborative designing as:

a process of actively communicating and working together to identify design constraints, creating and sharing design ideas, deliberately making joint decisions, constructing and modifying developed design solutions, and producing shared design objects, as well as evaluating the outcomes through discourse.

While students may not formally collaborate on a shared design solution, they often coordinate to benefit the collective. For example, students may work individually on design briefs [→67], and as they work alongside one another, they clarify requirements and coordinate and share work. This is especially pronounced when students perceive the collective effort to be more effective than what might be accomplished individually (McLaughlan & Chaterjee, 2020). Examples include conducting collective precedent studies, or exploring material properties through prototyping [→158] in a workshop. Individuals can handle larger and more complex tasks in collectives, using extended and distributed cognition [→38].

The level at which students coordinate or collaborate is often defined by how their work is assessed [→234] (Tucker, 2016, p.xix). A design brief [→67] may ask students to work individually or coordinate in groups. There is a large body of literature on collaboration, highlighting different dimensions of interaction, such as places [→198] of collaboration (Thoring et al., 2018), group size (Kamalipour et al., 2014), the time [→121] collaborators spend together (Okudan & Mohammed, 2007), and the expertise [→90] or identities [→94] (Schadewitz, 2009a; 2009b) each member brings to the group (see **Cultures and Power** [→258]). The literature also explores how these factors impact students' efficiency, creativity, and the quality of the outcomes (Safin et al., 2021). These dimensions contribute to a sense of what students experience as the 'collective' in their studio interactions.

In contrast to the role of collaboration, Shih et al. (2006) studied competition between students in studio learning environments. They assume a studio's purpose is to facilitate information sharing among students. If information is not shared or made public, then competition exists. Their study demonstrates that competition within a group of

students does not promote peer learning; however, competition between groups of students promotes peer learning, provided that cooperation within the group is maintained. Other studies have challenged the competitive studio and the focus on individualised design concepts, arguing this can lead to the marginalisation or exclusion of diverse students (Fathallah, 2021).

Studio collectives enable students to address complex design spaces together

Some researchers believe there are no significant differences between collaborative and individual design processes (e.g., Goldschmidt, 1995). However, others argue that collaborative designing can lead to personal transformations (see [transformative pedagogy \[→ 111\]](#)) that are difficult to achieve when working alone. This transformation may include interpersonal skills, group building, and conflict management (Bosworth, 1994; Safin et al., 2021). Collaborative design learning establishes common ground, and through this brokering process, students learn to deal with breakdowns (Schadewitz, 2009a). Constructive conflict can lead to higher-quality outcomes (Badke-Schaub et al., 2010). Okudan and Mohammed (2007) found that students who spent more time together outside studio demonstrated advanced conflict resolution behaviours. Smooth collaboration can lead to a rapid progression of the design. However, too rapid progress can also lead to design fixation and lower quality outcomes compared to groups who struggle with negotiating collective decisions (Safin et al., 2021).

In addition to personal transformation, scholars claim that collaborative design can lead to more [creativity \[→ 222\]](#) and innovative outcomes, which in turn may transform the collective (Sidawi, 2012; Leonard & Sensiper, 1998). A condition for such transformation is the structure of the collective and how the collective generates and shares knowledge and insights. The group's structure reflects a knowledge structure (see [extended and distributed cognition \[→ 38\]](#)). If a group structures its [knowledge \[→ 248\]](#) through the diversity of views of its members, new and innovative insights can emerge (Hewlett et al., 2013). The same diversity argument is made for including other stakeholders in collaborative designing in studio (Dhadphale & Wicks, 2022). However, diversity of groups has also been shown to lower group cohesion, introducing stress through miscommunications and 'creative abrasion' (Leonard & Sensiper, 1998, p. 118). The origins of misunderstandings and miscommunication may lie in the nature of [tacit knowledge \[→ 248\]](#) distributed in a group (see [extended and distributed cognition \[→ 38\]](#)). Making tacit knowledge more explicit through the externalisation of ideas and communication around physical objects (e.g., [prototyping \[→ 158\]](#); [making](#)

[→147]) supports more inclusive collaborative designing (Crabbe et al., 2022), see learning by doing [→145].

Materials and objects have an impact on collective design practices

The literature on collaborative learning focuses on written or verbal communication, but collaborative design learning brings artefacts [→151], making [→147], and materialities [→142] into the conversation. A lack of tangible or visual objects to act as a focus can make it difficult to anchor discussions in the real world, while too much focus on tangible or visual outputs can limit creative freedom. Crabbe et al. (2022) describe studio as ‘the balance of doing things together and reifying this experience into physical objects’ (p. 7).

Valkenburg and Dorst (1998) detail how participation and reification can influence design collaboration in their study of designers’ reflective practices. They found that the group that produced the best design built it in two days and used the rest of the week to test and improve it iteratively. Meanwhile, the group that produced an inferior design divided the solution into subparts early on, arguing for the importance of each part and not integrating their solution. This contradicts Safin et al.’s (2021) finding that efficient collaboration does not necessarily lead to better designs.

Even if scholars disagree on whether or not high quality collaboration leads to high quality outcomes, research has shown that properties of materials or objects used to support collaborative design work can influence the quality of learning outcomes (Peter, 2015). Peter found sketching seems to produce more ‘frozen ideas’, not altered through discussions unless the designer has a high level of artistic skill: ‘Sketching resulted consistently in more separated collaborative design activity’ (Peter, 2015, p.238). Some physical materials remain more fluid, such as LEGO™, supporting collaboration amongst diverse team members and those with different levels of design skill. McDonnell (2009) reported that three-dimensional artefacts promote tentativeness in design conversions. This uncertainty and ambiguity [→209] that Hennion and Fariás (2016) argue is a necessary condition for studio to exist is also useful to solve group disagreements. The diversity of views and disagreements in collaboration offer opportunities to take risks [→227] within a supportive collective and to grow as a collective.

Listening-in

Lurking, listening-in and legitimate peripheral learning all suggest that informal activities benefit students [and that] explicitly active forms of interaction are not the only means by which learning takes place.

(Jones et al., 2021, p. 856–857)

In studio, listening-in is the act of participating through observing, listening to, and experiencing events that occur, even when not directly involved. This includes listening to, or overhearing, conversations and dialogue [→181] amongst peers (Boling, 2016); observing activities such as crits [→79] and reviews (the ‘apprenticeship of observation’ Shulman, 2005); or simply being present during other studio-based activities and interactions (Cennamo & Brandt, 2012). Rogoff et al. (2003) define such activities as *listening-in*.

Listening-in depends on the contexts, situations, and social settings within which it takes place, and is explored from a spatial perspective in public and private spaces [→54]. Listening-in is closely linked to social learning mechanisms (Jones et al., 2021) and an essential part of the sustained experiences and learning that occurs through immersion [→118] in studio. Being in studio helps to develop the confidence to speak [→176] and can develop a sense of belonging [→189]. Students’ studio presence is a beneficial, even necessary, part of any studio-based design education (Schön, 1987; Cennamo, 2016a; Noel, 2021).

Listening-in is a legitimate and important form of participation in studio, not a passive activity

It is often assumed that students speaking and engaging in conversation in studio are more active than students who are only listening-in to a conversation. The speaking and what is said receive the most attention in studio studies. Nevertheless, listening-in, particularly in a studio setting, involves much more engagement and offers far more benefit than is superficially obvious. Rogoff et al. (2003) refer to listening-in as *intent participation*, emphasising it as an active process of *paying attention* to what is happening. When students engage in listening-in in a shared learning setting, it is a form of cognitive engagement and, given the right conditions, results in learning (Beaudoin, 2002; Dennen, 2008; Schneider et al., 2013). A student attending a project review or crit [→79] and listening-in to the dialogue but not speaking is still actively engaged in the encounter and

learning from the experience. Just as importantly, a successful crit [→79] requires an audience's active participation – that is, the active participant (the presenter) needs an audience to interact with (Cossentino, 2002).

As an educator, it is worth paying attention – or *listening-in* – to the less obvious but still active process of listening-in within studio. In this regard, it is important to note the connection between synchronicity and proximity [→128] and listening-in. In the face-to-face studio it is usual to need to be present at the same time (synchronous) and near others to listen-in; however, online studios have demonstrated that different forms of listening-in can be experienced asynchronously (see time [→121]) and in different ways; for example when reading comments or simply looking at other students' work (Jones et al., 2021).

Opportunities to listen in lead to other forms of participation in studio

In many studios, listening-in is a key mechanism for students to negotiate the uncertainties and complexities of design education (see public and private [→54] for examples). Through listening-in, students can see how other students go about planned and informal activities and interactions and this informs and shapes their expectations and collective norms in studio (Cennamo & Brandt, 2012). Being able to check and negotiate expectations is an important function of studio and listening-in and social comparison [→172] activities are primary ways to achieve this (Ashton & Durling, 2000). Both are involved in: validating progress, evaluating the quality of work in comparison to others, clarifying instruction or feedback, and establishing expected behaviours (Jones et al., 2022b). These examples also highlight the opportunistic and serendipitous [→212] nature of listening-in.

A key learning purpose of listening-in is developing engagement and confidence to speak [→176] over time, particularly to encourage students to move from one mode of engagement to another. Boling (2016) describes a typical studio encounter where students eavesdrop and then contribute directly by asking questions or seeking engagement and feedback, again noting the serendipity [→212] of such encounters. This move from passive to active engagement has also been identified in online studios, where browsing the online studio and listening-in are linked (Jones et al., 2021; Gray, 2021). Listening-in over time supports deeper learning than may be achieved through isolation from the conversations and activities of others. Listening-in supports students to learn and use design language (Oak, 2011; Gray, 2013a), a critical aspect of gaining the confidence to speak [→176] and developing a design identity [→94]. Likewise, it contributes to enculturation,

acculturation, and indoctrination [→285] into a discipline [→238] and professional identity [→94] formation and belonging [→189].

Social Comparison

Self-perceptions of competence and character are frequently filled with heavy doses of bias, misconception, and illusion. [...] In fact, at times, other people assess our competence and prospects better than we do ourselves. (Dunning, 2006, p. 600)

Social comparison is evaluating one's abilities by comparing oneself with others and is considered an essential aspect of human development (Festinger, 1954; Gilbert et al., 1995). Social comparison occurs through simple activities like watching and copying or more complex interactions, such as developing habits [→262] and behaviours in a community or culture (enculturation, acculturation, and indoctrination [→285]). Social comparison theory suggests that individuals automatically self-evaluate in many social settings, and this is considered a significant learning activity in studio (Ashton & Durling, 2000; Jones et al., 2021).

Social comparison depends on visibility and proximity

In studio, students are exposed to a shared environment where the activity and outputs of their peers are made visible [→34]. This making visible can occur formally, as an organised activity (such as the crit [→79]), or informally [→42], as part of ongoing background activity (such as in studio as a place of performance [→107]). In studio, the visibility of student work-in-progress and the outputs offer several listening-in [→170] and comparison opportunities (Lotz et al., 2015). In design education, the emphasis on visibility sets it apart from disciplines where the visibility of work may be tightly controlled. In most studio curricula, students are encouraged to use this visibility to compare their work to others as part of their own learning and motivation. These interactions act as self-evaluation opportunities where students use peers as reference points to evaluate their own abilities and progression. Importantly, these points of social comparison are valuable to students because they are not based on the apprenticeship model and '[t]o have deeper meaning and greater relevance, materials of any kind created by students have to be shared with people other than the instructor'

(Wilson, 2016, p. 125). Social comparison is so important that many authors now argue it is a necessary condition of face-to-face and online studio (Ashton & Durling, 2000; Boling & Schwier, 2016; Jones et al., 2017; Lotz et al., 2015).

Students compare themselves to others in studio using a range of factors

Students will engage in informal comparison around their outputs and artefacts [→ 151] created in studio, and most curricula encourage relatively objective comparison as part of learning. However, social comparison also depends on evaluating personal competencies, values, and self-perception. As Festinger (1954) observed, people will seek out others to compare themselves to without objective criteria and will make comparisons based on a range of subjective factors. It can be helpful for educators to know the factors that students use to compare or help direct them.

Competency and quality levels: Students evaluate their own competency and the quality of their work by comparing it with their peers. A core purpose of social comparison in the design studio is the development of students' disciplinary [→ 238] abilities, conceptual and critical thinking, and practice-based skills through self-evaluation. Students will look at their peers' work and compare it to their own, and, in the process, self-evaluate their ability level (Lotz et al., 2015; 2018; Jones et al., 2021). Ideally, this happens with some insight into how they might develop their own practices. In many design disciplines, however, self-evaluation is not entirely objective, and the development of the students' disciplinary expertise [→ 90] and judgement [→ 98] often go hand-in-hand with the application of their judgement in studio (Ashton & Durling, 2000), a process that can be guided by enculturation, acculturation, and indoctrination [→ 285]. Socially constructed judgement has emerged in studios with large cohorts, where the cohort's collective judgement influences individual judgement (Lloyd & Jones, 2013). In both cases, students are learning about evaluation, feedback, and reflection as it applies to their subject area and how to carry out these activities as part of their learning journey [→ 104]. The tensions inherent in this for students are both important to experience and to acknowledge in any studio, an important part of the inter-subjectivity inherent in design disciplines and education (Gray, 2013b).

Validation and verification: Students will use social comparison to validate and verify what they are doing, particularly when motivated by a need for assurance or confidence around a particular action or response (Jones et al., 2017). This becomes especially important where the uncertainty and ambiguity [→ 209] is intentional. For example, interpreting an open-ended project design brief [→ 67], where students must simultaneously assimilate,

synthesise, and interpret information. In these instances, social comparison encourages learning but, just as importantly, provides practical, psychological, and social support (Ashton & Durling, 2000; Lanig & Kühne, 2019).

Understanding and approaches: Students also compare their understandings of knowledge and practices in studio. For example, when students are introduced to the project design brief, they compare their interpretations with peers and develop a broader understanding of the brief. This sharing is a key learning opportunity in studio and is a form of extended and distributed cognition [→38]. McClean and Hourigan (2013) identify the multiple ways students collectively engage in decoding and understanding instructions, feedback [→74], and interpretations and note that this is more pronounced when students are uncertain of the meaning or intention. Much of this *collective decoding* occurs informally (informalities [→204]; informal learning spaces [→42]), particularly in online social spaces, where educators are not normally present (Schadewitz & Zamenopoulos, 2009).

Design identities: There is some evidence that students engage in social comparison in studio to explore their identities [→94]. Social comparison can drive students' enculturation, acculturation, and indoctrination [→285] into a discipline and is a way for students to learn and try out social and professional norms. In addition, students will also compare across different stages and years of education to examine their developing and future design identities [→94] (McClean & Hourigan, 2013) and develop belonging [→189].

Social comparison depends on appropriate comparison of ability

Comparison plays a similar role to feedback [→74] because it can highlight the gap between actual levels and desired levels (or reference levels) of ability (Ramaprasad, 1983). Both comparison and feedback require appropriate reference levels for effective learning (Gibbs & Simpson, 2005; Sadler, 1989). When students compare themselves to someone they judge to be slightly better or slightly worse than themselves, it tends to be more effective because this enables them to more readily imagine actions that would improve their own (or others') work (Dunning et al., 2018). However, when students compare themselves with peers at significantly different reference levels (much better or much worse), it can lead to unrealistic evaluations. If students are unaware that their evaluations are unrealistic, they face the further problem of being both 'unskilled and unaware' (Kruger & Dunning, 1999; Dunning, 2006). Educators and students have to establish appropriate reference levels in studio. This can happen through dialogue

[→181] between educators or peers, as part of the apprenticeship [→64] (novice/expert) relationship, or listening-in [→170] during a crit [→79]. In each of these activities, the role of social comparison is critical to establishing *reference levels* in relation to peers, mediated by experts (see feedback [→74]).

Social comparison is also motivated by personal factors

It can be useful for studio educators to be aware of the personal motivations and consequences of social comparison, particularly their assumptions about why students compare. In design education, it is often assumed that the student's motivation for *up comparison* (where students seek out peers they consider to be better than themselves) is to improve their work (e.g., Ashton & Durling, 2000). However, *up comparison* has also been associated with lowering self-regard (Wills, 1981). Conversely, students will also make deliberate *down comparisons* to others considered worse or different to validate their personal beliefs, perceptions, or values.

Simplistic *up* or *down comparisons* imply motivations and consequences beyond objective or pedagogical evaluation. Studies outside of design demonstrate the complexity of comparison to other personal and contextual factors, such as personability, value agreement and social standing (e.g., Tesser et al., 1988; Suls et al., 2002). This highlights that educators must take care when making assumptions about social learning in studio. Research that explores how social comparison operates in detail in a design studio setting is limited. Jones, Lotz, and Holden (2021) demonstrate that social learning theories can only be translated into design settings when particular nuance is given to social mechanisms in studio. Assuming that a studio only supports *up comparison*, and ignoring the conditions under which this form of comparison operates and all other forms of comparison, is likely to result in a misleading view. It may even hide the personal effects on individual students' wellbeing [→214] and learning.

Social comparison can be framed in different ways in studio

How educators frame social comparison in studio is important. McClean and Hourigan (2013) frame social comparison along Darwinian principles and as a utilitarian interaction, emphasizing that only the fittest survive. Conversely, Jones et al. (2021) offer a model that emphasises its personal and social benefits for all and is based on automatic social comparison (listening-in [→170]) arising in a large-scale online social studio. Both models identify the emergence of core stable social networks [→185] forming around engaged students, but each starts from different theoretical positions and worldviews.

Confidence to Speak

[S]tudents rehearse the articulation of rationale and reasoning as these are regarded as central to the review process and one's ability to perform well.
(McCLean & Hourigan, 2013, p. 40)

In studio, students learn to speak with confidence about their designs and designing. Confidence-to-speak is a developed ability. Designers are expected to present and justify their projects to clients, and the educational design studio simulates [→232] this practice with educators, peers, and sometimes external partners. As part of their enculturation [→285], studio enables students to listen-in [→170] to the conversations and activities of others (crits [→79]) and witness the kinds of contributions that are expected or desired. Students build confidence to speak by comparing themselves to others through social comparison [→172]. Students' confidence-to-speak is key to expressing and being exposed to diverse perspectives which aids the development of reflective [→83] practices. Increasing confidence also increases active participation in learning in studio (McCLean & Hourigan, 2013).

Confidence to speak is social and situational

In studio, the pace of dialogue [→181] and interaction will vary based on social or cultural expectations. Schadewitz (2009a) identifies face-saving communication techniques in international design education settings which 'manifest themselves in confronting or conforming communication styles' (p. 228). If a student tries to *save face* – or seek not to embarrass others or be embarrassed – they may communicate in a *slow* manner, which means giving additional context and rationale to support their point. *Slow* communication also refers to the preference to formulate a well-developed idea before communicating it to others, while in *fast* communication, ideas are shared as they pop up in their minds (Schadewitz, 2009b). This variation of pace in communication can be an advantage or disadvantage to students, depending on the context. A crit [→79] will often depend on *fast* rather than *slow* communication in response to immediate questions, and these dialogic [→181] assumptions will impact some students more than others. Therefore, it is worth considering as part of the assessment design.

Confidence-to-speak is partly based on the character [→101] and identity [→94] of the designer and partly based on the exposure to expected

norms, habits, and rituals [→ 262] in studio. The latter can give students the confidence to perform other roles outside their normal character or behaviour (performance [→ 107]). In his 2019 study, Hilton presents instances of international students in British universities who perform exceptionally well in their studios. His research challenges the persistent assumptions about national cultural norms and reveals that students can gain confidence to express themselves differently in a studio environment with proper support and scaffolding.

Confidence-to-speak relies on verbal communication skills that are seldom taught. Instead, studio exposes students repeatedly to the need to communicate verbally. Anderson and Shepherd (2006) criticise implicit approaches to teaching communication. They suggest communication can be explicitly taught by bringing acting practices into studio, including breathing and voice, tone and attitude, body language, and presence. Argyris (1981) refers to the tendency of educators and external stakeholders to use sophisticated words in semi-public crits [→ 79] to display conspicuous expertise [→ 90]. This discursive practice intentionally creates mystery around what it takes to master a discipline, potentially leading to students feeling excluded and decreasing their confidence to speak (see also *critical pedagogy* [→ 276]). The power-laden nature of communication has been picked up by Ahrentzen and Anthony (1993) who call such self-esteem crushing and biased practices the *patriarchal studio* (see *power transaction* [→ 282]). They argue for a (gender) inclusive socialisation into studio by building educators' and students' awareness of how they use language and their communication habits.

Confidence to speak is built up through language use

Students' confidence to contribute to conversations may come from shared, lived experiences or backgrounds of their peers, or their growing sense of belonging [→ 189] to studio. Dialogue is ubiquitous in studio, and the focus on verbal feedback [→ 74] teaches students 'to think certain ways and use certain language typical of professional designers' (Dannels, 2005, p. 152). From a *critical pedagogy* [→ 276] perspective, Freire (1970/2000) argued that connecting or co-developing (lived) experience and (professional) expertise [→ 90] through a dialogic [→ 181] learning process can penetrate the complex themes of professional practice. Initially, conversations and contributions in studio build on lived experience more than on professional expertise (see also *knowledge* [→ 248]). The balance shifts as students develop habits and rituals [→ 262] through enculturation, acculturation, and indoctrination [→ 285] into the community of studio practice. Here, students learn the discipline's [→ 238] language, vocabulary, grammar,

and context of use (Gray & Howard, 2014). The more time students spend in studio through immersion [→ 118] in different types of conversations, crits [→ 79], and presentations, the more shared language and confidence to speak is built up. In addition, the informal learning spaces [→ 42] and informalities [→ 204] students use and participate in are essential for practising the *designerly talk* that can then inform their curricular and professional interactions (Gray & Howard, 2014; Corazzo & Gharib, 2021).

Confidence to speak can be taught and learnt

Language can be exclusionary in both the experiential and expert worlds (McClellan et al., 2013). The diverse backgrounds and language used by early design students can impact their confidence to speak, especially when it appears to contrast educators', practitioners', and technicians' use of language and specialist terms. Students can find this intimidating and exclusionary (Argyris, 1981; Willenbrock, 1991; Oh et al., 2013), lowering their confidence to speak. McClellan and Hourigan (2013) observe that various methods are required to build student confidence in communication in studio, including expert intervention and validation as well as informal [→ 42] peer opportunities to engage in practising interaction, discussion, and feedback [→ 74].

To help students gain confidence to speak in studio, it is important for educators to be mindful of the language they use. They should use language appropriate to the skill and experience level of the individual or group. Over time, they can gradually introduce more design vocabulary and help students transform their frames of reference (see transformative pedagogy [→ 111]) (Mezirow, 1997). Here, studio offers diverse opportunities for social comparison [→ 172], and for students to listen-in as a means to build confidence-to-speak over time [→ 121]. A studio educator might praise valuable contributions, possibly rewording these using some technical terms to allow the student to recognise the value they bring, thereby creating an anchor to something they are good at or unique in, which might allow them to have more confidence to speak up (Do & Caballer, 2023).

To support international students' confidence-to-speak, Hilton (2019) advises educators to give students options in how they communicate their ideas. In an online and distance education context, Jones, Lotz, and Holden (2021) make a link between students' listening-in [→ 170] and their confidence-to-speak and comment on others' work. The more students viewed others' work online and were aware of the conversations around these artefacts [→ 151], the more they commented on the work of other students and participated in conversations. In contrast to student-educator conversations, McClellan and Hourigan (2013) stress developing students'

confidence and agency through informal peer conversations, provided they remain unstructured.

Explicit strategies supplement these implicit approaches to building or supporting confidence to speak. For example, studio educators can set ground rules for participation and the tone of a conversation before the actual conversation starts. Educators may present role models and ritualistic conversations for students to emulate (see [habits and rituals \[→262\]](#)). Educators may role play different conversations without needing to take a permanent position (see [performance \[→107\]](#)). Çıkiş and Ek (2010) observed that when students were instructed to use specific design concepts in their [assessments \[→234\]](#) they gained confidence to communicate their design project. The concepts and key terms are guidelines to structure conversations.

Confidence to speak is developed through artefact-centred communication

Talking with visual or physical outputs helps students develop confidence to speak. Roth et al. (1999) reported that in a design studio setting in secondary education, the ‘artefacts had important functions in maintaining and sequencing conversations’ (p. 293). This rhythm of artefact-supported conversations gives students a structure by which to speak. This confidence to speak can also be observed in [desk crits \[→79\]](#), which are often supported by concrete [artefacts \[→151\]](#), such as sketches or [prototypes \[→158\]](#). Roth et al. (1999) found that conversations around artefacts in small group work differed in comparison to when they were discussed in an all-class-crit session. In small groups, they observed a range of personal topics of interest being discussed and technical language and design concepts were mixed in. Artefact-supported conversations allow students to experiment with how to describe to others what they do, how they feel about it (see [affect \[→200\]](#)), and what that may mean (see [knowledge and knowing \[→248\]](#)). This emphasises the points made earlier around [critical pedagogy \[→276\]](#), and co-developing (lived) experience and (professional) expertise through language use on students’ own terms. Having explored what to say about a design in one-on-one or small group settings, the student comes with confidence into an all-class group crit (Gray & Howard, 2014; McDonald & Michela, 2019).

Seitamaa-Hakkarainen et al. (2016) conducted research on group work in three different textile and product design studios and found that students ‘gained confidence in their own ideas and developed abilities to communicate about them’ (p. 167). Oh et al. (2013) noted in their literature review of crits that group crits encourage students to actively participate and speak up as they ‘expose students to multiple solutions to the same

problem' (p. 306). Cennamo and Brandt (2012, p. 852) describe how listening-in [→170], confidence to speak, and supporting others to improve their work encouraged rich conversations in studio:

The students presenting their designs were very receptive to their peers' comments, and likewise, the students seemed very comfortable and free to provide a critique knowing that the presenters, by way of their presentations, were soliciting comments to help move their designs forward.

While certain students may feel confident to express their thoughts about something they have created and are content with, others may speak when they are curious to hear another's interpretation of their work, as demonstrated in the art studio by Svensson and Edström (2011). What students have created [→222] or experienced anchors the conversation into something concrete, touchable, and visible [→34]. An artefact [→151], image, or sketch breaks down the complexity of the whole and makes it approachable and understandable, in order to have a conversation. Hence, the 'design language that is developed is an expression of the design process, that is, it communicates aspects of designing as it unfolds' (Ferreira, 2018, p. 41). Peter (2015) suggested that some prototyping [→158] materials have varying effects on peer interaction, for example, LEGO™ may encourage more conversation between peers while sketching promotes the presentation of ideas.

The confidence-to-speak is not solely dependent on developing artefacts [→151] and the disciplinary [→238] language. It also involves understanding one's strengths and limitations at every stage. Being good at something specific can increase confidence, and being confident in one's skill of making can lead to expertise [→90]. But a humble and confident designer will also have the confidence to speak about what they don't know or what they still need to know (Nichols, 2019), which is something studio educators need to demonstrate, leading by example and by showing their own vulnerabilities or gaps in skills and knowledge.

Dialogue

[D]ialogue and 'exchange' may be ambiguous and ill defined constituting what might also be described as a pedagogy of ambiguity.

(Shreeve et al., 2010, p. 131)

In studio, dialogue occurs between people and people, and between people and artefacts. Studio plays a crucial role in supporting dialogue through various forms of interaction. It enables one-to-one dialogue during an individual crit [→79] and group dialogue in presentations or during brainstorming sessions. When feedback [→74] is sought and given, dialogue can occur between educators and students, among students, or with external partners. It can be formally required as part of a project cycle [→132] or assessment [→234], or can happen informally [→42], meaning dialogue can be planned and serendipitous [→212] (Broadfoot & Bennett, 2003; Shreeve, 2011). Dialogue also takes place in online and distance settings and, in online studios, commonly includes a mix of both verbal and written discussion.

Dialogue makes thinking visible and supports uncertainty

The primary purpose for dialogue in studio is to help students express, share, and make ideas visible, particularly when designing and learning collectively [→166] (Orr & Shreeve, 2018). According to Shreeve (2011), the aim of this dialogue is to make visible [→34] the thought process of each student. This, in turn, enables them to engage in secondary actions: critical thinking (see reflection [→83]), self-evaluation (see social comparison [→172]), and developing the language of their discipline (see confidence to speak [→176]). Importantly, when student thinking is made visible, and accompanied by discussion, it allows for uncertainty and ambiguity [→209], contingency, and creativity [→222]. Shreeve et al. (2010) describe this interaction as *a kind of exchange*, in which the student's experience is the starting point and anchor for a loose – *a kind of* – dialogic engagement with others – *exchange*. This dialogue – or *kind of exchange* – holds the uncertainties and contingencies of design, and is nicely summarised by Khaidzir and Lawson (2013, p. 332), referencing Tulving (1983): 'Its constituents are words and utterances that serve as "focal elements" in describing the collective experiences of things, events and spaces that occur within specific situations.'

Shreeve et al. (2010) argue that dialogue plays a vital role in the *pedagogy of ambiguity* in studio education. Exploring uncertainty helps students to understand its value in design. Pable (2016) develops this

argument and highlights the significance of dialogue in translating concepts to help people ‘get it.’ Pable suggests that dialogue reduces uncertainty and ambiguity [→ 209], but does not necessarily eradicate it entirely. A certain amount of uncertainty is necessary and beneficial in design processes, and introducing students to it is a crucial part of studio’s role. Through dialogue, studio enables different levels of uncertainty to be made visible and explored.

However, what educators consider effective dialogue may not be perceived that way by students. Therefore, artefacts are used in studio to mediate such differences. McClean and Hourigan (2013) identify gaps between the intended purpose and actual effects of dialogue in architecture studios. They observe different *perceptions* of the importance and relevance of dialogue and feedback. For example, students perceived educators’ feedback to be of higher quality, less variable, and more reliable than peer feedback (McClean & Hourigan, 2013). These findings indicate that dialogue is not a purely objective or singular entity, but instead varies depending on studio contexts and opportunities.

Dialogue takes place between expert and novice

In design education, one of the most important forms of studio dialogue is the interaction between the student (novice) and the educator (expert), which usually occurs during the crit [→ 79]. This form of dialogue is central to Schön’s (1984) influential model of professional and studio education, where dialogue between expert and novice is used to reduce the gap in expertise. Schön outlines three key features of dialogue in his model, namely that ‘it takes place in the context of the student’s attempts to design; it makes use of actions as well as words; and it depends on reciprocal reflection-in-action’ (Schön, 1984, p. 101). The *use of actions* referred to by Schön is especially critical in design education. The interactions with sketches, models, prototypes [→ 158] – the artefacts [→ 151] – that accompany verbalisation during a desk crit [→ 79] are essential components in design dialogue (Goldschmidt, 2002; Shreeve et al., 2010; Goldschmidt et al., 2010). Even the gestures around artefacts [→ 151] do vital work to support this form of dialogue (Mewburn, 2012, Peter, 2015).

One fundamental assumption behind Schön’s expert-novice model is that interaction with an expert is always beneficial, and it is important to recognise that this is not always the case. The expert-novice dialogue is not the only kind of dialogue that can benefit students. Indeed, the range of forms, modes, and media of dialogue, emerging in contemporary studios has expanded significantly beyond the expert-novice model.

Dialogue takes place between designer and artefact

In design research, thinking as dialogue is a well-established concept. Ideas like *back talk* (Schön, 1984) and *design talk* (Goldschmidt, 1991) are widely used and both operate around, or with, artefacts [→151]. In *back talk*, the dialogue takes place between an expert and novice with an artefact [→151] serving as a reference point or catalyst. In *design talk*, sketches are used to explore and communicate ideas. In this sense, the dialogue is between designer and artefact [→151] (sketches, contexts, operations, and so on). In both cases, the interaction between people and artefacts creates or enables the type of thinking required to make designerly decisions. The artefact used in such dialogue is an incomplete version of the design (prototype [→158]), and the dialogue acts as a way to make it complete by interacting, thinking, and working with it. This type of dialogue is often seen in studio settings during making [→147] and prototyping [→158], where the *negotiation of meaning* (Groth, 2017) is supported by activities such as dialogue.

Expertise-forming dialogue can take place between peers

Expert-novice dialogue is a crucial part of apprenticeship [→64] in studio. However, there are many more types and modes of discussion between peers and experts, as well as between peers. The crit [→79] encompasses a range of practices that do not solely rely on dialogue between the expert-educator and novice student. According to Dannels (2005), a good crit [→79] involves a broader discussion beyond the dialogue, ‘one where the student is able to present their idea to you in a manner that causes discussion’ (p. 149). In other words, dialogue arising from, or following, a crit is a way to continue the development of an idea, not simply an endpoint in the journey [→104]. In fact, dialogue in studio regularly extends far beyond single events like crits, to become part of developing expertise [→90].

Importantly, studio supports a broad range of critique forms centred around peer dialogue. These can be planned and supported to provide flat hierarchies for peer feedback (e.g., Liow, 2019); promote participation and inclusion in online crits (e.g., Gray, 2021); create authentic blended models with external partners (e.g., Hepburn & Borthwick, 2021); and hybrid opportunities for informal peer interactions (e.g., Tessier & Aubry-Boyer, 2021).

The work that dialogue does in studio is significant in its own right and also serves as a catalyst for other activities. Gray and Howard (2014), have observed the importance of ‘designerly talk’ and language among peers and outside of the formal curriculum (see also confidence to speak [→176]). In Gray and Howard’s (2014) example of the hidden curriculum [→271], students used dialogue in online social media spaces (in their example, Facebook) to extend the formal curriculum to exchange knowledge and

skills, support each other, and develop their [expertise \[→ 90\]](#) and [judgement \[→ 98\]](#). In such semi-formal spaces, whether physical or online, the importance and subtlety of social properties in studio are emerging areas of contemporary research. Joel-Edgar (2007) has identified that individuals with whom students choose to have dialogue influence how seriously their peer critique is taken, indicating a social standing within a peer community.

Dialogue is often more than just talking

Gray and Howard (2014) show that dialogue in online and distributed spaces, such as forums, virtual learning environments, or social media, can be as rich as any other medium. It requires articulation, interpretation, negotiation, empathy, [affect \[→ 200\]](#), and social presence (Kear, 2011; Donelan et al., 2010). This suggests that dialogue is more than verbal exchanges. One useful concept is *dialogue like* methods of interaction (Woodcock, 2017), where the interaction may involve a range of media that, taken together, could be considered a form of extended dialogue (Dearden, 2006). Examples of curricular designs where students use mixed media to tell the story of their design process for educators to assess as part of an extended dialogue in distance learning are given by Jones (2014b) and Jones and Hilton (2022). In these examples, the [artefact \[→ 151\]](#) represents both the process and the outcome, allowing many of the properties of dialogue outlined above to emerge.

The ways in which people talk and interact with each other during design studio sessions are heavily influenced by the broader educational contexts and traditions. These include debate, argument, and rhetoric (see [power transaction \[→ 282\]](#)), and can dictate the forms of dialogue and interaction. This means that certain forms of dialogue, like debate or argument, may be more common than others. For example, the type of dialogue encountered in a lecture theatre will often be quite different to that found in a one-to-one desk crit [\[→ 79\]](#). However, relying solely on these dominant forms of dialogue can exclude other important ways of interacting. This issue was famously brought up by Paulo Freire (1970/2000), whose dialogic approach to education has since been developed (Fernández-Cárdenas, 2014; 2018) and applied in a variety of learning contexts, including design (Ching Chiang & Fernández-Cárdenas, 2020) (see also [critical pedagogy \[→ 276\]](#)). Some studio curricula take these ideas further and challenge the contexts within which interaction and dialogue take place, arguing the need to relocate studios to contexts that rebalance power between designer and user, or student and educator (Lodaya, 2020). O'Brien (2021) gives the example of the country studio, in the context

and culture of indigenous Australian communities, outlining the critical differences that such a physical relocation makes to studio education.

Social Networks

Students also spent the majority of their time with a defined group of peers and it is most often from within this group that they make comparisons. ... Even when students are assigned desks in alphabetical order, they sought a group of peers with whom to compare rather than using those who are their near neighbours.

(Ashton & Durling, 2000, p. 9)

A social network is formed by the interactions and connections among individuals within a group. These connections arise from common interests and shared characteristics, and they facilitate communication and engagement between people. Essentially, a social network is built upon the interpersonal connections that naturally occur among people in any social setting.

Studio is a place of social networks

Studio is a space for interaction and connection based on common interests. As people meet and initiate connections, they give rise to a range of social structures and groups. These can be usefully thought of as networks, with people as nodes and their interactions as the connections between nodes.

Social networks are one of the most important informal structures found in studio (see [informalities \[→204\]](#)). Their importance is reflected in the literature for traditional studios (e.g. Lyon, 2011; Ashton & Durling, 2000; Vowles et al., 2012) and studios in distance and online settings (Lanig & Kühne, 2019; Lotz et al., 2015). Indeed, students identified social networks and connections as key losses during the emergency transition to online and distance methods during the global pandemic in 2019 (Grover & Wright, 2023; Marshalsey & Sclater, 2020).

Social networks have purpose and structure

In studio, connections emerge around a shared purpose, common values, and identities, all of which significantly affects the shape and nature of the networks that form (Ashton & Durling, 2000). These networks are

made visible through regular and ongoing interactions (active learning) and are critical to facilitating dialogue [→181], listening-in [→170], social comparison [→172], and confidence to speak [→176].

Social comparison [→172] is a good example of how the relationship between social interactions and networks operates. Students compare themselves to peers to orient themselves and judge their work and abilities. However, identifying the right person(s) to compare oneself to is vital to social comparison. Critically, the right person is not necessarily defined by objective or disciplinary criteria and can depend more on psycho-social factors (Festinger, 1954; Kruger & Dunning, 1999). Therefore, a student's social network will influence who they compare themselves to, and they may not necessarily use successful students as comparators (Ashton & Durling, 2000). In online studio, Lotz et al. (2019) identified that the qualities students pay attention to can be different to the qualities experts consider valuable. Joel-Edgar (2007) notes that students use trust as a way to establish appraiser networks in studio. Student engagement and interactions with others in a studio environment are often more influenced by social factors and networks in the physical or digital studio than by what educators might expect.

Students can become nodes and create hierarchies in a network

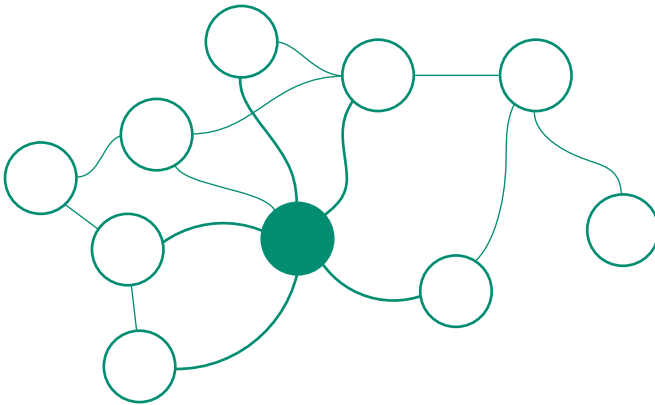


Figure 6: A well-connected node in a network.

In any social network, some people tend to attract more connections (interactions) than others. This is because they are more active and dynamic or valuable to others in that network. In network theory, this is commonly referred to as centrality. In studio, different students will value different things – especially regarding community, identity [→94], and belonging [→189].

Students value peers who serve as a reference point to compare themselves. Social comparison ensures they are ‘doing the right thing’ (Ashton & Durling, 2000) or making judgements [→98] of relative competency or expertise [→90].

Social comparison among students can have unintended consequences such as network reinforcement, where the popularity of a student is amplified because of the visibility of their connections. This is known as amplification in the network. It can be particularly pronounced in online and virtual studios where activities such as likes and follows can be used as functional elements in a social network. For example, a student may receive comments from several peers which can then serve as an activity indicator in the online studio, leading to more students connecting to them and their original networks (Jones et al., 2021). Such mechanisms of social comparison can form status hierarchies in student groups, where high quality work is associated with who is being followed (Ashton & Durling, 2000; Brown, 1988).

Students can become, or choose to be, isolated in a social network (Isolated or vulnerable nodes)

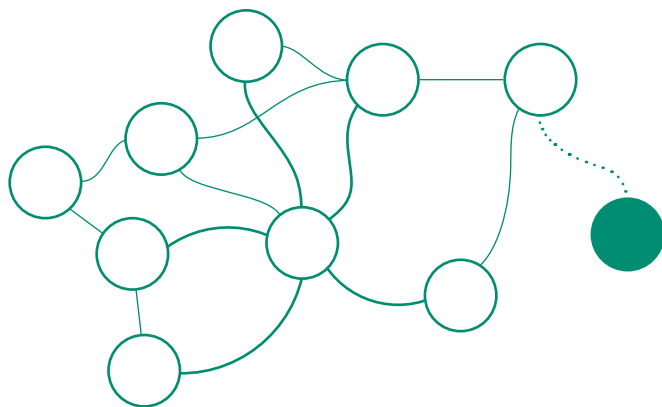


Figure 7: An isolated node in a network.

Just as the popularity of a student is amplified because of the visibility of their connections, the opposite can occur, and students can become isolated from a network or group, which can affect their sense of place, identity, or belonging in a studio. Vowles et al. (2012) suggests isolation can arise when students do not attend studio, resulting in fewer social interactions with peers and educators which decreases student experience and student success. However, this idea is contradicted by the results in several other studies (Ashton & Durling, 2000; Joel-Edgar, 2007; Jones et al., 2017), all of which offer alternative reasons and narratives as

to why students might, or might not, attend studio and the effect this has on their learning. Ashton and Durling (2000) suggest students can still attend studio and be isolated through a lack of interaction brought on by an absence of social skills or motivation to engage. Joel-Edgar's (2007) work identified that students deemed vulnerable – because they were isolated – had equivalent grades to more connected students.

The relationship between isolation and not attending studio is not necessarily unidirectional. Isolation in studio is not just caused by a single factor, such as social class (Burgess & Burgess, 2020) or disability (Boys, 2022). It can occur both inside or outside studio (see [belonging \[→ 189\]](#)), and sometimes isolation is a positive and intentional choice made by some students. However, in other studios non-attendance can lead to failing the course or class. Therefore, it should be considered together with other factors that influence how studio operates, such as [belonging \[→ 189\]](#), and [enculturation, acculturation, and indoctrination \[→ 285\]](#).

Student clusters can create long-lasting social connections (core and stable networks)

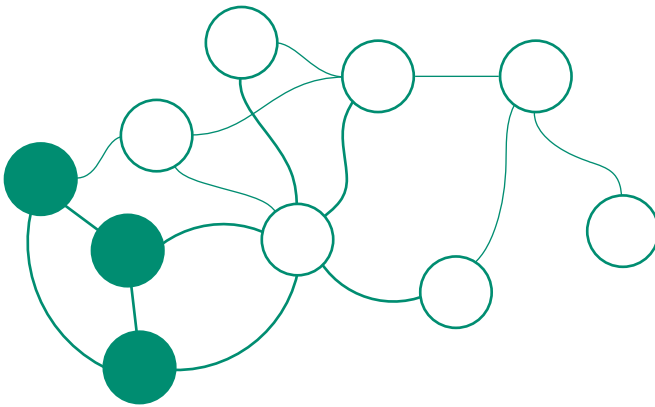


Figure 8: A stable core within a network.

The structure of social networks can evolve over time, impacting studio connections. Specific activities, events, or projects in studio will force operational networks to form. For example, Vowles (2012) observes that students' attendance and the social networks they form will vary depending on the stages of project cycles in a studio. General peer comparison and appraisal networks can remain stable over long periods of time, providing students with stable networks to engage with throughout their learning journey (Joel-Edgar, 2011). These stable networks can act in a similar way

to amplification (popularity of a student or a core cluster is magnified because of the visibility of their connections) but there is some suggestion that, in some online studios, students take great care in selecting and maintaining their networks if they make use of them, particularly over time and as students develop and experience immersion in studio (Jones et al., 2021). For example, students forming strong relationships through social comparison may put significant time into maintaining and consolidating that network to form a core and stable network cluster. Students in a core network are highly connected to one other, and maintain their relations over time.

For all the benefits a student might gain from stable and highly connected networks in studio, there is some evidence that core networks can keep students within a particular domain of creativity [→ 222]. Students limited to a domain of creativity achieve similar outcomes and results but not necessarily of the highest quality (Joel-Edgar, 2007). Clearly, balancing the need for personal challenge, risk, and failure [→ 227], and the comfort of a strong social network in studio is an important consideration.

Belonging

[W]ho belongs and who does not is written in the landscape. As a visual means of communication.
(Antonsich, 2010, p. 650)

Belonging is a sense or feeling of connectedness. The personal and socially constructed sense of belonging is important in studio. While it is internal and personal to an individual, a feeling of belonging is created and maintained by regular social interaction and placemaking. Antonsich (2010) describes belonging in two dimensions: **1**) a personal ‘feeling of being “at home” in a place [→ 198] (place-belongingness)’ (p. 644), which is enacted and maintained in everyday practices (Fenster, 2005), as well as **2**) a social construct of formal belonging to a collective (community), as a form of membership. Belonging includes *be-ing* as well as *long-ing* (Probyn, 1996).

Belonging is personal and can be linked to identity

The personal dimension of belonging is often described as a place-belonging (Antonsich, 2010). Studio, like the home, becomes a place of familiarity, comfort, security, and emotional attachment (hooks, 2009,

p. 213) (see also [place](#) [[→198](#)]). Students may feel a sense of belonging by simply stepping into studio, moving to a desk, or passing familiar surfaces (see also [affect](#) [[→200](#)]). The role of personal space in studio place-belong is further discussed in [public and private spaces](#) [[→54](#)].

In tandem with place-belonging, everyday practices (explored elsewhere as [rhythms](#) [[→124](#)]; [habits and rituals](#) [[→262](#)]) strengthen the feeling of personal belonging in studio. This is because individuals express their views (Klandermans & van Stekelenburg, 2022) and personality (Pollini, 2005) in everyday practices. By moving from your desk to a peer's desk or a workshop, and by engaging in [making](#) [[→147](#)], [performance](#) [[→107](#)], and [dialogue](#) [[→181](#)], the feelings of belonging to a place and processes of journeying (see also [journey](#) [[→104](#)]) and identity are mutually implicated (Antonsich, 2010). Hence, belonging in studio can be considered along similar lines with studio as [place](#) [[→198](#)] and studio as a place of [identities](#) [[→94](#)]. Yuval-Davis (2010) frames identities as 'narratives, stories that people tell themselves and others about who they are, and who they are not, as well as who and how they would like to/should be' (p. 266). This points to the social as well as the physical dimension of belonging to studio.

Belonging in studio is a form of social attachment

Pollini (2005) describes the dimensions of *interdependence of human involvement*, which is basically a series of increasing levels of attachment. In studio, individuals are situated within a [place](#) [[→198](#)] and carry out everyday life which creates an interdependence or symbiosis between them (Mead, 1934; Park, 1952) (see also [Visibilities and Proximities](#) [[→30](#)]). Individuals form attachment to this ecological or geographic community. In studio, everyday practices, like [habits and rituals](#) [[→262](#)], [play](#) [[→155](#)], or [making](#) [[→147](#)] create these opportunities for interaction and symbiosis and attachment.

Social belonging is constructed when an individual assumes roles and is included in the [social networks](#) [[→185](#)] and community of studio. This individual could be a student who is always alongside certain others at their desk in studio or at the bench in the workshop. The attachment to a community is organised in patterns of shared meanings, e.g. memberships of clubs or associations, which can transcend place. A design student who leaves their desk in studio is still a design student and continues to experience feelings of belonging even when they are not physically in studio. When these patterns of meaning are maintained through loyalty and solidarity, an 'immutable we-feeling' (Foster, 2013, p. 25) is created, which is rooted in studio but also transcends it.

Social membership or social belonging does not exclude the possibility of disagreement. This differs from the dimension of cultural conformity in

Pollini's (2005) view, when individuals share value systems and build attitudes of 'consensus' (p. 498). In studio this is also expressed through enculturation, acculturation, and indoctrination [→ 285].

Sense of belonging in studio is constructed

According to Antonsich (2010), five factors contribute to creating a personal and social sense of belonging: 1) history and memory, 2) relationships and social ties, 3) culture and habits, 4) economic and professional, and 5) legal and formal. All are relevant to belonging in studio.

History and memory: The opinions, foresight, narratives, and experiences of others in studio help students to decide on whether this is for them, and whether they belong here (Broadhead, 2018). Surfaces make the history of studio visible. In different studios, different time frames of history can be gleaned from surfaces. An end-of-year exhibition is temporary and offers a glimpse into recent history. At the same time, many design school foyers show exhibits and the library carries catalogues from the school's alumni for many years. Online studios' surfaces include temporary new or social media feeds of recent history and online exhibition websites or catalogues that are accessible for years. The materialities of studio play a role in preserving its memory and history. Austerlitz et al. (2008, p. 139) suggest that these tactile, visual, and spatial qualities of studio create a sort of knowledge and knowing [→ 248] that is more 'illusive to those outside our community' and hence strengthens belonging within the community.

Relationships and social ties: The connections students make in studio, especially in the beginning, forming friendships and supportive pastoral relationships with peers and educators, help them adjust to a studio learning environment (Orr et al., 2014). Many social networks [→ 185] are formed in studio (Joel-Edgar, 2007). To create a social belonging, relations must be 'long-lasting, positive, stable, and significant', filled with 'care' (Antonsich, 2010, p. 647). Arvola and Artman (2008) talk of camaraderie in studio as an example of strong relations. Joel-Edgar (2007; 2011) discusses how interpersonal relations form networks that support social comparison and appraisal.

Culture and habits: Students develop a sense of belonging and an association with a group beyond interpersonal relationships. This includes the group's sense of place [→ 198] (studio workshop), artefacts [→ 151] (models, exhibits, curricula), and norms or ideologies (Hagerty et al., 1992). These structures create coherence in studio and a feeling of belonging. Interactions between studio environments and people facilitate new habits and rituals [→ 262]. For example, a design language or oral rituals [→ 262] are developed

and adopted by cohorts in a studio. This may also include a style of clothing and other symbolic markers of belonging.

Economic and professional: Studio enables students to perform a designer's role, or aspects of the role, in professional practice. This simulation [→232] constructs a wider sense of belonging to a discipline or profession. Sometimes, students are paid for design project work which links it to the economic aspects of belonging. Antonsich (2010) explains that 'economic embeddedness matters not only from a material perspective, but also in relation to make a person feel that s/he has a stake in the future of the place' (p. 648). This 'stake in the future' is an important part of forming identities in studio, particularly in terms of disciplinary, professional, or design community alignment (see discipline [→238]).

Legal and formal: Individuals assume a legitimate role as students when they enrol at a university. This additional identity, whilst easily overlooked, is one of many identities [→94] that overlap in studio. Treating design students as *students* instead of *designers* can have an important function in studio, particularly where there is a need to separate these roles explicitly. For example, where a mode of education may be unfamiliar, such as online or distance learning, inducting students into being distance students creates a distinct and formal sense of belonging (McClellan et al., 2013; Cho & Shen, 2013). Once enrolled, students also have a legal right to belong to an institution and have access to the same spaces and facilities as their peers. Most obviously, this includes the right, which can be enforced by national laws or institutional equality policies, not to be excluded from studio based on their characteristics, such as physical (Boys, 2010, 2022) or mental health disability (Lotz & Sippel, 2024), ethnicity and race (Brown, 2020; Thomas et al., 2021, Berry et al., 2022), or gender (Datta, 2007; Cheryan et al., 2009). Students experiencing physical, emotional, social, or cultural exclusion from studio are unlikely to have a sense of belonging.

To matter and to belong in studio are different concepts

Studio may evoke a greater or lesser sense of belonging among students. Asher and Weeks (2013, p. 287) differentiate two aspects of belonging. The first is a sense of valued involvement which they define as 'the feeling of being valued, needed, and accepted in the system or environment'. By giving valuable feedback [→74] to others, a student may feel valued, needed, and accepted in a studio; however, they may not share all characteristics with a group. This might lead them to feel they don't fit in.

The second is a sense of fit, defined as 'the person's perception that their characteristics are shared with or complementary to those present in the system or environment' (Asher & Weeks, 2013, p. 287). By using the

language of a studio or wearing the same clothes, a student may feel a sense of fit, but experience that their involvement is not valued.

To matter 'is the feeling of being significant and important to other people' (Flett et al., 2019, p. 667). Mattering is different from belonging and occurs through an individual's interpretations of others' behaviours towards them. Therefore, the former student matters, but does not belong. The latter student belongs but does not matter.

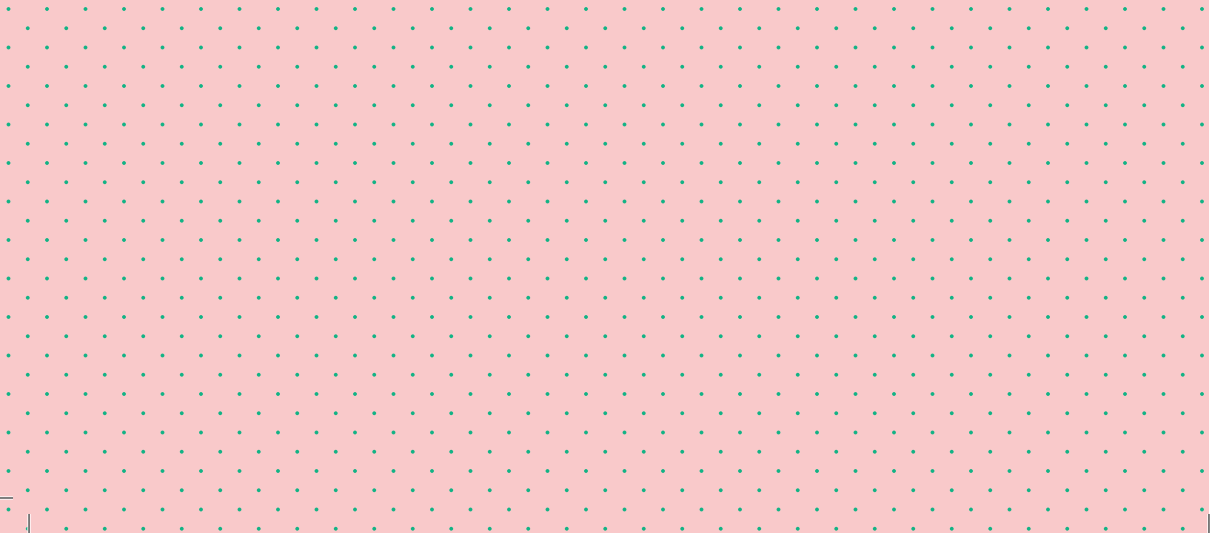
Essential components of mattering include receiving and giving attention, and being respected. One matters if one is treated as an individual and one's opinion and contributions count. This is a two-way relationship; one gives others the same importance as one receives, being supported by and supporting others. For example, appreciation is shown by recognising one's contributions and positive feedback through [crits \[→ 79\]](#).

Belonging can have inclusive or exclusive effects in studio

Positive enculturation [\[→ 285\]](#) in studio allows the learners to ask: *Do I belong here? Could I belong?* and *Is this the kind of designer I want to be?* (Broadhead, 2015; Burgess & Burgess, 2020; Martin, 1995). In answering the first question, belonging is explored through the interplay of historical, social, cultural, professional, and formal elements that inform whether or not we feel we belong somewhere or not. This then influences the latter questions, where the student actively imagines or experiments with belonging, linking belonging to performativity (Antonsich, 2010). Bell (1999) goes further, arguing 'belonging is the effect of performance' (p.3) and that studio acts as a place of [performance \[→ 107\]](#), a place for being, becoming, and longing to belong.

Constructing and performing belonging carries a risk of exclusion through marginalisation or isolation of individuals from a group or groups in studio. Yuval-Davis (2010), a prominent identity researcher, writes '[b]elonging assumes boundaries of belonging and is thus exclusive as well as inclusive' (p. 266). Therefore, it is important to consider the relationship between belonging and [power transaction \[→ 282\]](#) in studio, particularly in terms of what educators and the institution deem *normal* or *acceptable* identity (Boys, 2022). Boys observes that studio's multi-sensory environment provides significant opportunities to those excluded in other learning spaces and fosters more opportunities to develop a feeling of belonging in studio. To foster belonging, educators could consider peer mentoring opportunities between entry-level students and those at higher levels (Zamberlan & Wilson, 2015). It's also crucial to consider students' and staff's [wellbeing \[→ 214\]](#) to increase belonging in studio.

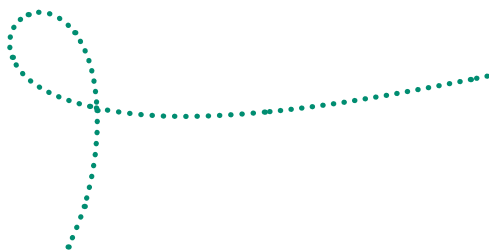
Atmospheres and Place



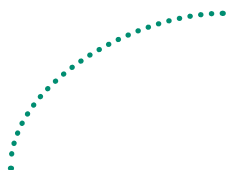
The physical or digital space devoted to studio is more than a container for activities. Students and educators imbue studio spaces with personal and emotional identities **affect**, making them more than the sum of their physical parts **place**. An educator setting up, maintaining and moving around a studio space recognises that here students will be asked to engage in difficult, personal, and transformative learning experiences **uncertainty and ambiguity**. Such learning experiences require that students feel relatively safe in studio, with their physical and mental needs accounted for **wellbeing**. Making studio into a place instead of simply a space also involves recognising and supporting the range of interactions and events that happen between the formal structures of learning and the informal experiences of students and educators **informalities**. Making room, physically and structurally, for happenstance is also intentional in studio **serendipity** and is possible by virtue of this placemaking.

A map of the Atmosphere and Place cluster showing possible relationships and connections between properties.

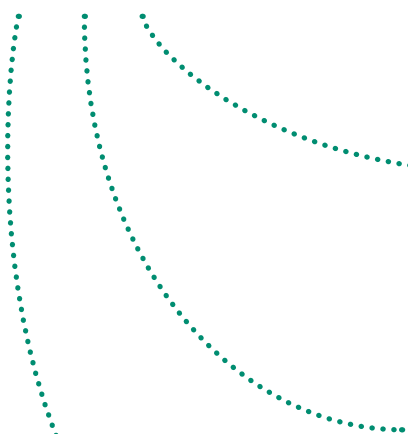
Uncertainty and Ambiguity



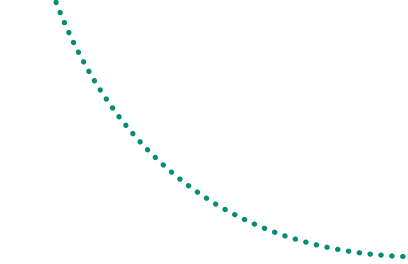
studio is a place for challenge



benefits from



is supported by and enables



can impact on wellbeing

Place

studio is a place of affect, because
of the intentions it houses

Affect

place is created, and helps
create, informalities in studio

Informalities

informalities support
serendipity and wellbeing

Serendipity

Wellbeing

Place

[S]tudio space should be understood not as geometric containers in which action takes place, but instead as a series of co-existent spheres and atmospheres that shape the possibilities for action of those who work in studio settings.

(Ash, 2016, p. 91)

Viewing studio as simply a physical or technical space (i.e., *studio as container*) fails to explain fully its complexity and value as a site of creative production (Wilkie & Michael, 2016). Thinking of studio as space distinct from the interactions and experiences of people who inhabit it offers a limited view of studio, and most contemporary theorists argue that one cannot exist without the other – body and environment shape and develop each other (Ingold, 2002; Malnar & Vodvarka, 2004; Mewburn, 2012; Marshalsey, 2017).

Studio can be seen as more than the sum of its functional parts, as reflected in the concept of *place*, created through the interaction between people, space, and norms (Leurs et al., 2013; Gray, 2013b). The concept of place is complex and contested. A simplified use is presented here because of its utility in studio education: place emerges from the value people perceive in and imbue into the environments they interact with (Clark & Maher, 2001). This outline definition offers a lens through which to consider or analyse studio.

Place depends on interaction, connection, immersion, and belonging

Placeways (1998) author E. V. Walter argues that people experience a sense of *place* in their daily interactions within *space* (Malnar & Vodvarka, 2004, p. 60), pointing out that that interaction with *space* is a necessary condition for *place*. Over time such interaction leads to a personal and emotional connection between people and space (Aravot & Neuman, 2010). The strongest sense of place experience is what Relph (2008, p. 55) terms ‘existential insideness’, a situation of deep, unselfconscious immersion [→118], similar to what most people experience when they are at home or in familiar places.

The idea of familiarity and home is linked to belonging [→189] and the complexities and subtleties that one invokes in the other (Antonsich, 2010). Familiarity comes from being in a place or inhabiting it, and Nottingham (2017, p. 47) links the idea of habitation to its pedagogical purpose in studio:

Non-Representational Theory suggests that the kind of graphic designer an individual student becomes is not just the consequence of the teachers, ideas and the tools he or she learns to manipulate; it is also an effect of inhabiting a particular world (Thrift, 2007) of design school.

This sense of place can be extended to studios of very different modes. For example, the single practitioner can feel at *home* in a personal studio space (Fariás, 2016), just as a student in a large online social media studio may feel at *home* in a particular, connected online space (Jones, 2013; Jones & Lloyd, 2013; Northcote, 2008). In both cases, it is the conceptualisation of studio that matters just as much as its physical or technical properties, offering the potential for the creators of studio places to consider far more than function alone.

Place is made by participants in studio

The simplified view of place as comprising space, interaction, and value allows educators to consider how it can be used to inform learning and student experience. For example, Leurs et al. (2013) outline how ownership of a studio environment can enhance the learning experience through added meaning, value, and functions that facilitate commitment and team spirit. In other words, place can be treated as an entity. Terminology such as a sense of place, attachment to place, placelessness, place-based, and placemaking offer ways in which the idea of place can be put to use in studio (Walter, 1998; Relph, 2008; Aravot & Neuman, 2010).

Pragmatically, Leurs et al. (2013) further outline how students make use of space to create place in studio directly through acts of placemaking, such as through the use of artefacts [→151], surfaces [→48], and habits and rituals [→262]. These types of student-created and owned elements of studio become affective, creative, and/or memory-laden, and can allow students to project their ownership of a particular *space within a space*, also supporting the creation of identities [→94] in studio (Vyas et al., 2013). Such acts of making place are also acts of *making sense* of other aspects of studio, such as discourse, interaction, and interpretation, all important pedagogical norms that are *negotiated* in studio (Gray, 2013a). In terms of learning and teaching, placemaking is a two-way process, where the reciprocal nature of place-making and sense-making offer learning opportunities as well as establishing belonging [→189] in studio (Marshalsey, 2017).

Place is not universal or homogenous and can change over time

Studio as place is necessarily subjective, based on individual interactions and experiences (Malnar & Vodvarka, 2004), meaning individuals can vary in their sense of belonging (see the potential for pluralism when viewing studio through the lens of *habitus* [→265]). Concepts of *belonging* [→189] are often directly linked to the levels of interaction and engagement required to create place. For example, some students may cultivate a sense of place belonging through acts of placemaking or even territorial behaviours (Modell & Gray, 2011), whilst others may feel alienated from *belonging* [→189], and hence not contribute to placemaking (see *public and private* [→54]).

It should not be assumed that a single, homogeneous or monolithic sense of *place* will emerge in a given studio, just as there may not be a single feeling of *belonging* [→189]. Students may create multiple places of learning in and out of the *official* studio defined by the curriculum (*informal learning spaces* [→42]; *informalities* [→204]), offering important opportunities to introduce and share different worldviews (Jones, 2022a), not least through the overlap of physical and online places (Budge, 2013; Castro, 2019). And, of course, studio is necessarily a place of *personal* change through a learning journey [→104]. The obvious visual progression of design practice marks this change as characters are formed, *habits and rituals* [→262] are displayed, and studio becomes a place of *identities* [→94] (Boys, 2010, p. 95), reinforcing the original idea that place depends on people.

Affect

Studio is often emotional, in both painful and pleasurable ways
(Boling & Schwier, 2016, p. 7)

Studio is a place of affect: a place where moods, feelings, emotions, and attitudes emerge from participants' individual and collective subjective experiences. Aspects of affect can arise from an individual's activities (such as engaging in *risk and failure* [→227]) and through social interactions and relationships where personal and creative transformation is an emotional process. They can also emerge through a sense of *belonging* [→189] or the collective atmosphere of a (digital or physical) studio. Pedagogically, these patterns of affect can have a direct and significant influence on learning (Tyng et al., 2017), *creativity* [→222], *wellbeing* [→214], motivation, and engagement (Marshalsey, 2017).

Emotions can have a significant impact on learning

The relationships between affect and learning are well documented; for example, the impact that feelings and emotional states have on memory, rote learning, and cognitive functions, including perception, attention, learning, memory, reasoning, and/or problem-solving (Immordino-Yang, 2015). Studio is a space where all of these examples of immediate feelings and emotions are relevant but it is also a place where these take place repeatedly and over time. Such extended feelings are referred to as emotions or moods in literature (Tyng et al., 2017), and studio is a place where both immediate in-the-moment feelings and longer-term moods operate and influence learning (Marshalsey, 2017).

Feelings, emotions, and moods can be expressed along a positive-negative spectrum (valence), as well as a spectrum of boredom-excitement (arousal) (Tyng et al., 2017). Emotions and moods such as happiness, dissatisfaction, elation, or confusion are likely familiar to educators and students (Austerlitz, 2007; Austerlitz et al., 2002; Orr & Shreeve, 2018). Over time, these can influence personal dispositions towards learning, which has been shown to manifest in students' learning trajectory, intensity, and persistence, ultimately affecting goals and learning commitment (Christenson et al., 2012; Marshalsey, 2017).

The dispositions students develop, partly through responding to feelings over time [→121], can contribute, in turn, to developing expertise [→90] and character [→101] (Nottingham, 2017; Grocott et al., 2019). Grocott et al. observed a learning activity in which an educator and their students reflected on and encouraged feedback on their teaching practices, modelling vulnerability to students. The authors further observe how the attitudes students develop through risk-taking informed their emerging design identities and competencies. This example explores a positive, longer-term outcome but it should be noted that sustained *negative* affect can lead to behaviours that reduce engagement in positive learning experiences (Depraz et al., 2003).

The relations between educators and students can be emotionally saturated

Studio is inherently affective because it involves relationships between people. One of the central relationships is between educator and student, a relationship that has been described as *emotionally saturated* (Austerlitz et al., 2002). Historically, this relationship has been based on an expert-novice relationship of apprenticeship [→64]. In contemporary design education, the educator-student relationship is slightly more complex and the educator's role is fluid; they can act as a coach, mentor, friend, and ultimately judge

and assessor (Orr & Shreeve, 2018). The fluid status of the educator-student relationship can create an ambiguity [→209] difficult for students to negotiate. It is further complicated by evaluations and judgements (feedback [→74]; crit [→79]) being made by educators about students' personal interests and their creative processes and outcomes – an area of potentially profound vulnerability and exposure. All of this suggests an *intimacy* in the educator-tutor relationship arising from the hours educators and students spend sitting together (immersion [→118]) and the nature of sharing ideas in the 'common effort to maximise the educational process' (Austerlitz et al., 2002, p. 107). This intimacy is heightened further when a creative process requires students – or educators – to reveal aspects of themselves (Grocott et al., 2019).

Austerlitz et al. (2002) highlight the tendency for a studio to induce unexpected or unanticipated events, which are significant triggers for emotional responses. For example, a student may receive negative feedback on an aspect of their work they had considered to be good – an unexpected event (see feedback [→74]). The practical intention to inform a student of changes they could make in their work, regardless of intent, can come with heightened and unintended affect, precisely because the feedback is unexpected.

Austerlitz et al. (2002) argue further that the emotion of experiences can impact a student's self-image or confidence, potentially influencing their beliefs about their *academic future*. Despite this, the role of feelings and emotions is rarely considered explicitly in curriculum design (Austerlitz, 2007) and, in many cases, is actively suppressed in the discussion (Sagan, 2008), as captured powerfully by bell hooks:

When as professors we care deeply about our subject matter, when we profess to love what we teach and the process of teaching, that declaration of emotional connection tends to be viewed favorably by administrators and colleagues. When we talk about loving our students, these same voices usually talk about exercising caution. They warn us about the dangers of getting 'too' close. Emotional connections tend to be suspect in a world where the mind is valued above all else, where the idea that one should be and can be objective is paramount.
(hooks, 2003, p. 127)

Personal and creative transformation is an emotional process

Studio is a place of transformative pedagogy [→ 111] where students are often expected to engage in changing themselves. At the very least, they are expected to enter challenging states of mind, such as engaging with uncertainty and ambiguity [→ 209] or dealing with risk and failure [→ 227]. A necessary discomfort accompanies the effort ‘to tolerate the fog and its uncertainty’ of the design process (Orr & Shreeve, 2018, p. 65), and this tolerance is something to be learned through experience as part of a studio education.

The expectation of transformation can have consequences, yet the affective impacts that are known to influence student motivation and engagement are often missing in discussions of studio pedagogy (Powers, 2017). When such expectations remain unaddressed or unacknowledged, they can become part of the hidden curriculum [→ 271] and students must deal with the affective aspects of studio in isolation or without support. Austerlitz (2007) summarises this succinctly: ‘Emotional phenomena such as admiring the tutor, stressful sleepless nights and student breakdown are accepted as “part of the game” and have long become part of designer’s education folklore’ (p. 166).

Several contemporary educators now recognise the need to directly support the affective aspects of this type of learning for students (Boling, 2016; Cennamo, 2016a; Tracey, 2016). Orr and Shreeve (2018) make it clear that this is a tension that cannot just be *cleared up* and argue that it is the job of the educator to take on the challenge of managing the necessary tensions in studio, ensuring a transformative learning experience whilst maintaining student-centric pedagogies, including attention to affect.

The feelings and moods that emerge at particular points in time are both individually felt and collectively shared

Personal affective states rarely exist in isolation or without a context, and studio offers a context that is simultaneously social, cultural, and physical. The feelings and moods that emerge at particular points in time, for example, at the end of a project (the culmination of a project cycle [→ 132]), are both individually felt and collectively shared. They are also visible, meaning they are shared, perhaps scrutinised, in situations like the crit [→ 79]. Such states are familiar to many students: ‘As soon as it becomes “deadline” it absolutely goes crazy... But in a good way because of the stuff being made – of things created. But it does get a bit overwhelming’ (Design student, UK, 2017 cited in Marshalsey, 2023, p. 177).

Importantly, these intensities of affect are dynamic in studio; they vary not only through project cycles [→ 132] but also through time [→ 121] and

with the number of people in a studio. For example, the affective qualities of studio can vary from relaxing or exciting to unpleasant or gloomy when populations grow or disperse (Steg & de Groot, 2019). Social and cultural forms of shared affect also emerge in studio as atmosphere, mood, or even personality of a studio, whether in a physical setting (Joel-Edgar, 2007; Ashton & Durling, 2000), or in online spaces (Spruce et al., 2021).

Concepts such as *atmosphere* are difficult to describe analytically (Borch, 2010) but have been theorised in design terms (Sloterdijk, 2011), and applied to studio (see Ash, 2016; Khalili, 2023). Most authors and design educators use such terms heuristically as common references to how individuals and groups respond emotionally to studio as a place [→ 198]. It could be argued that the manipulation of shared affect and atmosphere is easier to do than to discuss (Nottingham 2017). Importantly, it is how this affective response informs the learning experience that ultimately matters most in studio.

Informalities

[S]tudios are organised to foster informal discussion among students. In an open studio space, students naturally monitor each other's progress, comment informally on each other's work, compare design approaches or learn certain skills such as drawing and modelling.

(Oh et al., 2013, p. 308)

Informal learning is most often defined by its antonym – formal learning, which has four defining characteristics: a curriculum, a teacher, an assessment, and an association with an institution (Hager & Halliday, 2006). This property uses *informal learning*, or informalities, in two quite specific ways. The first is to signify learning on the periphery of formal learning, suggesting it has a fluid quality, flowing between formal learning events and those that obviously have nothing to do with learning. Secondly, we draw from the dictionary definition of *informally*, meaning ‘unofficially; without formality, ceremony, in a casual or relaxed manner’ (Oxford English Dictionary, 2023); and applied here to describe the character and tenor of encounters in studio. Some educators intentionally cultivate a relaxed, friendly, and unofficial atmosphere in studio-based learning and, through a series of intentional interpersonal and material affordances, educators

create the conditions for managing uncertainty and ambiguity [→209], and pursuing creativity [→222].

Informalities support learning on the periphery of formal learning

All learning contexts are composed of formal and informal learning (Malcolm et al., 2003), whether formal learning is defined as the ‘explicit and implicit curriculum enacted through traditional educational structures’ (Gray, 2013b, p. 199), or the kinds of informal learning that happen in, around, and outside of traditional educational structures. Rather than discriminating between formal and informal learning, we may productively declare the boundaries of formal and informal learning as fuzzy ones that ‘slip-slide into each other’ (Bennett, 2010, p. 4). For example, the serendipity [→212] of a chance corridor encounter between student and educator (informal) can lead to a conversation which impacts how a project unfolds (formal learning); informal learning has coalesced into formal learning. The opposite is also possible; for instance, when design students extend the formal learning of the crit [→79] into informal peer discussions after class in order to test, clarify and question things, they are collaboratively making sense of formal learning (Gray, 2013b). In this way, informalities can contribute to the formal learning environment even though they are absent from the formal curriculum and often beyond the purview of educators (Gray & Howard, 2015).

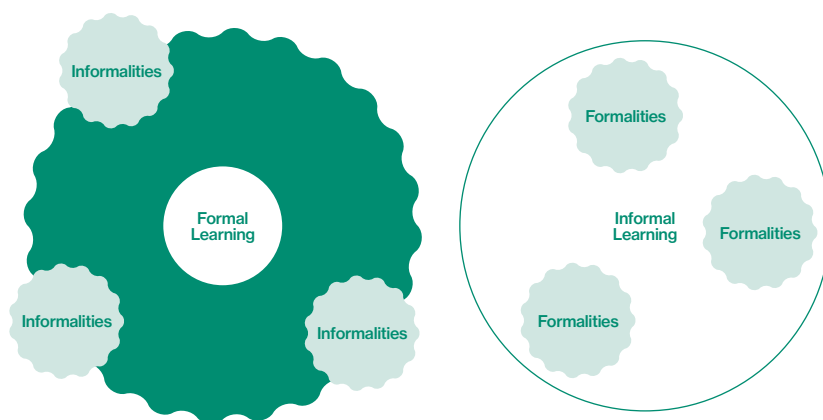


Figure 9: All learning contexts are composed of informalities in formal learning and formalities in informal learning.

Building on Gray’s (2013a) work, Corazzo and Gharib (2021) identify four activities that students engaged in on the periphery of formal learning

and predominantly amongst themselves within physical studio settings: socialising, comparing work (social comparison [→172]), measuring progress (listening-in [→170]), and performing or trying out designerly identities [→94] in low-stakes ways. These day-to-day interactions – often friendly and informal – appear integral to learning on a collective and individual basis (Marshalsey, 2017). It is worth noting that Corazzo and Gharib (2021) found these peer-focused informal activities were largely absent in a distance version of a studio. In contrast, Jones et al. (2021) found they did exist in online settings but in different, often hidden, forms. Common to both studies is the identification of the complexity of informal interactions, their importance, and how integral they are to studio.

In studio, educators should also pay attention to the balance between informal and formal learning and how formal and informal flow or *slip-slide* into each other. This can be seen by considering certain types of studio properties, such as: serendipity [→212] (offering chance encounters that move from informal to formal), studio having no front [→46] (the ability to create formal or informal layouts in studio), and social networks [→185] (which may begin formally but shift over time to informal relationships).

Informalities differ from the hidden curriculum in their origins and intent. The hidden curriculum [→271] may be informal and tacit, but it is still primarily created by the educator, institution, or discipline. Informalities, however, are largely emergent, created by students or co-created with educators. In this regard, informalities are closer to what Gray (2013b) calls *negotiated* as opposed to hidden curricula. Informalities offer a potentially important way to make the hidden curriculum [→271] visible and perhaps offer a space where it can be critiqued.

Informalities can intentionally cultivate a relaxed and friendly atmosphere

The atmosphere was relaxed, with students conversing casually as they worked, and the presence of low-volume background music of their own choice added to the informality.

(Logan, 2006, p. 334)

Studio often consists of different types of space that afford a range of functions (Thoring et al., 2018) and offer different levels of public and private [→54] spaces. These spaces support learning but are also areas to relax in, sometimes with sofas and kitchen areas (see informal learning spaces [→42] and wellbeing [→214]). Ensuring studio spaces are physically comfortable

helps to form a sense of place [→ 198] and can encourage students to immerse [→ 118] themselves in the affect [→ 200] of studio over prolonged periods. Immersion is central to developing design competence; through it, students consciously and unconsciously gain *new habits of thought and action* (Schön, 1987).

One of the primary functions of studio and informal learning spaces [→ 42] is to engender a *kind of exchange* between studio inhabitants (Shreeve et al., 2010), through the extended presence of people and their interactions. The nature of many formal and informal conversations in studio contrasts to what might be expected elsewhere in higher education where *transmission models* of learning might be found. Design education relies on tacit, experiential, and constructed forms of knowledge and knowing [→ 248], as opposed to explicit forms. In creative education, the educator's role is not to impart knowledge but to ensure 'the answer is brought about from within' the student (Orr et al., 2014, p. 38).

Studio encourages students to work creatively in a shared space with other students (see learning and designing collectively [→ 166]) and in this way, studio fosters informal learning and peer support. Whether it is students asking peers to look at their work when they are lacking direction or uncertain of their next step (Arvola & Artman, 2008), or seeing the work of others, which in turn encourages critical reflection on their work (see social comparison [→ 172]), these informal interactions appear critical in moving ideas forward and developing design competence (Cennamo & Brandt, 2012; Brandt et al., 2013). Analysis of crits [→ 79] in the design studio by Oh et al. (2013) emphasise the importance of students forming close learning groups through informal interaction. These types of informal connections emerge from spending long hours together in studio (Cuff, 1991; Schön, 1985) and moving forward in their projects requires a continuous oscillation between moments of individual concentrated work and moments of discussion with peers (Arvola & Artman, 2008).

Informal interactions in and around studio often appear unplanned or spontaneous; they are not articulated as part of the formal curriculum, but they are intentional (see active teaching [→ 71] for examples). The *looseness* of such interactions is essential because specific moments of time for creative breakthroughs or serendipitous [→ 212] conversations cannot be allocated in advance. The uncertainty of a design process requires what Maccoby (2000) calls *heterarchic communication*, in which conversations are required to engage a range of people and to happen frequently at random (or unplanned) points. Studio is a place that encourages this type of communication, and informality plays a role in creating these conditions.

Informal learning, as described above, also appears to require good social networks [→185]. Students who are unable to develop these networks may be missing out on informal learning (Ashton & Durling, 2000; Jones et al., 2021). In physical studios, informal learning favours presence (Logan, 2006; Ashton & Durling, 2000, Corazzo & Gharib, 2021) and the confidence to speak [→176]. Unless informality is carefully considered, the desire to reduce hierarchy and cultivate relaxed atmospheres may actually exclude some students.

Informalities require us to be attentive to power

Informalities contribute to and shape the learning environment in ongoing and relational ways. They are vital for studio learning and the co-construction of design knowledge (see general education theories and concepts [→242]). However, there remains a challenging balance to strike when it comes to power in studio (Gray, 2013b; Corazzo & Gharib, 2021). All learning situations involve power (Malcolm et al., 2003) and studio is a place of power transactions [→282]. An overemphasis on informalities in studio can result in only informal channels through which to challenge power transactions [→282], meaning power imbalances can remain opaque or hidden because they are unformulated (Malik, 2011). Caution is required to avoid thinking that informal learning is more emancipatory than formal learning simply because it sits beyond the formal curriculum or appears to flatten hierarchies. Informalities do not remove power even if they are introduced to reduce hierarchy or to imbue the situation with low levels of authoritarianism (Dineen & Collins, 2005). For example, studio has no front [→46] in order to redistribute a particular hierarchy (that of singular knowledge). In doing so, however, it does not remove *all* hierarchies, and it remains important to understand this critical distinction.

Uncertainty and Ambiguity

Engaging with these open ended tasks forces students to deal with ambiguity and uncertainty and [...] experienced artists and designers expect this and even embrace ambiguity since they know that this incubation phase of 'not knowing what to do' is often the origin of innovative ideas.

(Austerlitz et al., 2008, p. 144)

Design is nondeterministic, rarely proceeding in a predictable way from problem to solution. In fact, most design problems are sufficiently complex that they cannot be solved in any perfect or real sense, an idea described by Rittel and Webber (1973) and updated subsequently by Goel (1995), Lawson (2004b), Austerlitz et al. (2008), and Protzen and Harris (2010). It is impossible to know in advance what the outcome of a design process will be, meaning the process itself has to allow uncertainty and ambiguity. One of the primary roles of studio is to act as a space to locate uncertainty and ambiguity. Designers need studios 'because things are open, they are not given' (Hennion & Farías, 2016, p. 74), and studio is a place [→ 198] to 'hold things open,' as reflected in design curricula (Orr & Shreeve, 2018), and the literature (Hennion & Farías, 2016).

Uncertainty and ambiguity are separate concepts, and sometimes treated differently in curricula. Uncertainty may be presented as a quality of a *project*, its context, or the client, where the unknown nature of the outcome is mediated by the design process itself (Smith, 2016). Similarly, ambiguity may be approached as part of a designerly *process*, such as the act of sketching in order to hold *multiple realities* in hand before finalising a concept (Goel, 1995; Garner, 2008).

Uncertainty and ambiguity are a necessary part of design education

Two strands of uncertainty and ambiguity are required in design education. First is the uncertainty and ambiguity of outcome, which is obviously present in any creative design practice and considered necessary as part of the education of a designer in a studio setting (Broadfoot & Bennett, 2003; Shreeve et al., 2010; Sawyer, 2017). Second is the uncertainty of the process required to ensure uncertainty and ambiguity of outcome. Schön (1987, p. 6) referred to 'intermediate zones of practice' as necessary to address

the limitations of purely technical rationality when professionals encounter a new situation.

The dual uncertainty of outcome and process is often difficult for students who may be used to comparatively prescribed or determined outcomes in prior educational experiences. Boling sums it up as ‘Students follow a pattern that goes, roughly, panic, ruminate, plan, stumble, recover, plan, do, revise, do, revise, do’ (Boling, 2016, p. 94), hinting at the experiential nature of the process. It is important to understand that uncertainty and ambiguity are more than disciplinary or curricular requirements; they are personal and affective [→200] experiences for students, with each student responding in different ways to the challenge of addressing them. Educators have to consider, therefore, how such experiences are scaffolded in studio as part of developing expertise [→90] and maintaining wellbeing [→214].

Teaching uncertainty and ambiguity can be challenging

Uncertainty and ambiguity in design education present a non-trivial problem which can be considered usefully from both a purely pedagogical point of view as well as a disciplinary one (Shulman, 2005). Pedagogically, a rough consensus emerges in literature around the importance of students experiencing uncertainty and ambiguity in order to learn about it (a form of learning by doing [→145]). Studio functions as a somewhat authentic simulation [→232], meaning students have to be uncertain by entering into ambiguous thinking and states of mind. As Orr and Shreeve (2018, p.65) argue:

there is a tension between creativity and clarity and ... we need to come to an accommodation of the latter to allow for the former. We need to live with the stickiness and discomfort of not knowing all the answers, but to support students’ learning, we also need to establish clear frameworks and structures. These dilemmas cannot be ‘cleared up’. We need to tolerate the fog and its uncertainty ... embrace uncertainty.

Of course, this can be challenging for students, and the very nature of the experience can affect student motivation and engagement (Powers, 2017), which leads some authors to identify the need to develop student confidence in approaching uncertainty and ambiguity (Boling, 2016; Cennamo, 2016a). Taking this further, Tracey (2016) argues for actively targeting students who require additional support in developing such confidence and asks us as designer-educators to remember the affective [→200] and *felt quality* of uncertainty and ambiguity for novices.

A disciplinary approach to uncertainty and ambiguity is also in play. Most design disciplines have their own processes, methods, and tools for dealing with the inherent uncertainties in that discipline or of the general design process. Exposing students to these is often part of enculturation [→285], of developing habitus [→265], and of the simulation [→232] that takes place in studio. For example, Salama (2017) describes project phasing, staging and planning as used in architecture to guide activity, while Kharrufa and Gray (2020) discuss the use of creative design methods like productive failure in HCI design.

These examples highlight the *scaffolding* and support role that studio plays in educating for uncertainty and ambiguity. Studio is a site where students are exposed to uncertainty and ambiguity in relatively safe simulation [→232], such as through dialogue [→181], play [→155], making [→147], and other activities. Whilst there is literature around supporting students' introductions to uncertainty and ambiguity, particularly how this relates to other prior educational experiences, there is far less research on how students develop tolerance and expertise in these areas. There is perhaps a general acknowledgement that students acquire tolerance and expertise through time [→121] and immersion [→118] in studio, but further research is required to understand how this operates pedagogically.

Serendipity

In the elusive role of serendipity and the field of observation, chance favours only the prepared mind.
(Pasteur in Woods, 2014, p. 176)

Serendipity is an unexpected encounter that leads to a useful outcome or new idea. In knowledge scholarship it is formalised as abduction (Foster & Ellis, 2014) and, of particular relevance to design knowledge, *creative abduction*, where an unexpected event leads to the creation of a new idea or new thinking (van AnDEL, 1994).

In practical terms, serendipity arises from the myriad chance interactions, discoveries, observations, encounters, discussions, and connections that routinely take place in studio, prompting a designer to have a new idea or act somehow in response. Serendipitous interactions are considered critical to creative activity in the design studio (Crowther, 2013), and the nature of the serendipitous encounter itself is assumed to be a learning opportunity (active teaching [→ 71]) for both practitioner and student alike (Goldschmidt, 2015).

Serendipity is more than chance

In all definitions of serendipity, both the chance component and some action or response are required. In other words, it is insufficient to simply observe a surprising encounter without acting on it in some way, whether physically or cognitively. The famous example often given is Alexander Flemming and the discovery of penicillin, where a chance observation was followed by action to inquire into the why of what happened. Whilst this is debatable as an example of *pure* serendipity, the ability to act on, or take advantage of, chance observations and encounters is a key design capacity, succinctly summarised by Redström (2020, p. 84) who describes ‘design as an act of making things possible, and therefore as the opposite of taking things for granted’.

Serendipity requires preparedness

Young (2003) refers to the importance of preparing the creative mind to be ready for ideas to emerge. This idea of preparedness is reflected in the broader design literature (Florida, 2014), and Woods (2014) specifically argues that serendipity requires both preparation and insight to make new connections. Goldschmidt (2015) also refers to the *prepared eye* of the

designer as a mechanism for taking advantage of stimuli to support creative idea generation.

Such views of serendipity suggest that preparedness can be deliberately developed, whether by immersion [→ 118] in a subject area or particular studio (Woods, 2014), seeking different materials to enable varied cognitive engagement (extended and distributed cognition [→ 38]) (Jones, 2014a), or collecting artefacts [→ 151] to act as creative stimuli in studio (Goldschmidt, 2015). Each of these is an act of preparation with the intention of leading to some later undefined, unknowable outcome. These outcomes can be more than ideas or new thoughts; they can be new relationships, seeing and trying new techniques, expanding references, and collecting precedents.

Serendipity depends on chance but can be intentional or planned

Van AnDEL argues that designing intentionally for something based on chance can seem contradictory (Woods, 2014) – you depend on chance, but you cannot deliberately plan for it. However, the event of practical value is the designerly act of combining a random event with action and insight to make new connections. This is the active and intentional component to serendipity that can be influenced, supported, and even directed in learning (see informalities [→ 204]).

The physical spaces studio supports, such as the studio couch, water cooler (MacVean, 2014), and other informal settlements (Bostwick-Lorenzo Eiroa & Jones, 2014), offer immediate opportunities for serendipitous encounters and activity. It is these types of unplanned but deliberate (or semi-structured) preparations for serendipity that tend to be found in the design studio (Florida, 2014), notably in its informal learning spaces [→ 42].

Makri et al. (2014, p. 18) identify that serendipity can be a deliberate part of online practice in digital spaces. They note that instead of focusing on serendipitous events themselves, it is important to adopt and support strategies that can increase the likelihood of serendipitous encounters, analogous to the spatial opportunism of the physical studio. In addition, the social comparison [→ 172] observed by Jones et al. (2021) in virtual studios is, at its most basic, a serendipitous encounter.

Finally, serendipity can be a cognitive encounter. Amacker (2019, p. 1841) argues that surrendering to experience of designerly activity can be serendipitous in that it leads to creative thinking, or an ‘imaginative sensing of possibilities’. Serendipity is thus framed as an intentional, or even deliberate, state that designers enter into in order to support their thinking. In studio this is often presented as part of the whole package of *being in*, or immersion [→ 118] in, studio.

Serendipity in studio depends upon educators and structures that encourage and set the conditions for it to emerge, not necessarily making it happen in any predictable or deterministic way. The uncertainty and ambiguity [→209] this brings to studio is a deliberate outcome of such preparation.

Wellbeing

[L]ooking after the health of the organs and systems our design thinking relies on seems like it should be just as important as taking care of any other tool [...] talking about, and taking seriously, topics such as cognitive stamina, mental health, embodied and affective states, should be something we do in any design curriculum.

(Jones, 2022c, p. 15)

For many students, studio is a place of safety, belonging [→189], and nurturing. Here, students have an opportunity to build and be supported by social networks [→185] with their peers. The transition to emergency online teaching during the Covid-19 pandemic showed that many students suddenly missed those conditions, reporting a consequential demise in mental and physical wellbeing and highlighting support systems previously taken for granted (Grover & Wright, 2023; Marshalsey & Sclater, 2020). For some students, however, studio is not always a nurturing environment that contributes positively to wellbeing. A culture of working long hours is integral to the experience of some studios, but can be detrimental to wellbeing, and in extreme cases even fatal (AIAS, 2002). The habitus [→265] of studio can establish unhealthy working practices that persist throughout the working lives of graduates. Troiani writes: ‘the architectural design studio emerges as a critical site of analysis because of the way it consumes and demands of its labour force, affecting wellbeing...’ (Troiani, 2021, p. 13).

Studio influences mental wellbeing

Stress is a major factor that may impact students in studio, as Gomez-Lanier (2018) notes: ‘the perceived levels of student stress progressively increased and shifted during the research, exploration, refinement, and finalisation design phases of project solution’ (p. 46). Stress is often associated with high-stakes assignments – like design projects – that develop a ‘heightening consciousness and anxiety of failure’ (Jones, Priestley, et al., 2021,

p. 441). The creative process (creativity [→222]) makes use of uncertainties or unknowns (see uncertainty and ambiguity [→209]) to progress design projects, but as Glăveanu (2022) argues, if we don't know for too long, anxieties emerge, and students feel more vulnerable and uncertain (affect [→200]).

In such situations, students may feel themselves becoming *stuck*. In her study of two design studios, Sachs (1999) explored design students' feelings of *stuckness*. They define *stuckness* as 'the culmination of an involuntary, unintentional process that begins with a breakdown in the student's capacity to respond to the studio requirements' (p. 209). Students were found to behave in particular ways, each of them affecting mental wellbeing: coming to a standstill, procrastinating, or becoming fixated on the problem.

Practically, educators can design curricular activity in ways that support mental wellbeing. Christian (2019), for example, found value in developing reflection [→83] with mindfulness and contemplative practices amongst interior design students, observing this helped students reduce stress, reflect on their work more critically, and empathise better with stakeholders in the design process.

Studio as a place [→198] can also support positive mental wellbeing and develop resilience in students. Campus closures during the COVID-19 pandemic prompted many students of studio disciplines to conceptualise and articulate the negative changes they perceived in their mental health and wellbeing as in Grover and Wright's (2020) survey of architecture students. They identified a sense among students that by not being in the studio in person, they were, in some way, missing out on a set of implicit and explicit frameworks that provided for their mental wellbeing. Students in online and distance design studios can follow different rhythms [→124] and can also rely much more on local social networks [→185] (such as family and friends) to construct their studio at home (Lotz & Sippel, 2024). In other words, there can be important differences in synchronicities and proximities [→128] between students in traditional studio spaces and those in online and distance settings (Jones, 2022a). Regardless of mode (online or proximate), mental wellbeing is supported by formal and informal (see informalities [→204]) interactions with staff and students, formal activities in the curriculum or informal activities organised by students themselves.

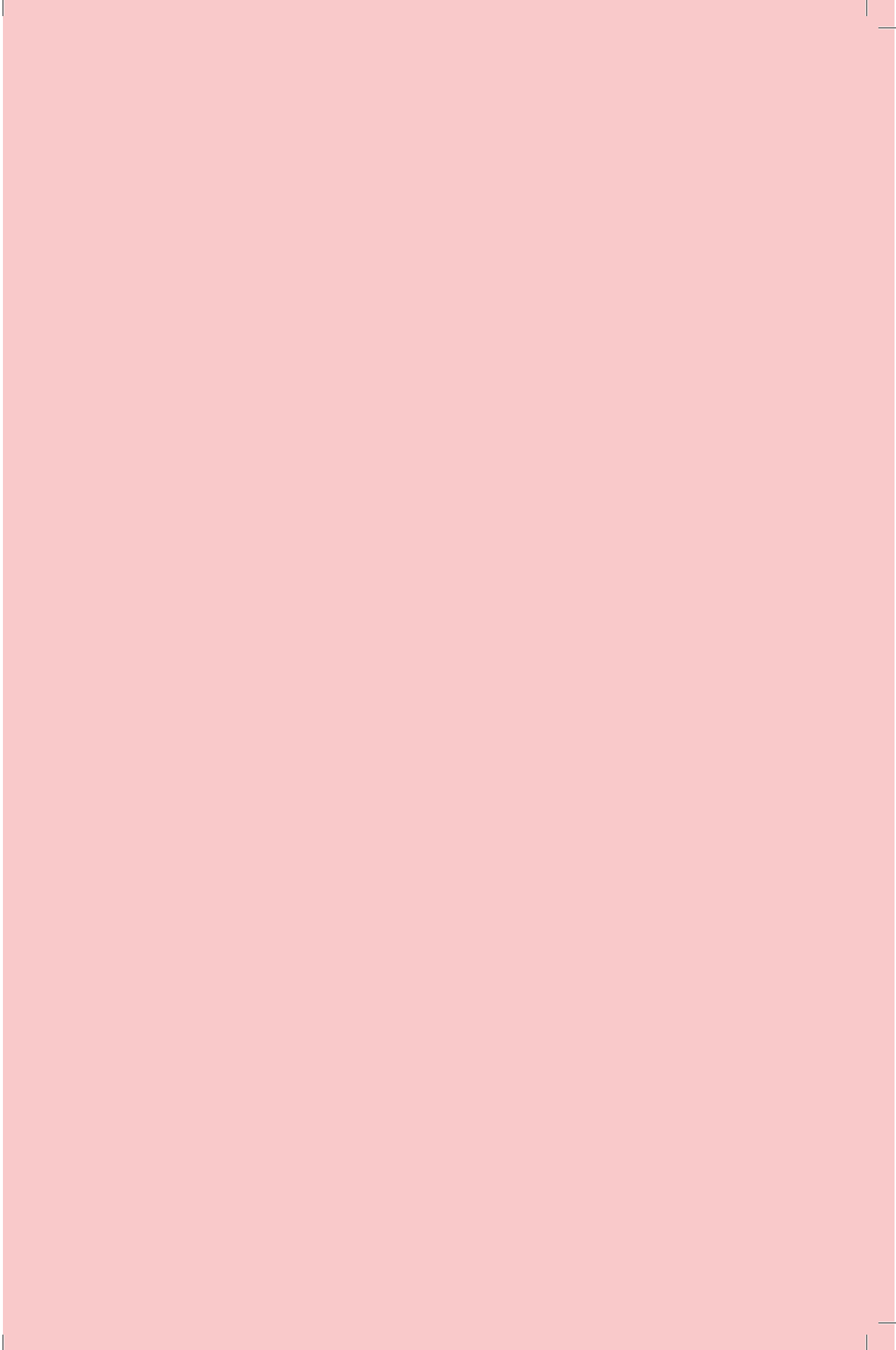
Studio influences physical wellbeing

The design studio demands presence, which places particular physical demands on the bodies of students. Many contemporary studio pedagogies are influenced by the Bauhaus curriculum, which promoted good health by starting studio sessions with physical and mental wellbeing

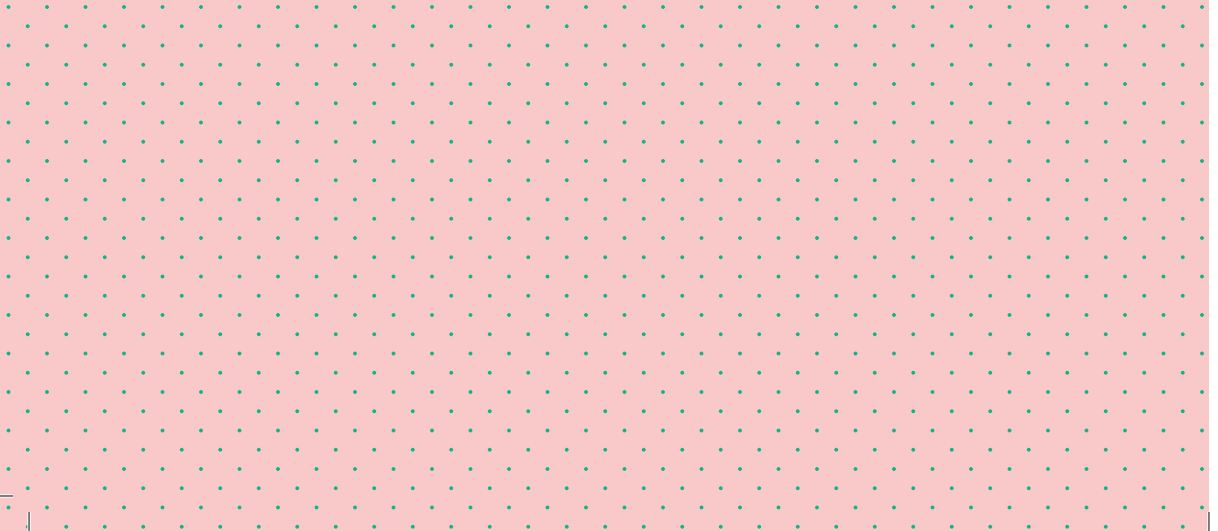
Studio Properties

activities, such as stretching and breathing exercises (Bauhaus Kooperation, 2023). The expectation of long periods spent inhabiting the quasi-residential environment of a studio (see [immersion \[→ 118\]](#)) demands that students and educators consider their physical wellbeing, not least as individuals experiencing the intersecting rhythms [\[→ 124\]](#) of their personal and professional lives (Troiani, 2021). Long hours spent in studio can limit the amount of time available for maintaining physical wellbeing and fitness, but also put students with regular and demanding outside commitments at a disadvantage. Many students have caring responsibilities to others or need to have paid employment during their studies. The mental impact of not being able to be present in studio to the degree expected by educators or peers can be a cause of real mental and physical stress.

The unhealthy aspects of studio may be most readily visible in the limited availability of healthy food near studio, time to cook at home limited by long hours in studio, and lack of provision for heating up or preparing food at a studio location. Vending machines, which students themselves recognise as offering substandard sustenance, can be the only source of food in some studios or at night (Yip et al., 2019). Where kitchens are provided for students in studio settings, conflict may arise around piles of used, disposable flatware and take-away lunch boxes, as well as overt managerial regulation of eating in restricted spaces or the covert regulation of eating foods that are considered inappropriate, invasive, or unpleasant (McGowan, 2019). Despite this, studio-adjacent kitchens can provide valuable [informal learning spaces \[→ 42\]](#) where students can, out of earshot and oversight of their educators, engage in peer-to-peer [dialogue \[→ 181\]](#) and provide passive support mechanisms that contribute positively to student wellbeing. Student wellbeing can also be addressed by casting a critical eye on the [habits and rituals \[→ 262\]](#) of studio pedagogy.

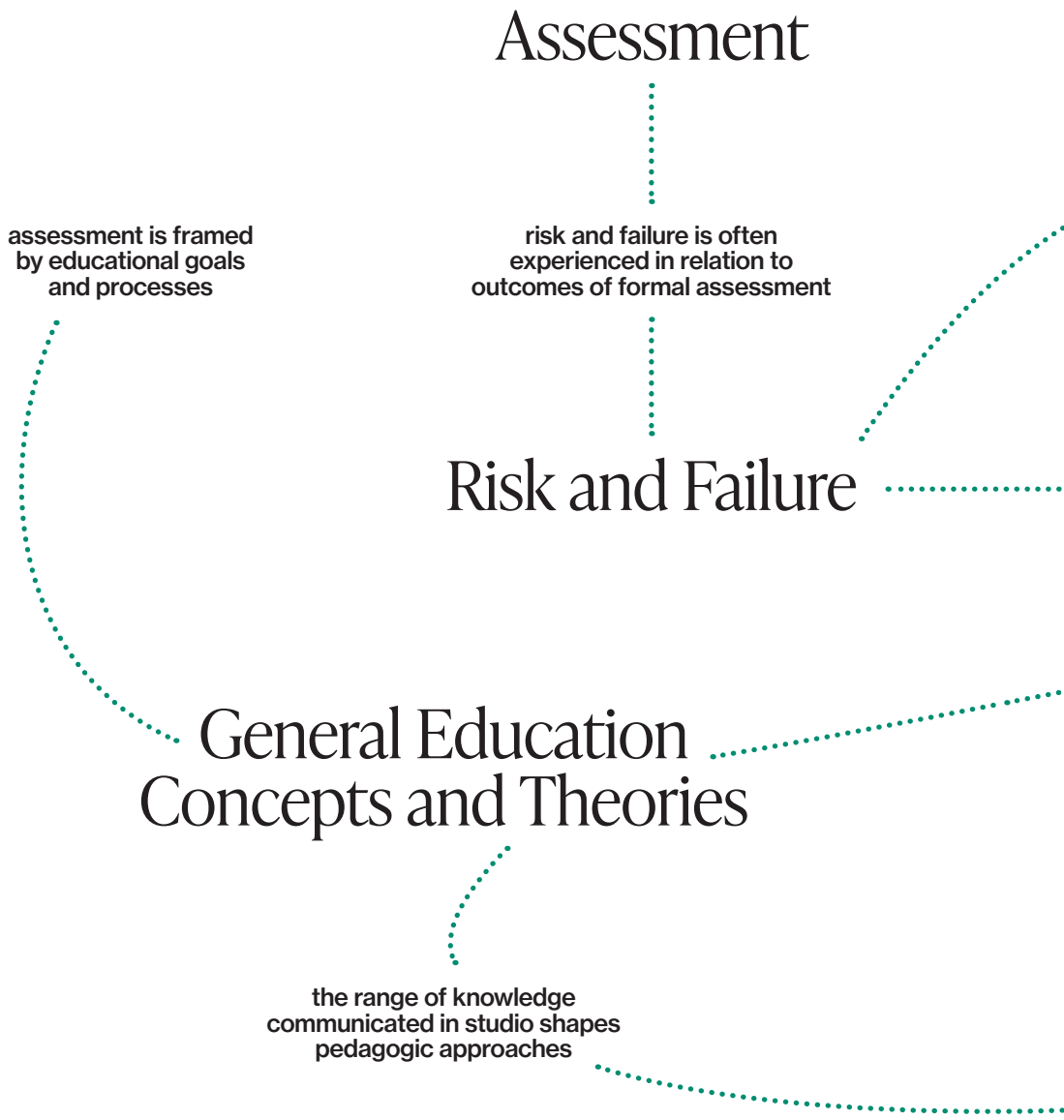


Theories and Knowledge



For all the ways in which studio can appear to be a simple mirror of the professional situations in which students will later practise design **simulation**, it is a complex site where the differing norms of professional design practise are reproduced **disciplines**. Studio in one field of design may therefore look quite different to studio in another, but studio is always a learning environment informed by basic understandings in the field of education **general education concepts and theories**. The observer of studio who sees students engaged in project work might conclude that the environment supports development of primarily technical or procedural skills, but studio supports a wide range of knowledge development, including how to engage with learning and how to arrive at tangible outcomes **knowledge and knowing**. Building tolerance for the unexpected and undesired result **risk and failure**, and capacity for arriving at unanticipated but appropriate solutions **creativity** together with the ability to embrace and utilise critical feedback **assessment** are all part of both learning in studio and professional performance.

A map of the Theories and Knowledge cluster showing possible relationships and connections between properties.



Creativity

..... expectations of creativity are shaped by disciplinary norms

.....
Discipline

.....
studio simulates particular aspects of a discipline and future profession

.....
Simulation

..... studio is a simulated space that supports risk and failure

.....
educational approaches strengthen and value different forms of knowledge in different ways

.....
Knowledge and Knowing

Creativity

[W]hile creatively active individuals need courage, creative ecosystems should provide encouragement. While creatively active people should be curious and exploring, creative ecosystems should encourage exploration and ‘playing around’ with ideas and materials; and so on. What links these paired properties of people and environments, of course, are the psychosocial demands of creative processes.
(Harrington, 1990, pp. 157–158)

Creativity is the process of thinking and doing to bring something new and valuable into existence. Although there is no universally accepted definition of creativity (Sawyer, 2017), it has been succinctly summarised as ‘the process of having original ideas that have value’ (Robinson, 2001, p. 109). Robinson’s definition of creativity involves three key components: process, novelty, and value. Each component is critical to different definitions and framings of creativity, and worth considering when applying creativity in a learning context such as studio.

Creativity is assumed to be ubiquitous in studio

There is a general assumption that studio is a place of and for creativity. A place for creating new things, imagining new concepts, forming new ideas, and trying different combinations (Williams et al., 2014; Fariás & Wilkie, 2016a; 2016b; Sawyer, 2017). This creation takes place via different modes and constitutions of operation: in online virtual studios or small co-located groups where students learn and design collectively [→ 166], across surfaces [→ 48] in studio, and through dialogue [→ 181] and crit [→ 79]. This creativity is spread throughout the entire studio space and is expressed through dialogue, critique, and other means. Fariás and Wilkie (2016b) see studio as a central location where ‘creativity operates as a situated practice’ (p. 1) rather than an individual one. This suggests that creativity is not isolated to a single person but is a result of complex interrelationships.

The literature on teaching creativity is complex and varies based on how different authors define and frame the concept (Sawyer, 2017). Recent literature focuses on *fostering* creativity, as opposed to explicitly teaching it (Craft, 2006; Sawyer, 2017), a tradition that has its roots in earlier works by authors such as de Bono (1990), Young (2003), or Csíkszentmihályi (1996).

In design education, assumptions persist that creativity develops spontaneously in certain circumstances. However, Rutland (2009)

problematizes the idea that a student's creativity develops automatically and in parallel with becoming a designer. He cautions against assumptions that creativity will automatically develop alongside design competence, just as expertise [→90] does not necessarily come from exposure to an expert's knowledge and skills in studio (Smith, 2015). Rutland argues that creativity should be explicitly included in any design curriculum (hidden curriculum [→271]).

Creativity consists of three critical components (or conditions)

The initial definition above outlines three components for supporting creativity: process, novelty, and value. Each component highlights important aspects of creativity and reveals how creativity emerges and how studio supports it.

Process. Creativity is linked to thinking and cognition – and thinking through doing – because it depends on new and different ideas. Such thinking can be considered heuristically (e.g., blue sky thinking or thinking outside the box; Lempiala, 2010), through psychology (e.g., imagination; Stokes, 2014), or using cognitive theory (e.g., divergent thinking or cognitive connecting; Goldschmidt, 2016). In studio, a range of affordances and conditions support students to develop these types of meta-cognitive skills, often employing discipline-specific [→238] methods. Some approaches rely on using artful surfaces [→48] for visual inspiration (Vyas & Nijholt, 2012), observing making [→147] and prototyping [→158] practices to inculcate new skills (Hynes & Hynes, 2018), or building partnerships through social networks [→185] that enable creativity (Joel-Edgar, 2011).

Novelty. Creativity is about creating something novel: an outcome that is new, different, or (sometimes) innovative (Robinson, 2001). The degree of novelty can be evaluated by comparing it against existing solutions, ideas, or designs. Studio supports the creation of novelty through comparisons because it is a place where artefacts [→151] are made visible [→34] and can be used to generate comparative judgements [→98]. These judgements are further contextualised through external precedents (knowledge and knowing [→248]) and in apprenticeship [→64] relationships between educators and students where expertise [→90] is offered and constructed (crit [→79]; feedback [→74]).

Value. Related to novelty is the idea that creativity results in the creation of some societal value that is ideally aligned with the human values that people hold. The assessment of societal value of work in studio particularly relies on judgement [→98] and expertise [→90], very often developed along disciplinary [→238] lines. However, the context for the generation of value can equally be the collective identity [→94] of studio culture or community (Lloyd & Jones, 2013; see also Cultures and Power [→258]).

Creativity is sensitive to conditions and contexts in studio

How creativity is taught and learned remains under-theorised in the literature (Sawyer, 2017). However, there is a growing body of work discussed below that focuses on the physical, behavioural, or psycho-social factors, and conditions that support, or suppress, creativity. Williams (2013) proposes a grammar that can be used to assess the capacity of places to support creative activity. He calls this the *creative press*, and it can be organised by: Affordances, Sensory properties, Workplace units, and Non-workplace units. Thoring et al. (2018) present a typology of creative spaces, identifying five different spatial types (Personal, Collaboration, Presentation, Making, and Intermission), as well as five spatial qualities (knowledge processor, indicator of culture, process enabler, social dimension, and source of stimulation). In both examples, the authors offer ways for researchers to apply the complexities of socio-material creativity in practical settings. Thoring et al. offer a visual way to relate spatial qualities to space types and Williams uses patterns to evoke the conceptions of spaces. These are methods, metaphors, or patterns that can be applied to studio because they offer underlying conceptions of space as opposed to explicit definitions or instructions (Jones, 2014c).

Psychological and social factors also greatly influence creativity in any social space (Amabile, 1983; 1988). Extrinsic motivations (drivers that are not personal) have been linked to inhibiting creativity, while intrinsic motivations promote it automatically (Lepper & Greene, 1973; Craft, 2006). In general, however, attributing single factors causally to creativity, such as intrinsic or extrinsic motivation, should be approached with caution because the phenomenon is far more complex than that. Many key authors have suggested viewing the relationships between these factors as an ecology (Harrington, 1990) or as a complex system (Csikszentmihályi, 1990). The lesson for educators is that isolated factors, addressed on their own in isolation, are usually insufficient to enable creative thinking. In studio, properties such as [place](#) [[→198](#)], [habitus](#) [[→265](#)], [belonging](#) [[→189](#)], [social networks](#) [[→185](#)], or [hidden curriculum](#) [[→271](#)] can all contribute to or suppress creative thinking. Considering studio as a place that fosters creative attitudes and dispositions (Craft, 2006; Ash, 2016) and facilitating an atmosphere that is conducive to creativity is often a more useful approach.

It is very easy to *suppress* creativity (Amabile & Kramer, 2011), and it is worth remembering Hennessey's (1996; 2003) top five creativity killers: expected reward, expected evaluation, surveillance, time limits, and competition. Educators should generate the appropriate conditions that foster creativity while addressing the conditions that can suppress it. This can present significant challenges when [assessing](#) [[→234](#)] work,

encouraging social comparison [→172], writing design briefs [→67], and imposing unrealistic models of design identity [→94] and expertise [→90].

Creativity is related to innovation through novelty and value

In many studios the link between creativity and innovation is assumed, or the two concepts are conflated. There are important differences that are useful to understand in a studio context, particularly in terms of novelty, where it is not only something new or different that is the purpose of design activity. Innovation, the successful introduction of a new product into a particular context (Rogers, 2003), almost always depends on some type of novelty to differentiate it from alternatives. Rogers offers a framework to understand difference in context, which includes relative advantage, compatibility, complexity, trialability, and observability. These factors show difference and novelty is not enough; the difference also has to be valuable and relatable to people. Merely creating things that differ to what already exists is not enough – the difference has to be present but not so different that it alienates people. This is similar to the idea of *Most Advanced Yet Acceptable* (Loewy, 1951). For audiences, clients, and publics to accept new concepts and designs (Hekkert et al., 2003) there must be a balance between familiarity and novelty. Creativity in innovation and design cannot simply be applied as a process to generate novelty without considering value in context. Understanding creativity and innovation as value in context depends on a designer's judgement [→98] and knowledge or analysis, and studio is a critical site for this development.

Creativity is an evolving term that reflects changing values in society and education

Despite the working definition in use here, creativity remains a contested concept with no agreed-upon universal definition (Abraham & Windmann, 2007). The various definitions of creativity, over the past decades reflect different attitudes and beliefs in education and society generally (Williams, 2013) and educators need to be aware of these.

Creative genius. Traditional views of creativity tend to frame creativity as a function of individual thought and talent, often linking greater creativity to exceptional thinking (Wallas, 1926), creative genius (Ryhammar & Brolin, 1999), or even having some mysterious or unknowable quality (Osche, 1990) (see also Dreyfus' *visionary* in expertise [→90]). Implicit in this idea is that the creative output itself is also exceptional: that it is novel and valuable to many people and transformative in several contexts (Amabile, 1983; 1988). This idea of exceptional creativity is sometimes

referred to as ‘Big C Creativity’ (Runco, 2014; Simonton, 2010), or h-creativity for historical creativity (Boden, 2003).

Individual creativity. This can be thought of as ‘everyday creativity’ (Richards, 2010; Williams, 2013). Novelty is constructed within an individual’s personal context and arises from innate creativity capacities present within everyone (Amabile, 1983; Simonton, 2005; Richards, 2010; Williams, 2013). A student might come up with an idea that is new to them but not new to others, and this novelty within the student’s experience and knowledge can have significant utility (experiential knowledge [→248]). It also represents a challenge for the educator – engaged in active teaching [→71] – who must make a judgement [→98] on how and when to make the student aware of the extent of the novelty of their creative thinking (e.g., through assessment [→234] or feedback [→74]).

Social or domain creativity. A more recent framing of creativity acknowledges the context(s). It shifts the origin of novelty from the individual to the particular psycho-social settings (Amabile, 1990), domains (Csíkszentmihályi, 1990; 1996), or ecologies (Harrington, 1990), often referred to collectively as the *creative press* (Williams, 2013). Creativity depends on, and arises out of, these contexts. This framing is particularly relevant in a studio setting, where the collective and individual construction of creativity emerges in a community of learners (Lloyd & Jones, 2013; see also **Interactions and Sociality** [→162]).

Creativity as a conceptual gestalt. Finally, it is worth considering creativity as having no *real* or *true* meaning. Instead, we should consider it as a useful heuristic (Orr & Shreeve, 2018). Coyne (1997) concludes that creativity, like James’ definition of consciousness, is a conceptual gestalt – an idea that is easily understood but that remains undefinable. As with many other heuristic, tacit, or implicit aspects of studio, creativity remains useful when used to reflect on and apply in a learning and teaching setting.

The beliefs and attitudes an educator holds regarding creativity, such as those outlined above, significantly impact how creativity operates in an educational setting (Cheung & Leung, 2013; Craft, 2005). Educators’ beliefs can promote or inhibit creative thinking and actions, often in subtle ways in interactions between students and educators (Berezcki & Kárpáti, 2018; e.g., dialogue [→181]; feedback [→74]; risk and failure [→227]). When introducing or working with creativity in studio, it is worth being aware of the common conceptions of creativity that students may have (see also judgement [→98] and identity [→94]), and to consider making explicit or deliberate use of different framings for different pedagogical purposes (**Foundations and Methods** [→60]).

Risk and Failure

Failure forms an important dimension of art and design and is inherent in creative endeavours.

(Fremantle & Kearney, 2015, p. 309)

Risk-taking and failure are often considered necessary parts of design courses and are cited as central to creative endeavour and practice (e.g., Gray et al., 2020; Jackson, et al., 2022; Orr & Shreeve, 2018; Patterson & Sharman, 2014). The commonly presented relationship is that students attempt design activity in studio via play [→155], making [→147], simulation [→232], and project cycles [→132]. Through these attempts, students learn more from their failures than from their successes. This learning from failure necessarily involves risk-taking in terms of the uncertainty of success of the outcome. In some design curricula, educators also *demand* risk-taking to induce creative thinking through new ideas and learning.

Failure is a mechanism of designing and learning in studio

The design students were learning through physical experimentation and, particularly, through failure.

(Lyon, 2011, p. 93)

Failure has two main purposes in studio, as a mechanism in the process of designing and as an experience to learn from. Failure is a key mechanism in the process of designing (e.g., Gray et al., 2020; Lachheb & Boling, 2024; Schön, 1987; Thompson, 2002; Orr & Shreeve, 2018) and has been strongly linked to design iteration (e.g., Petroski, 1992; Nelson & Stolterman, 2012; Miller, 2014). It has been made popular through aphorisms such as ‘Fail frequently; fail fast’ (David Kelley quoted in Norman, 2013, p. 229). Activities such as ideation, sketching, and prototyping [→158] are all ways to engage in iteration using deliberate, constructive failure, enabling the designer to identify what works and find out what does *not* work before it gets too difficult to change. This type of failure is easier to understand because it relates to some deferred or future success, but, as Schön (1987) observes, a student watching an expert work rapidly through iterations does not automatically lead to that student being able to do the same for themselves (pp. 289–290). As outlined below, *successful or productive* failure requires certain conditions for success.

The second purpose of failure in studio can be framed as *learning from failure* (Lyon, 2011; Shulman, 2005; Orr & Shreeve, 2018). Cognitively, there is a growing realisation that failure (or the failure to complete or resolve a cognitive task) leads to the initiation of other cognitive processes in response (Dehaene, 2020). In other words, when we fail, new thinking emerges, and this general pattern occurs in a range of studies around learning through failure (Tawfik et al., 2015). Indeed, some studies suggest risk without failure results in less learning (Litchfield, 2016). However, even when learning does occur through failure, it can come at an emotional cost to the student and should be considered through models of acculturation [→285], identity [→94] formation, and social support in studio (Gray et al., 2020).

In the design studio, failure as a mechanism in the design process and as a mechanism of personal learning is critical. As an educator supporting studio activity, it is essential to focus on the types of failure that are desired and how they can best be supported to create the right conditions for learning. Both studio educators and students can learn from failure in studio as part of their reflexive educational practice (Rowland, 2016).

Risk-taking is a key method of engaging in failure in studio

Risk-taking is often linked to failure as a key intention behind learning and curriculum design (e.g., Orr & Shreeve, 2018; Patterson and Sharman, 2014; Choi et al., 2019). Studio educators frame risk in different ways. However, research is limited in how these different framings of risk are disambiguated in practice. We outline a few framings of risk relating to identity risk, risk of rejection, and risk of the unknown:

Design identity risk. Design involves creating new ideas within complex and uncertain contexts, linking directly to risk through fear (Dorner, 1997). For many educators, risk-taking is a necessary condition of any creative practice (Orr & Shreeve, 2018) and we should prepare our students for living with and taking creative risks. However, this risk – while central to design practice – can require students to unlearn patterns of thinking, and adopt new practices (e.g., Gray, 2013b; Siegel & Stolterman, 2008), and this can present a risk to their identity.

Risk of rejection. Regardless of how competent or meaningful our work may be, creative work always runs the risk of being rejected or attracting negative reactions because design involves judgement [→98]. Criticism of a design proposal or creative outcome and criticism of the designer can easily be conflated and even experienced designers can find this a challenge. Developing resilience to rejection (failure) is cited in the literature as a necessity of design education (Orr & Shreeve, 2018; Grocott et al., 2019).

Risk of the unknown. Risk can occur at the limits of our knowledge [→248], where we do not know enough to be secure or are developing new thinking or skills for the first time. Students working at, and around, limits is summarised nicely by Gore (2004, p. 43): ‘failure [...] helps the maker understand the idea of limits: the limits of the maker, the limits of materials, techniques, plausibilities’. Students working at the boundaries of their knowledge and expertise can learn for themselves when this occurs and seek out expert consultants (Thompson, 2002) – a process directly supported by active teaching [→71] in studio.

Learning from failure and risk taking requires certain conditions in studio

For effective learning to take place, and to avoid unwanted negative effects that may impact students, failure in design education must take place under the right conditions. A common condition, noted by several authors, is that studio should be a place of safety to allow risk-taking and failure to take place. Cennamo (2016a) refers to a ‘safe place to make mistakes’ and Gore (2004) refers to failure ‘but while inside the protected frame’. Both refer to safety as a student feeling able and comfortable to take risks, and this safety can relate to both failure of design outcomes and failure during the process. Choi et al. (2019, p. 73) suggest the following conditions for creative risk-taking in studio:

P[rovision] 1 An open and playful learning environment that encourages sharing and challenging multiple perspectives; P2 An adequate period of time for students to develop and revise creative concepts; and P3 Opportunities to assess their own performance in developing creative risk-taking capacities.

Both Choi et al. and Gore refer to the importance of time [→121], but for different reasons. For Choi et al. (2019), time is needed to expose and acclimatise students to risk. In studio this is supported through repeated project cycles [→132] and immersion [→118]. For Gore (2004), time provides the ‘right time for failure to happen so that it can become part of the knowledge base’ (pp. 43–44). For example, educators can support risk-taking through active teaching [→71], encouraging personal reflection [→83], or supporting other students through social networks [→185] and informalities [→204].

Studio increases the chances of finding the *right time* for failure. Similarly, the idea behind active teaching [→71] makes further use of the

flexibility of studio to seek out intervention opportunities at moments of failure. Encouraging students to reflect on their past and present learning experiences can also support risk-taking; Gray et al. (2020) describe ‘reflection as a way-of-being [...] a habitual means for students to understand themselves and their role as designer [and] become more aware of their actions and rationale in informing their design judgments’ (p. 51). Reflection can enable a student to interrogate past examples of risk-taking and consider what learning or new patterns of behaviour have resulted.

Setting up conditions for failure to occur is not without pedagogical risk. Balancing the need for risk and its effects on students is critical in studio. Risk-taking and failure can lead to discomfort because the mechanism of learning from failure is analogous to what Schön referred to as a *destabilised state* (Schön, 1971; Ramage, 2017). Hence, ensuring that students are inducted appropriately to risk-taking in studio is critical (Grocott et al., 2019). Miller (2014, p. 80) explicitly advocates the need for responsible risk-taking in studio:

To teach responsible risk-taking, we need to first get students comfortable with being in a state of discomfort. They must develop awareness that their future growth is dependent on their willingness to stay on the edge of failure and take calculated, productive risks.

Risk, in this view, requires a component of judgement [→98] on the part of the educator, learner, and future practitioner. It reinforces the importance of making visible [→34] the idea of risk to students and introducing it as part of their learning journey [→104] (Duer, 2016).

Risk and failure can be paradoxical but also develop designers’ capacities, attitudes, and resilience

There are two important paradoxes inherent to risk-taking and failure. The first is that of risk itself becoming normalised, as summarised by Orr and Shreeve (2018): ‘Bell (2013) reminds us that there is an inherent paradox at the centre of our exhortation to students to take risks. If all risk taking is rewarded and valued, what is the risk?’ (p. 47). How this risk is balanced with educational requirements remains, as Orr and Shreeve point out, a tension in any design studio located within the academy. The second paradox is our tendency to avoid uncertainty and failure, even though these moments often lead to future success (Dorner, 1997). Failing and failure are framed negatively in Western society. In most higher education settings, the language of success is far more obvious than the language of failure, and this shapes students’ perceptions, regardless of the potential future success

that failure may offer (Patterson & Sharman, 2014). Educators and students must navigate the paradox between wanting to succeed in an academic programme and needing to take risks and fail to learn (Orr & Shreeve, 2018).

Introducing students to failure as a positive mechanism in design, recognising that studio is a place where failure can be applied and practised (Gray et al., 2020), becomes critical. As Miller (2014, p. 81) states: ‘we must first seek to challenge a student’s relationship with failure. Instead of fearing failure, we must cultivate a studio culture that celebrates it’. One method is refocusing curricula and assessment on the *process* of creative endeavour, as opposed to the output (Broadfoot & Bennett, 2003; Jones, 2015) and not being ‘preoccupied with succeeding but with trying’ (Allen, 2011 in Orr & Shreeve, 2018, p. 48). As Thompson (2002, p. 42) summarises: ‘they may fail, but under the guidance, insight, and encouragement of faculty who are focused on student development not project completion’.

When students take personal risks, they can learn from their failures and develop important attributes. Risk and failure is linked to students’ development of personal capacities and attributes, such as confidence (Gore, 2004; Miller, 2014), indicative of their [journey \[→104\]](#) and [identity \[→94\]](#), and the [transformative pedagogy \[→111\]](#) they experience in studio (Grocott et al., 2019). As Nelson and Stolterman (2012, p. 278) summarise:

The ability to manage failure, both emotionally and practically, increases students’ abilities to negotiate risk and develop creative solutions to complex problems. It is by fostering and promoting reflective risk-taking and open-ended engagements with the not-yet-known that learners can explore and experiment with new possibilities and ways of thinking.

Simulation

A practicum is, as I have noted, a virtual world. It seeks to represent essential features of a practice to be learned while enabling students to experiment at low risk, vary the pace and focus of work, and go back to do things over when it seems useful to do so.

(Schön, 1987, p. 170)

Historically, the educational studio and the activities that take place in it have been attempts to replicate studios in professional practice (Cuff, 1991; Shulman, 2005). Studio is a space where '[d]esign students "act out" the role of designer' (Cross, 1982, p. 222) in a context of relative safety to try different approaches and learn from them. The degree to which studio utilises simulation depends on disciplinary [→238] and professional requirements, the activities that get privileged (e.g., making [→147]; play [→155]; reflection [→83]), and attitudes (e.g., wellbeing [→214]; social comparison [→172]). Gibbons (2016) goes further and argues simulation is so central to design education that educators should replace the term *instructional design* with *simulation design*.

Studio simulation is contextualised and relies on failure as a way of learning

Two primary mechanisms underpin simulation in studio: contextualised experiences and failure as a mode of learning. The risk and failure [→227] property thoroughly covers the role of failure, so we primarily focus on contextualised experiences.

The education studio aims to replicate, in part, the activities that might be found in some practice setting or other applied context (e.g., Gestwicki & McNely, 2016 in the design of educational video games; Makki et al. (2019) in linking interior design work to professional practices). In-studio activities are designed to be as authentic as possible (design briefs [→67]) while still meeting learning and teaching needs. Contextualised design activities are authentic and closely resemble real-world situations, which helps students understand the purpose of their engagement. Lessons learned from authentic activities can be valuable (Rowland, 2016). Salama (2017) notes the potential of actual responses from real, not imagined, stakeholders, contexts, and situated events. The potential lies in the complexities of interactions in a live setting which can provide a *realistic* learning

experience. However, this realism necessarily means that what students learn can be less predictable than in constructed scenarios or contexts.

Through simulation, students have the chance to experiment and try things (Shulman, 2005) in a risk-free environment (Schön, 1987). This can support students to learn from failure in an environment that is a 'safe place to make mistakes' (Cennamo, 2016a, p. 158). In simple terms, a student can create a virtual design and make many mistakes along the way within a simulated environment, knowing that these mistakes will not have any real-world consequences. This experience of risk-taking allows students to explore ideas and learn from their failures (risk and failure [→227]).

Studio can support a wide range of discipline simulations

The extent to which educational studios simulate professional practice settings can vary significantly by activity, discipline, or pedagogical approach. In some settings, the artefacts and prototypes made can be very close to what is produced professionally in practice. In contrast, the outputs in other disciplines may be less realised because they require more resources. Hence, balancing the level of simulation against the curriculum need becomes an important tension to consider in a studio. For example, *live project pedagogy* in architecture represents a range of student engagement(s) with real aspects of design projects (Salama, 2017, pp. 245–253). In some, the project and brief may be real; in others, the project may be driven by a real stakeholder, client or user. Brown (2012) found that live projects tended to be initiated by educators who felt that more normative *non-live* pedagogies were not sufficiently authentic simulations of design practice; introducing live aspects heightened the simulation of practice in the educational institution.

Smith (2015) and Schwier (2016) independently observe that the challenge working with a real client is finding an appropriate balance between the experience itself and its utility in learning. Not all real clients are effective educators, and not all educators are effective clients. And, as noted by Schwier, by running too accurate a simulation and using a live client project, the overriding need to deliver a real product can supersede any process or learning (Hokanson & McCluske, 2016).

Studio can support simulation of general design activity and thinking

Finally, a studio can simulate general aspects of design commonly found in many disciplinary settings. General personal competencies, skills, and attitudes often contribute to, or overlap with design expertise [→90] and identity development [→94]. For example, time management may be developed by replicating real-world pressures associated with deadlines,

design process time constraints, and project cycles [→132] (Schwier, 2016). Students can also play the role of stakeholders, such as clients, users, and testers, in the design process (Tracey, 2016). In contrast, educators often default to simulating clients in assessing [→234] project outcomes. Educators face a significant challenge when engaging with students in a simulated environment, acting both as both a coach, offering feedback to improve processes and outcomes, and as a gatekeeper, offering assessment of learning. Studio serves as a space where students can be indoctrinated and enculturated [→285] into the customs and expectations of a profession. Here, students engage in a visible performance [→107] and learn how to take on various roles while also testing and exploring their own identity [→94] and character [→101] as designers.

Assessment

One of the main characteristics of the design education is that its assessment is not based on formal examinations ... the evaluation of student attainment, knowledge and skill, is indirect, that is through practice and projects.
(Çıkış & Çil, 2009, p. 2105)

Assessment in studio takes place for different reasons, in various ways, and at multiple points across the entire learning journey [→104]. Most of this assessment is implicit and relatively informal, carried out as part of ongoing feedback [→74] and dialogue [→181] and dependent on the judgement [→98] of the educator in discussion with students. The interaction between the educator and student during the desk crit [→79] or project review is a good example of how the assessment process works. This is usually done informally at regular intervals (time [→121]; project cycles [→132]) to evaluate the student's work and design process. The aim of this dialogue [→181] is to improve the student's ongoing work and design process. More formal and/or explicit assessment opportunities often occur at key points in project cycles [→132] and can be driven by institutional requirements. For example, end-of-project assessments may be semi-public (see public and private space [→54]) wall crits [→79] or jury assessments where the outcome is a grade for students' work. Assessment does not have a singular manifestation in studio and its integration alongside feedback [→74] and other key educational moves (Foundations and Methods [→60]) is a critical part of a studio experience.

Assessment in studio can be summative or formative (of, or for, learning)

A helpful distinction can be made between assessment *of* learning and assessment *for* learning (William, 2011; Orr & Shreeve, 2018; Doren, 2023). For this property, these two framings of assessment are aligned with broader definitions of summative and formative assessment, respectively. Summative assessment typically ranks, scores, or grades student work. It aims to indicate a level of performance or attainment, and does not depend on [feedback \[→74\]](#) (other than that offered by the ranking itself). Formative assessment is often descriptive or discursive, intending to develop student activity and performance, and is oriented towards shaping future work. Formative assessment requires a [feedback \[→74\]](#) mechanism as a necessary condition for learning to occur (see [feedback \[→74\]](#), [critique \[→79\]](#), and [dialogue \[→181\]](#) for additional detail).

Most assessment activities in studio include summative and formative assessment (Orr & Shreeve, 2018; Doren, 2023). The [crit \[→79\]](#) generates [feedback \[→74\]](#) for (and with) students to formatively assess their learning, but might also indicate some comparative or extrinsic grade that is summative. This leads to a key tension for design educators when assessing: the educator must act as both coach (offering assessment for learning through [feedback \[→74\]](#)) and gatekeeper (offering [assessment \[→234\]](#) of learning). Unsurprisingly, assessment can feel contradictory to the practice of design and uncomfortable for some educators. Rook and Hooper (2016) describe how they sought to resolve this tension: ‘[a]ssigning grades is one of our least favourite activities. We believe that giving feedback is essential but that assigning letter grades to graduate students is not’ (p. 243). This tension between [assessment \[→234\]](#) and [feedback \[→74\]](#) is also a tension between developing and judging. With assessment, there can be a palpable disjunction between the educator’s intention and a student’s experience. For example, educators may intend to give advice on improving a design (e.g., formative feedback), yet students may experience this as a rating of their ability (e.g., summative assessment), particularly in the early stages of learning (Shreeve et al., 2004). Parsons and Gray (2022, p. 8) recommend strategies to ‘decoupl[e] assessment and feedback as a way to encourage the development of self-regulation’ and avoid students’ undue focus on a final grade. By separating assessment and feedback activities temporally and proximally we can ensure students understand whether the aims are summative or formative.

Assessment can include different areas of focus in studio

Artefacts are central to nearly all forms of assessment in studio because they represent or stand in for less tangible qualities, knowledge, and learning (see [artefact \[→151\]](#), [making \[→147\]](#), and [learning by doing \[→145\]](#)). Usefully, Orr and Bloxham (2013) and Orr and Shreeve (2018) outline three areas of focus for assessment in art and design education: product, process, and person.

Product. Ultimately, design activity leads to some tangible output and the evaluation of these [artefacts \[→151\]](#) is an important part of the learning journey [\[→104\]](#). Different disciplines may place varying emphasis on the importance of the final product in assessment. Orr and Shreeve (2018) suggest that such variance depends on the stage of students' [expertise \[→90\]](#) and [judgement \[→98\]](#), where students have an early focus on outcomes while educators have an early focus on process.

Process. The process can be formatively assessed across the [project cycle \[→132\]](#), but is also often summatively assessed at the end of a project where it accompanies the final product/outcome, and often takes the form of sketchbooks, reflective accounts, design journals, and process narratives.

Person. Because the development of design [expertise \[→90\]](#) and [identity \[→94\]](#) takes place over time, the individual student is inextricably linked to the work they make and how they have made it. The students and their journey [\[→104\]](#) are present in the assessment process and educators rarely assess student work without knowing who created it. This personal learning journey is usually assessed in conjunction with the process (e.g., sketchbooks, reflection, self-evaluation) and product (the final outcomes) (Orr & Shreeve, 2018).

Assessment takes different forms in studio expressed through a range of conditions

Some forms of assessment are highly visible in studio, such as the formal wall crit [\[→79\]](#) or project review, but assessment is also applied across many other activities. As a result, the range of conditions that comprise or shape different forms of assessment can lead to wide variation. We describe some of these conditions that can mediate assessment practices below.

Motivations and Focus. The purpose of assessment necessarily varies, with most activities offering both formative and summative assessment opportunities. This purpose can be deliberately adjusted to support the learning and teaching need; for example, summative assessment carried out early in the process might be useful in helping students orient themselves or to give them a sense that they are doing the *right thing* (Lotz et al., 2018; Jones et al., 2021) ([identity \[→94\]](#); [social comparison \[→172\]](#)).

Participants and Visibility. Assessment can take place with different combinations of participants in more public or private ways, ranging from a one-to-one review or crit [→ 79] between student and tutor, such as a desk review, or as part of a group setting for a project review (Oh et al., 2013). Similarly, the assessor will often also be a studio tutor but can also be represented by an external examiner, expert, or practitioner and, in some cases, by student experts or peers. More recently, peer critique and evaluation mediated or guided by a tutor has emerged as a preferred assessment vehicle using traditional group critique [→ 79] methods (Liow, 2019) or student grading (Orr & Shreeve, 2018) with parallels to peer assessment in other non-studio pedagogies.

Timing. Assessments take place at different times to suit particular time-based [→ 121] activities within studio. Project assessment, for example, depends on project cycles [→ 132] or other studio rhythms [→ 124], which can take place over longer periods of time and require appropriate forms of assessment at different points. The mix of assessment and feedback during a project will differ based on what is required for a final project presentation. In particular, the use of inappropriate assessment at certain points during a project, such as offering feedback at the end of a project when it is no longer actionable by the student, can be problematic (Elkins, 2001; Doren, 2023).

Assessment in studio requires judgement of quality and expertise

Assessment in art and design is not about the ‘reproduction of knowledge’ (Orr & Shreeve, 2018, p. 125) or ‘given knowledge’ (Addison, 2014). In contrast, there is a general understanding in design education literature that simplistic, transactional, or purely rationalist assessment paradigms are inadequate when applied to creative subject areas (Sadler, 1989; Orr, 2007; Orr and Bloxham, 2013; Jones, 2014b). Assessment in studio involves professional judgement [→ 98] and expertise [→ 90] because design (and designing) depends on tacit knowledge [→ 248] constructed through uncertainty and ambiguity [→ 209]. It is critical to reflect this in the assessment process (Yorke, 2007; Orr & Shreeve, 2018). Specifically, Sadler (2009) warns against dividing the whole of a project into parts and assessing these individually, observing that ‘such approaches do not adequately represent the full complexity of multi-criterion qualitative judgements, and can lead to distorted grading decisions’ – instead advocating for ‘holistic assessment’ approaches (p. 159). Orr and Shreeve, arguing similarly, advocate a *constructivist interpretive paradigm*, where the emergent and discursive process around assessment provides the framework for the assessment itself (Orr, 2007; Orr & Bloxham, 2013).

There are two important considerations for conducting assessment in studio. First, the judgement [→98] itself can be a vital component of the work, particularly when educators and students engage in the content of judgements explicitly. Second, like many studio activities, the *process* of assessment in a studio context matters as much as the object being assessed. Both considerations align with Parsons and Gray's (2022) findings that making visible [→34] aspects of assessment to students can be a positive way to avoid its inherent tensions in studio.

Discipline

Recent efforts to foster educational experiences that cross disciplinary boundaries create new opportunities to synthesize unique pedagogical and disciplinary approaches. Such experiences provide students tools to understand and tackle complex global challenges in ways that would be impossible within siloed disciplinary coursework.

(Exter et al., 2020, p. 796)

In many cases, 'studio' is directly preceded by the name of a discipline, marking that studio as an architecture studio, an industrial design studio, a fashion design studio, or a service design studio. In framing studio through discipline, the title of studio defines the students' or educators' expectation of what will be found and experienced in that particular environment. Some emergent design disciplines have challenged this uni-disciplinary history of studio, bringing together two or more disciplinary perspectives – often including multiple representational forms as well as pedagogical norms that point to different sources or trajectories of enculturation [→285] – as a key part of an inter- or trans-disciplinary studio (e.g., Gray & Exter, 2023; Exter et al., 2020).

Studio as uni-disciplinary

Most studios are oriented towards one disciplinary perspective, linked to a specific professional *type* of design, which we describe as 'uni-disciplinary'. Indeed, as a signature pedagogy, studio shares components that are borrowed from a broader acknowledged set of studio practices and properties (Foundations and Methods [→60]), but where the dominant expression of studio is shaped in particular tacit ways by each discipline (Schön, 1985).

As an overarching umbrella, studio as a signature pedagogy (Shulman, 2005) sets the tone for the entire educational experience, and some attempts have been made to define what skills and knowledge should transcend individual disciplinary modes of studio (most famously, the Bauhaus model of education described in the classic *curriculum wheel*, cited in Cennamo, 2016b). However, individual design disciplines often rely upon slight or dramatic differences in critique [→ 79], process, artefact [→ 151], rhythm [→ 124] of activities, and surface [→ 48] features of studio. There are also differences in types of outcomes and norms that are reproduced over time. These disciplinary imperatives also mark out a space for students to develop their own identity [→ 94] as a designer.

The notion of discipline is acknowledged in studio education, but primarily at the level of professionalisation and job role. Discipline is rarely addressed on a conceptual level as design researchers have attempted to work out what it means to engage in design work (cf., Buchanan, 1995; Faiola, 2007). Within descriptions of studio education, there is often acknowledgement that individual disciplines must adapt various parts of studio to respond to disciplinary imperatives, while still retaining connections to the broader studio tradition (Boling et al., 2015). As Michela and McDonald (2020) note, ‘each discipline modifies studio pedagogy to meet its needs, most retain similar features, including a studio instructor with a primary responsibility to provide feedback that communicates professional design knowledge’ (pp. 183–184).

However, the means and particular impacts of this modification or adaptation of studio as a signature pedagogy are rarely mentioned in the literature (Exter et al., 2020), seemingly related both to the material [→ 142] qualities of doing work within the discipline, and routines of studio that have shaped approaches to critique [→ 79], organisation of work practices, and dominant traditions of design knowledge [→ 248]. Additionally, the materiality [→ 142] of studios may vary widely. The architecture or fashion studio has recognizable tools and prototyping materials that mark it out as a space for making [→ 147]; in contrast, other design disciplines such as service design or user experience design may promote making practices that are less visible or permanent (e.g., sticky notes) and thus make a studio appear more ephemeral and *less different* than non-studio spaces.

Studio as multi-/inter-/trans-disciplinary

In conjunction with emerging modes of studio, other disciplines have become intrigued by the potential of studio (Gray, 2016a), and these frequently draw from more than one disciplinary perspective – informed either by multiple design disciplines, or using design as a conceptual umbrella

in relation to one or more non-design disciplines (Chew et al., 2020; Faiola, 2007), challenging the uni-disciplinary norm of studio education. These formations of studios might include the addition of a new disciplinary perspective while allowing a traditional one to dominate (e.g., industrial design studios that include a minor emphasis on user experience design; Budd & Wang, 2017). Arrangements such as these are generally considered to be multi-disciplinary or cross-disciplinary according to definitions by design education scholars (Chew et al., 2020; Dykes et al., 2009), with deeper engagement across disciplines reserved for studios that incorporate inter- or trans-disciplinary perspectives that exceed any one discipline (although the boundaries among these terms is fuzzy and disputed; Dykes et al., 2009). For instance, a transdisciplinary studio (Guyotte et al., 2014) might be organised around a new unified concept such as a UN Sustainable Development Goal, which involves many design and technical disciplines but is not *owned* by any one of these disciplinary perspectives. An inter-disciplinary studio might reference two or more disciplinary perspectives in an integrative way – such as through the synergetic arrangement of technical and traditional design disciplines, for instance – but the boundary line between integration (a hallmark of interdisciplinarity) and a new coherence umbrella (a hallmark of transdisciplinarity) is sometimes difficult to identify (Lawrence & Després, 2004). The landscape of design courses is always evolving and increasing numbers of multi-/inter-/trans-disciplinary curricula are emerging. What is interesting is that many, if not all, of these still make use of studio pedagogies as a primary mode of delivery.

Working across disciplinary boundaries in studio

While specific acknowledgement of how multiple disciplinary perspectives emerge and can or should exist alongside each other in studio is rare, the presence of these formulations provides a glimpse into how studio may not only be a site for reproducing what is already known of a single discipline, but also how a studio can reveal multiple traditions of knowledge that support – and even are in tension with – each other (Exter et al., 2020). These emergent views often leverage framings of design that exceed outcome-defined disciplines such as visual communication or industrial design, instead considering the design of interactions, experiences, and systems (Buchanan, 1995). Exter et al. (2020) describe their use of multiple *flavours* of design in a studio that was intentionally framed as transdisciplinary, revealing the challenges and opportunities for students and educators alike to work across disciplinary boundaries. This transdisciplinary studio experiment revealed the challenges in maintaining educator alignment, as these educators had been trained (if at all) in

primarily uni-disciplinary studio models, but also underscored potential opportunities in bridging institutional and disciplinary silos and addressing problems that require engagement with multiple disciplinary forms and bodies of knowledge [→ 248]. Another example of a transdisciplinary studio is described by Gray et al. (2020), where the frame of that studio related to a single emerging design discipline: user experience (UX) design. Here, the formation of studio included explicit integration of multiple disciplinary perspectives (e.g., psychology, anthropology, ethics, visual design), using a transdisciplinary conception of design as a point of connection for these other traditions of knowledge and inquiry.

However, not all reformulations of studio across multiple disciplinary boundaries may be useful or productive. With the promulgation of *design thinking* methodologies that promise real world impact across a broad range of contexts and outputs (e.g., IDEO ‘Design Kit’, n.d.), the blurring of disciplinary boundaries may result in less, rather than more, clarity regarding which disciplinary knowledge is being employed. For instance, a transdisciplinary studio framed around complex, *wicked* problems without an acknowledgement of what disciplinary perspectives are invoked, what levels of expertise are relevant to engage in discourse, may struggle to problematise – or even acknowledge – the differing epistemological positions and types of knowledge needed to drive successful outcomes.

General Education Concepts and Theories

The psychoanalyst Erik Erikson once observed that if you wish to understand a culture, study its nurseries. There is a similar principle for the understanding of professions: if you wish to understand why professions develop as they do, study their nurseries, in this case, their forms of professional preparation.

(Shulman, 2005, p. 52)

Several theories and concepts in education literature apply to studio education and are frequently mentioned in design education literature. Some of these theories and concepts connect directly to studio education, while others apply to studio but have important differences. Engaging with these theories can illuminate studio education but can also present challenges. First, concepts or theories created in a general education environment do not always neatly fit with a complex and situated learning ecology like studio. Jones et al. (2021) note that, in adapting general social learning theories, the observed data in studio did not entirely fit the theoretical models, requiring the authors to construct an alternative model built from the perspective of situated studio pedagogy itself. Second, applying well-defined concepts or theories to studio contexts without fully engaging in the detail or literature behind those ideas is just as problematic. Lave and Wenger's (1991) concept of *Community of Practice*, for example, is regularly cited in studio literature but not necessarily in as complete a way as the original authors intended it.

Where a concept or theory shares a significant body of work in both general education and design education literature, that work can be found in the relevant property such as reflection [[→83](#)], learning by doing [[→145](#)], feedback [[→74](#)], or hidden curriculum [[→271](#)].

Concepts and theories with significant overlap in design education

Constructivism

Constructivism is a learning theory that places the student at the centre of the learning process, arguing that the student constructs learning by applying new ideas or information to existing thinking and knowledge (Vygotsky, 1978; Piaget, 2011). Constructivist scholars argue

that new thinking comes from experiences that are given value or meaning by students rather than by educators (Narayan et al., 2013), and it is this relationship of experience and meaning-making that distinguishes all pedagogies based on constructivism.

In constructivism, students actively participate in the construction of knowledge, a position that is often contrasted to *banking* (Freire, 1970/2000) or *transactional* (hooks, 1994) models of education, where the knowledge is transferred from expert to novice. It follows that learning experiences are to some degree subjective and, by some interpretations of the theory, knowledge [→248] itself can be considered as a form of meaning-making. In practical terms, whilst specific learning outcomes might be initiated or prompted through teaching, they cannot then be perfectly and deterministically predicted with regard to what is learned (Orr & Shreeve, 2018).

A core purpose of studio is to provide ample time for personal and experiential learning as well as meaning-making through extended immersion [→118] over time (learning by doing [→145]). This focus on experiential learning and immersion is based on constructivist ideas in studio literature (Hill, 2017; Orr & Shreeve, 2018; Faerm, 2023). Experiential learning is central to learning by doing [→145], making [→147], materiality [→142], and play [→155], whilst meaning-making is essential for developing judgement [→98], character [→101], and expertise [→90]. Design education relies on tacit knowledge, which involves students (re)constructing knowledge rather than receiving explicit knowledge and knowing [→248] through transmission.

Social constructivism extends constructivism and argues that learning is influenced and carried out in social contexts (Vygotsky, 1967; 1978). A studio environment is an example of social constructivism in action, where students learn by listening-in [→170], social comparison [→172] of their work, and learning and designing collectively [→166]. At a broader scale, studio supports forms of meaning-making that depend on social, cultural, or negotiated methods, such as those found in professional or disciplinary settings. In these settings, the passing on of disciplinary ideas often depends on properties like enculturation, acculturation, and indoctrination [→285].

Experiential learning

Experiential learning refers to learning that occurs by doing something and then using that experience to learn from it (learning by doing [→145]). This type of learning can come from recognising the usefulness of an activity, imagining how an experience may be applied in the future, or forming strong memories of an affective experience. Experiential learning has a long history in education and is closely related to constructivism. It was famously formalised by Kolb (Kolb, 1984; Kolb & Kolb, 2012), who believed that

learning is grounded in experience, involves interactions between people and the environment, is best thought of as a process (not outcomes), and creates knowledge. These characteristics will be familiar to experienced design educators who are used to studio-based education.

However, some differences emerge when Kolb's ideas are considered in detail or when applied to longitudinal studio learning practices. The form of reflection that takes place in studio is not only the singular 'reflection on' outlined by Kolb, but also includes the reflection-in-action added by Schön (1987; 1991), covering a more immersive and longitudinal component of design and learning. As a further example, although Kolb incorporates some consideration of educational spaces in his model, it remains a limited account of person and context, compared to how studio operates as place [→198]. Contemporary concepts of embodied, extended, and distributed cognition [→38] provide alternative ways to understand how cognitive learning mechanisms work, specifically in terms of how thinking is extended through our surroundings (place [→198]), other people (learning and designing collectively [→166]), and our bodies (Murphy Paul, 2022). As a final, critical example, Kolb's model famously, and deliberately, omits significant social factors, being rooted in a psychological tradition of learning and development. Kolb does acknowledge these omissions in later editions (Kolb, 2014), but the importance of social constructivism in studio is such that uncritical applications of the theory are avoided. In other words, like many other theories, it's important to use the model with care when applying it in a complex setting like a studio.

Threshold concepts

A threshold concept in education is a learning experience that changes the way a student understands a concept or subject. As Meyer and Land (2003) originally described it, these thresholds describe learning experiences that enable 'seeing things in a new way' (p. 412). Threshold concepts are often difficult or critical ideas in a discipline that require greater support than other ideas in order for students to make sense of them. The support required will vary by student and concept, and different students might even have their own personal threshold concepts or differing accounts of thresholds, such as those surrounding design methods (Gray, 2016b; Pivonka et al., 2024). Studio acts as a place where variable support can be offered and respond directly to student need (active teaching [→71]; critique [→79]).

Threshold concepts require that students confront previous knowledge [→248] and expertise [→90], revising or replacing it, meaning engagement with threshold concepts is very often a transformative pedagogy [→111]. A transformation is effected in the students themselves

– including their beliefs and understandings – and one purpose of studio is to engender this ‘metamorphosis’ (Siegel & Stolterman, 2008) or transformation [→ 111] of a student into an emerging designer. Building on Meyer & Land (2003), Smith (2013) frames this process of transformation as the acquisition of threshold concepts which function as ‘portals to professional expertise’ (p. 37) and are characterised, in part, as ‘potentially troublesome’.

Cognitive apprenticeship

Cognitive apprenticeship (CA) is an educational approach situated somewhere between apprenticeship [→ 64] and traditional teaching methods (Collins et al., 1991); it is ‘the use of an apprentice model to support learning in the cognitive domain’ (Dennen, 2004, p. 813). The goal of CA is to offer the best aspects of apprenticeship [→ 64] but to avoid the traditional downsides of a master-apprentice relationship. Educators using this approach are required to:

- ‘identify the processes of the task and make them visible to students;
- situate abstract tasks in authentic contexts, so that students understand the relevance of the work; and
- vary the diversity of situations and articulate the common aspects so that students can transfer what they learn’ (Collins et al., 1991, n.p.).

For cognitive apprenticeship to be effective, it is critical to have an environment that supports situated learning (knowledge [→ 248] is being used in authentic or otherwise meaningful context(s); e.g., learning by doing [→ 145], simulation [→ 232]); specific aspects of communities of practice (learning is shared and social with a ‘personal investment and mutual dependency’; e.g., social networks [→ 185]; social comparison [→ 172]); intrinsic motivation (tasks are linked to learner goals that exceed ‘getting a good grade’; e.g., play [→ 155]; journey [→ 104]; identities [→ 94]); and ‘exploiting cooperation’ (using collaborative approaches to problematise learning and offer opportunities for competition; e.g., learning and designing collectively [→ 166]) (Collins et al., 1991, n.p.).

Collins et al. (1989) identify the primary methods that support cognitive apprenticeship as modelling, coaching, and fading. Dennen (2004), commenting on the application of cognitive apprenticeship in general education contexts, summarises similar and complementary

methods to support cognitive apprenticeship, including modelling, explanation, coaching, scaffolding, reflection, articulation, and exploration. In a studio context, Coso Strong et al. (2019) echo comparable methods in their framing of coaching practices that draw from a shared *playbook* of design moves, including modelling, coaching, instructional scaffolding, articulation of student thinking, reflection [→83], and providing room for exploration. In another studio setting, Gray (2021) also identifies cognitive apprenticeship as one strategy to enable the scaling of studio curriculum, enabling not only educator-led learning but also engaging students to implement modelling and coaching in vertically-integrated studio activities.

Concepts and theories that seem to overlap with design education but have important differences

Communities of Practice

Lave and Wenger (1991) proposed Communities of Practice (CoP) to describe how practitioner groups – which share a common aim or identity – pass on knowledge between members. Central to the theory is the *situated* nature of the community and its knowledge [→248], particularly how knowledge, culture, and traditions are passed on as part of the process of practice and education (see also habitus [→265]). CoP includes a core principle describing how experts ('old timers') educate novices ('newcomers') as a mechanism to build expertise [→90] and social connection. As part of this theory, Lave and Wenger (1991) introduce the idea of *legitimate peripheral participation*, in which learners move from novice to expert through increasing levels of participation. Over time, learners engage further in the community and, ultimately, define it. The idea that learning within a CoP will also change and define that community is a key feature of the theory, explaining how traditions of praxis, such as studio, can persist but also change over time.

While the ideas from CoP have relevance to many aspects of studio learning, some caution is required. Researchers and educators have only applied parts of the concept, such as the shared learning goal of a group, or even just the heuristic meaning of the title – overlooking critical details in the theory, such as the change to the community through participation. As with other major theories, more recent work and contemporary criticisms should also be considered (see Lave, 2019, for example). One final challenge is that most educational studios remain separated from professional contexts and communities. Instead, they act as places of simulation [→232]. Hence students are not engaging in the CoP that they will eventually join. However, the idea of an educational CoP in studio can still be relevant

because it is a place of identities [→94], habits and rituals [→262], and social networks [→185].

Problem-Based Learning (PrBL)

Problem-based learning (PrBL) is a pedagogical approach that makes use of problems, problem contexts (scenarios), and/or problem solutions as catalysts and opportunities for learning (Wood, 2003). PrBL is usually related to specific disciplines in applied fields, such as engineering, medicine, business, and some design domains (Barrows, 1996). PrBL is focused on outcomes, offering well-bounded and clearly defined problems and/or solutions, to encourage particular learning. For example, PrBL is frequently used in medical education where problems, such as patient symptoms, are offered as the starting point and condition for exploration of that problem, and feature correct or optimal solutions. Hence, PrBL works well for Diagnosis-Solution problems, Decision-making problems, and Situated Cases/Policy Problems (Jonassen and Hung, 2008).

However, PrBL can falter when it comes to design problems, where the level of complexity and uncertainty in most design contexts is too great to control for specific learning outcomes (Jonassen & Hung, 2008). Cennamo et al. (2011), building on Jonassen & Hung, develop the argument further and advocate that studio (or studio-based learning), rather than structured PrBL in its typical manifestation, is the only appropriate way to properly engage in design problems because it offers the space and time to approach the uncertainty and ambiguity [→209] present in real design problems. Rather than relying on a set problem-solution paradigm, most design curricula make use of studio in conjunction with the design brief [→67], encouraging exploration within a broad and contestable problem and solution space through which the design student builds expertise [→90] and situated judgement [→98] capacity (Schön, 1984; Sosa, 2020).

Project-Based Learning (PjBL)

Project-based learning (PjBL) is an approach in education that focuses on longitudinal or in-depth activity oriented towards some goal or agreed outcome. Because it offers a goal-oriented learning context, PjBL can support many different activities within the overall paradigm. In many cases, it requires students to select and use multiple methods independently. PjBL is often associated with real-world or authentic topics or problems that form learning experiences through which students navigate and construct knowledge [→248]. Hence, PjBL can encourage a student-centred and constructivist approach to learning. However, in traditional learning settings, particularly in earlier curricula (or schools),

PjBL has to carefully balance the openness of the outcome with the scaffolding that may be required by students for it to operate successfully (Kokotsaki et al., 2016).

In studio, the PjBL approach serves a dual purpose: 1) as a pedagogical framework for the curriculum and its teaching, and 2) as a simulation [→232] of a real-world design project but with the authentic experience of engaging as a designer in a project (for example, the experience of uncertainty and ambiguity [→209] felt in any design project). This latter purpose distinguishes much studio PjBL from mainstream PjBL: the experience of conducting the project is, *in and of itself*, part of the learning outcome. Most studio education uses repeated projects to reinforce and develop students' judgement [→98] and expertise [→90] and these form project cycles [→132] over time, offering another important structure to studio. Some studios also deploy PjBL in the context of live projects, where the learning takes place in a real-world setting, albeit the advantages and challenges of this approach are worth considering (Salama, 2017).

Knowledge and Knowing

In terms of content, design knowledge is a collection of different cognitive artifacts with different purposes. These include visions to stimulate and steer strategic discussion; proposals to integrate into the development of specific projects; tools to help understand the state of things and implement design ideas; along with reflections on the sense of what we are doing or could do.

(Manzini, 2009, p. 5)

Studio is a space that abounds with knowledge. Existing in many different forms and with different levels of physicality, temporality, or tacit-ness, knowledge and knowing have numerous impacts on students' professional competence and identity [→94] formation, and on educational practices. Knowledge and knowing practices are central to signature pedagogical features of studio such as the crit [→79], embedded in habits and rituals [→262], manifested in prototyping [→158] and making [→147]

activities, and central to core pedagogical approaches in studio such as tacit transfer, [feedback](#) [[→74](#)], and [reflective learning](#) [[→83](#)].

This property acts as a lens that focuses on how students and educators employ, operationalise, and sustain knowledge and knowing through patterns of action, interaction, and embodiment in studio. These interactions among knowledge, action, and ways of being positions studio as a unique culture that encapsulates and frames ways of knowing which are oriented towards change. These knowledge-informed interactions, in turn, privilege particular *epistemological stances*. A competence-focused stance might prioritise knowledge that informs one's professional judgement [[→98](#)], which is instantiated and developed through [critique](#) [[→79](#)] and [feedback](#) [[→74](#)]. A materially-focused stance might prioritise knowledge built through [making](#) [[→147](#)] and [prototyping](#) [[→158](#)]. Finally, a personally-focused stance might prioritise reflexive engagement with individual components of an emerging designer's [identity](#) [[→94](#)] and [character](#) [[→101](#)]. These various engagements with knowledge in studio indicate the presence of a wide range of *kinds* of knowledge and *ways* of knowing (e.g., Goldschmidt, 2003; Höök & Löwgren, 2012; Nelson & Stolterman, 2012) – which interact in complex and interconnected ways.

Researchers of studio education have previously used the concepts of knowledge and knowing to critically engage with studio in a range of ways. These include studying the types of interactions ([power transactions](#) [[→282](#)]) between students and educators (i.e., [critical pedagogy](#) [[→276](#)]; Anthony, 1991; Dutton, 1987), identifying what kinds of knowledge are communicated in studio activities and [critique](#) [[→79](#)] practices (e.g., [listening-in](#) [[→170](#)]; Jones et al., 2021; Dannels & Martin, 2008; Uluoğlu, 2000); describing how knowledge can be distilled and communicated in [informal](#) [[→42](#)] ways (e.g., through [play](#) [[→155](#)] and [serendipity](#) [[→212](#)]; Goldschmidt, 2015; Zimmerman, 2022); and deconstructing how knowledge is reified in [design briefs](#) [[→67](#)] and [reflective](#) [[→83](#)] learning practices (Hoadley & Cox, 2009; Schön, 1984).

Design knowledge takes varied forms

Multiple types of knowledge are commonly used and present in studio environments. These can be categorised by knowledge type (e.g., precedent knowledge, intermediate-level knowledge) or detail the perspective through which various types of knowledge are formed or exercised (e.g., experiential, embodied, tacit).

Precedent Knowledge

Precedent knowledge is knowledge a designer stores about *real artefacts* [→ 151] and experiences rather than abstract forms of knowledge such as theories (Boling, 2021; Nelson & Stolterman, 2012). Precedent artefacts [→ 151] can include: concrete items that have been designed (e.g., a creative or inspiration file (Leclerc, 2010)); ‘representational stimuli’ (Gonçalves et al., 2014); past lived experiences (i.e., episodic knowledge of prior events; a knowledge ‘reservoir’ (Lawson, 2004a)); formal elements of a disciplinary canon that a designer has been exposed to as part of their training in studio (Boling, 2021; Clark & Pause, 2012; Schön, 1990); or even elements that surround the designer in studio as they do their work (Jacucci & Wagner, 2007).

Precedent knowledge originates in artefacts [→ 151] and experiences and designers constantly absorb this as they go about their everyday lives as a form of sensemaking and immersion [→ 118]. These elements of a designer’s repertoire can then be activated non-deterministically in studio through design activity. Formalised knowledge of design precedent can also be realised through disciplined generation and documentation approaches such as the *design case* (Boling, 2010; Gray, 2020) as well as informal practices such as the collection of interesting or potentially relevant artefacts that inspire the designer or allow them to problematise their design space (e.g., a mood board or creative file; surfaces [→ 48]).

Intermediate-level knowledge

Intermediate-level knowledge is an umbrella term that includes ‘knowledge [types] that [are] more abstracted than particular instances, yet do not aspire to the generality of a theory’ (Höök & Löwgren, 2012, p. 23:2). This category of knowledge includes many types that enable or guide the designer in generating new design outcomes, including methods and tools, guidelines, styles, heuristics, patterns, best practices, and annotated portfolios (Eckert & Stacey, 2000; Löwgren, 2013).

A designer relies upon many of these intermediate-level types of knowledge to support their work. For instance, design methods can prompt a designer to consider new constraints or types of outcomes, providing alternately prescriptive or performative prompts that can direct or inspire action (Gray, 2022b). Heuristics may lead to iterative evaluation and design improvement, functioning as cognitive *shortcuts* to highlight potential opportunities for further action (Yilmaz et al., 2016). Patterns or styles may also provide structure by adopting established or socialised practices or approaches, guiding the designer through analogical forms of reasoning (Goel & Bhatta, 2004) or creating guiding systems (Frost, 2016). Annotated

portfolios may aid the designer in identifying juxtapositions of existing precedent artefacts that inspire a *creative leap* (Gaver & Bowers, 2012).

Intermediate-level knowledge can be shared in multiple ways, including books or collections. For instance, researchers have codified methods in *Universal Methods of Design* (Hanington & Martin, 2019) or the *Delft Design Guide* (van Boeijen et al., 2014) as a mechanism for sharing knowledge with design students to explore and use in their studio work. Similarly, collections of guidelines around practicalities and tangible issues like accessibility, ergonomics, usability, and so on, such as those found in the *Metric Handbook: Planning and Design Data* (Buxton, 2015) can take on formal properties – even in some cases aligning to professional standards. In a more local sense, annotated portfolios or styles may be collected and synthesised through interactions specific to a design studio or designer. Pattern language is another common type of intermediate-level knowledge found in studio, drawing on the original articulation of patterns in architecture and urban planning by Alexander et al. (1977). Pattern languages have been used to develop common heuristic approaches to design situations such as design systems (Frost, 2016; Rose et al., 2023) that can standardise work within or across design disciplines [→ 238].

Experiential and embodied knowledge

Experiential and embodied knowledge is knowledge gained through being and acting in the world. In design education, experiential and embodied forms of knowledge arise from doing something or having some embodied experience, or ‘*knowing how*’ (Ryle, 2000; Dunne, 1997). This can be contrasted with declarative forms of knowledge such as remembering facts, information, or propositions; ‘*knowing that*’ knowledge. *Knowing how* knowledge is also referred to as personal or tacit knowledge (Polanyi, 1966), since it arises from our lived experience with the world and is not transferable directly to others. Additionally, *knowing how* knowledge has roots in our embodied selves, and as noted by Hendren (2020), this embodied knowledge – if taken on in a way that celebrates the subjective position of our bodies and the other bodies that students design for – can radically alter narratives of normalcy and homogeneity of lived experience.

From the design student’s perspective, the construction of *knowing that* and *knowing how* knowledge happens through meaningful reflexive engagement in design work. For instance, a student can construct *knowing that* knowledge through exposure to precedent and intermediate-level knowledge; while students generate *knowing how* knowledge through experiences of design processes such as prototyping [→ 158], making [→ 147], or more broadly, learning by doing [→ 74]. For example, a student can memorise

information about colour and students can also learn from the experience of using colour. There may be a different focus on each type of learning at different points in a student's learning journey and studio plays an important role in helping to make these pedagogical as well as design decisions. Frick (2023) provides detailed explanations of these forms of knowledge and how educators can support them in educational experiences.

Knowing how and knowing that encompass practical knowledge (or phronesis) and embodied knowledge, which is 'inseparable from the knower' (Nelson & Stolterman, 2003, p. 25; see also Dunne, 1997). A design student must account for and build both forms of knowledge in ways that are personal and subjective, recognising this subjectivity yet also seeking to relate this personal knowledge to other forms of knowledge that are shared within studio, discipline, or socio-cultural context.

Tacit knowledge

Tacit knowledge is *inarticulable* knowledge or 'knowledge [that] does not appear in the form of rules' (Polanyi, 1966). More precisely, it is knowledge that can only be constructed, expressed, and activated in certain ways. In studio, experiential tacit knowledge can be found in the development of judgement [→ 98], identity [→ 94], or character [→ 101]; and cultural or normative tacit knowledge can be found in enculturation [→ 285], belonging [→ 189], and the hidden curriculum [→ 271]. These instances are notable for their non-written, and even non-verbal, articulations in studio, meaning they are often associated with properties of studio which are not readily visible, but critical in constructing tacit knowledge (Venkatesh & Ma, 2019). As one example of this non-verbal transfer of tacit knowledge, Groth (2017) describes a series of interactions between a sighted expert and a deafblind novice in throwing clay, identifying that 'tactile communication was sufficient to pass over to the participant my embodied and tacit knowledge' (p. 59).

Tacit knowledge transfer takes place in a range of studio activities. Sketching and demonstrating drawing, for example, is a common non-written means of conveying knowledge. Importantly, the precise learning that takes place will vary from student to student, and this variation is an intentional and critical part of tacit transfer. The indeterminacy surrounding the construction and use of this knowledge is summarised in Lyon's (2011) phrase 'Like, but not exactly like' (p. 26). This means that the student recreates tacit knowledge rather than being *transferred* (Sennet, 2008; Venkatesh & Ma, 2019; Lodaya, 2020). However, this places considerable pressure on the student, and most studio curricula induce

students into tacit practices through immersion [→118] over time [→121] and as part of developing expertise [→90].

The inarticulable nature of tacit knowledge offers educators a challenge in conveying this type of knowledge to students, many of whom may be more familiar with explicit forms of knowledge, such as declarative or *knowing that* knowledge. But it is precisely this inexplicitness that gives tacit knowledge its utility and value in studio because it supports complex and ill-defined learning concepts, such as uncertainty and ambiguity [→209], play [→155], or risk and failure [→227] (Orr & Shreeve, 2018). Abel (1981) argues that the inexplicit nature of tacit knowledge is valuable because it allows students and educators to discuss and create ideas and concepts *simultaneously*; that is, they are not only discussing the tangible and explicit, but also the intangibles of forming ideas and speculations.

Tacit knowledge is difficult to discuss because of its non-articulable nature and it has tended to be part of an unspoken studio tradition. We have seen how tacit knowledge has a positive function supporting uncertainty and ambiguity; however, there are also downsides, because it is unspoken and can become part of the hidden curriculum [→271]. Hence, from a practical point of view it is not about choosing explicit over implicit knowledge. Instead embracing both and focusing on the pedagogical consequences of the application matters most. Educators should ask what is required at what times in what contexts to ensure students have an appropriate balance of explicit structures needed to play with risk and failure [→227] and implicit elements that encourage uncertainty and ambiguity [→209].

Design knowledge is activated through the artefacts, interactions, and trappings of studio

In a design studio, knowledge can be made visible through various means, such as social interactions, artefacts [→151], rituals [→262], and core educational methods (**Foundations and Methods** [→60]) which make studio a coherent and meaningful place. However, design knowledge is often activated or invoked in social and distributed studio practices while remaining inexplicit or tacit, making it difficult to describe or access and contributing to the ‘mystery’ of studio (Coyne & Snodgrass, 1991).

Design knowledge exists in things found in studio

Knowledge is latent in many elements of physical or digital studios. This includes (physical and digital) artefacts [→151] that function as precedent materials (Boling et al., 2015; Vyas & Nijholt, 2012); making [→147] and prototyping [→158] activities that demonstrate embodied knowledge and make visible a student’s capacity for judgement [→98] (Kroes, 2002; Lim et

al., 2008); and cues in the construction of a studio space itself (e.g., no front [[→46](#)]) that indicate a decentralised approach to engagement with knowledge (Jones, 2022a; Shulman, 2005).

Elements of explicit and visible design knowledge can take a variety of forms, such as Boling et al.'s (2015) curation of a design library with visual precedent artefacts and Vyas and Nijholt's (2012) exploration of *artful surfaces* [[→48](#)] in industrial design studios that both inspire and organise design activity. *Things* in studio can be considered a form of knowledge itself (Jones, 2013), reflected in recent work around digital materiality (Jung & Stolterman, 2012). *Things* can include verbal and material communication, patterns of discussion and *listening-in* [[→170](#)] used to disseminate design knowledge, or one's ability to observe *making* [[→147](#)] or *prototyping* [[→158](#)] practices as they occur.

Design knowledge is activated through elements of studio

Core studio pedagogical moves, like the crit, can invoke knowledge (see **Foundations and Methods** [[→60](#)]) and raise students' awareness. For instance, design knowledge is activated, traversed, and accumulated through *critique* [[→79](#)] processes that convey *feedback* [[→74](#)] and expectations regarding design practices (Dannels & Martin, 2008; Uluoğlu, 2000). These moves can enable students to access different points of view and develop alternate perspectives, act as sources of knowledge that might provoke further design investigation, or shape students' *identity* [[→94](#)] and capacity for *judgement* [[→98](#)] (e.g., Schön, 1984). Studio can also activate knowledge in relation to other goals beyond *artefact* [[→151](#)] development, reflected in Corazzo's (2019) conjecture that studio is a place 'to make artefacts and selves' (p. 1256) or Brandt et al.'s. (2013) concept of the *studio bridge*, where practice knowledge and academic knowledge come into contact and can be mutually shaped (see also Gray, 2014a for a critical account of this interaction).

Design knowledge is reproduced and re-formed through social and distributed mechanisms

Knowledge is not only personally held, but is also socially distributed (*extended and distributed cognition* [[→38](#)]). Knowledge and knowing can be held or shared amongst individuals in a group setting (Hutchins, 2001). For example, a project completed by a group of students is both a shared process of knowing (e.g., *listening-in* [[→170](#)]; *social comparison* [[→172](#)]; *critique* [[→79](#)]) and a shared repository of knowledge (e.g., *precedents*; *surfaces* [[→48](#)]; *making* [[→147](#)]; *prototyping* [[→158](#)]). However, the social and distributed nature of design knowledge is far from a matter of simple

transmission. Explicit and shared knowledge might be distributed through means of power, such as through the invocation of knowledge or habits and rituals [→262] by an educator (see also critical pedagogy [→276] and power transaction [→282]). Embodied knowledge may be socially distributed through shared play [→155] or other making [→147] activities that prioritise building the knowledge with or through our bodies. Design knowledge is also reproduced and re-formed over time, continuously evolving to match the demands of industry, society, and the changing shape of the discipline [→238]. This reproduction is necessary since much of the knowledge that studio relies upon is tacit, relates to trends or styles evident in precedent materials, or is transmitted only through enculturation [→285] and habits and rituals [→262]. Educators and students must confront this volatility and lack of a single source of ‘truth’ for design knowledge. In addition, students have to reconcile the knowledge communicated explicitly and tacitly in studio with the expectations of knowledge asserted through job descriptions in industry (Gray & Kou, 2019; Kou & Gray, 2019).

Design knowledge is pluralistic, subjectively experienced, and socio-political

Design knowledge is pluralistic

As we have described, design knowledge takes on numerous forms and types that are impacted by our experienced reality, our value orientations, and the ways we relate to culture, society, and political structures. At the most abstract level, the pluralism of design knowledge is impacted by our cosmology – or the way we *individually* view the world that we *collectively* inhabit (cf., Dilnot, 2017; Nelson & Stolterman, 2012). Thus, our interpretation and use of design knowledge is informed and shaped by our subjectively experienced worldview in addition to collective assumptions embedded in cultural or societal structures we belong to. This dual pluralism, including pluralism of cosmologies and pluralism of individual designer perspectives, results in a state of epistemic diversity which is one of the most characteristic features of design knowledge as it is employed in studio practices.

In studio, students and educators might build upon indigenous forms of knowledge that are often fused with cultural or spiritual ways of knowing (O’Sullivan, 2019; Tunstall, 2023), scientific forms of knowledge relating to perception or materiality, and one’s own lived experience – all at the same time. As studios continue to become more diverse, knowledge originating in different cultures, from different gender identities, through differing senses of spirituality and cosmology, and with different economic incentives will not only impact studio experiences, but also provide insight

into how knowledge is continually reshaped by these dimensions (Gray, 2022a; Noel, 2022).

Design knowledge is subjectively experienced

Each design student and each educator encounters design knowledge through different phenomenological engagements and relationships. Because experiential and embodied knowledge or *knowing how* is found in individual or shared life experiences and declarative or *knowing that* knowledge is found in formal structures, the kinds of knowledge that students and educators bring with them into the studio from other places can be seen as a source of knowledge enrichment. The subjective experience of knowledge shifts the focus of studio from content *delivery*, in an explicit sense, to the creation of experiences (including *habits and rituals* [→ 262]) that allow a designer to build their own repertoire of knowledge. The development of a student's capacity for *judgement* [→ 98], *expertise* [→ 90], and *character* [→ 101] includes observable behaviours that prove that knowledge has been acquired. These observations can facilitate an educator's or student's indirect *assessment* [→ 234] of personal knowledge – 'inseparable from the knower' (Nelson & Stolterman, 2003, p. 25) – that informs their design action.

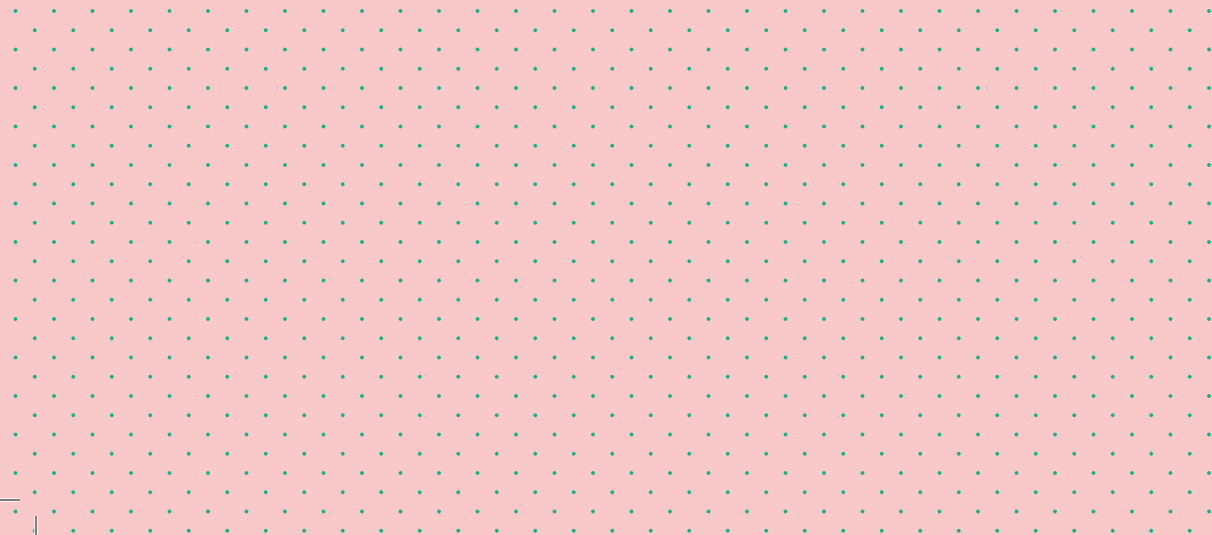
Design knowledge is socio-political

Design knowledge carries values, disciplinary assumptions, and professional roots, including latent forms of power and authority. Design knowledge is inherently value-laden (Costanza-Chock, 2020; D'Ignazio & Klein, 2020; Verbeek, 2006). Design knowledge impacts the *habitus* [→ 265] of studio and students' ability to shape their own learning experiences through the knowledge they bring with them (cf., *critical pedagogy* [→ 276]). Specific types of knowledge also bring assumptions of power or privilege (*power transaction* [→ 282]), including forms of knowledge valued by studio educators and students and who are considered to have these types of knowledge. For example, Afrofuturist scholars have questioned the assumption that the Western design canon is primary. This is part of a broader trend among indigenous scholars who call for a de-centering of Western traditions to allow other forms of knowledge to be seen as relevant to studio practices (e.g., Lima, 2023; Noel, 2022; O'Sullivan, 2019; Tunstall, 2023; Winchester, 2018). Design, as a claimed (and disputed) *discipline* [→ 238], also influences what is considered valid knowledge within its domain. As with other academic disciplines, this influence is enacted through academic journals, key texts and canon, and common reference points, many of which are reflected or utilised in studio.

Design knowledge is permeable and changeable

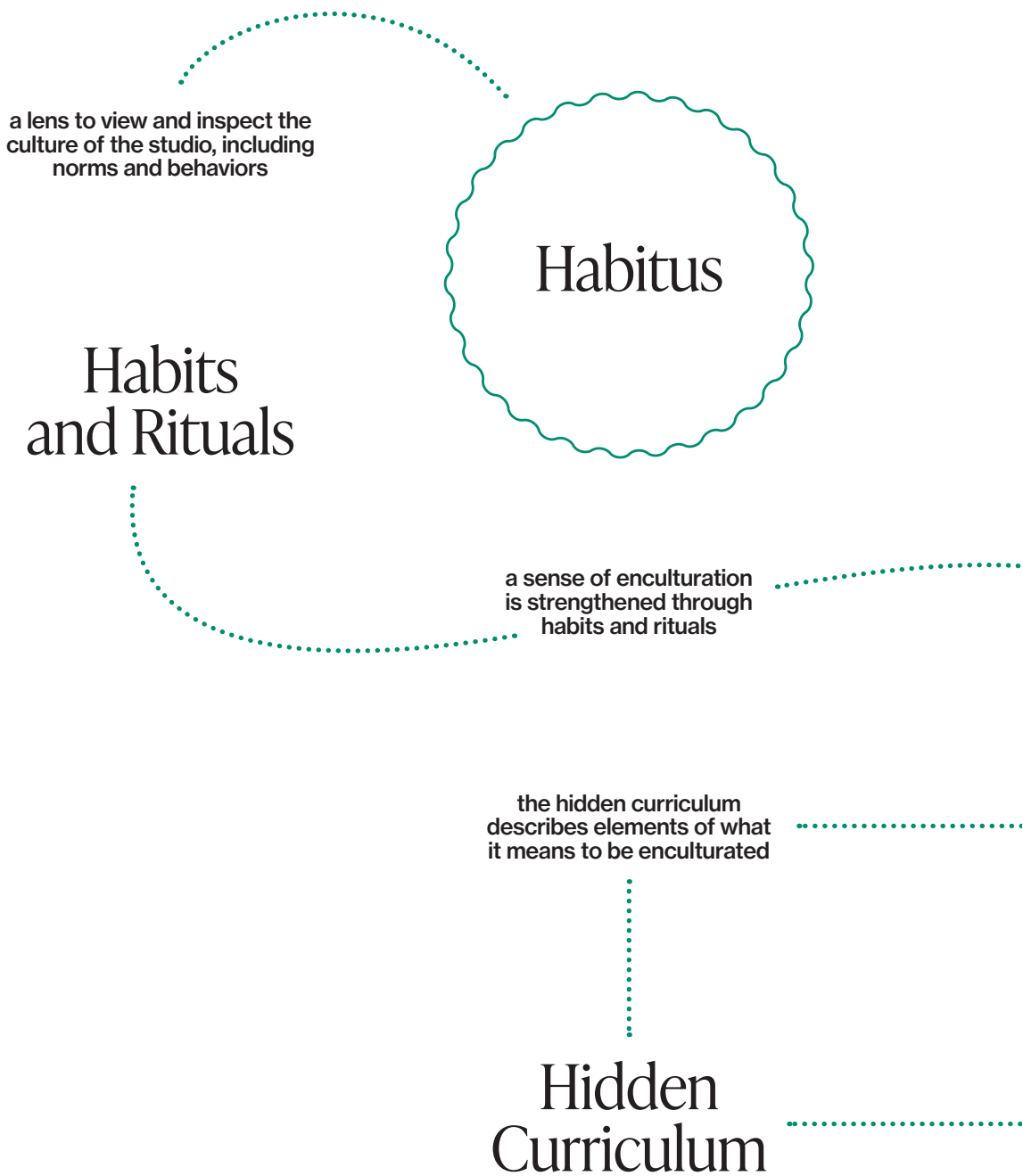
Design knowledge is constantly influenced, updated, and augmented by the actors and contexts involved in studio and the discipline at large. However, the degree to which knowledge is actionably permeable and changeable depends on the ability of students and educators to actively shape and alter the activities that occur in studio – forming a plurality of identities [→94], forms of expertise [→90] and judgement [→98], and different states of habitus [→265]. Students coming to studio will have culturally- and contextually-based forms of knowledge, commonly described as ‘funds of knowledge’. This form of knowledge encompasses the cultural, situational, or practical knowledge students have built in their formative years (Svihla et al., 2022). How this knowledge is treated – or even acknowledged (enculturation, acculturation, and indoctrination [→285]; hidden curriculum [→271]) – in studio will depend on the extent to which such knowledge is allowed to emerge and inform design decisions alongside other historically prominent forms of knowledge (e.g., canon, patterns, habits and rituals [→262]). Additionally, as disciplines [→238] of design continually change and shift, different forms or clusters of knowledge might be considered as central or tangential at any given time (Davis & Dubberly, 2023). This constant shift and evolution of personal and disciplinary perceptions and activation of knowledge is negotiated among practitioners, design students, and design educators in studio.

Cultures and Power



In every site of learning, there exists what is seen together with what is not seen. Entering a studio, we can readily notice projects being worked on and critique taking place ^{habitus}. It is not so easy to see what students absorb from everything around them. This is because of the way that activities, spaces, and interactions – the culture of studio – have been structured for them ^{hidden curriculum} *and* because of students' default position in the structure of studio ^{power transaction}. Neither is it easy for the students themselves to see how they are taking on the culture of studio ^{enculturation, acculturation, and indoctrination} or how they might find their own ways of being in studio without some perspective adopted that allows them to participate in shaping the culture ^{habits and rituals} and purpose ^{critical pedagogy} of studio.

A map of the Cultures and Power cluster showing possible relationships and connections between properties.



a lens to view the power latent
in the studio and opportunities
for students to have more
agency in their learning

Critical Pedagogy

Power Transaction

enculturation and indoctrination
often are shaped through power

Enculturation, Acculturation, and Indoctrination

modes of enculturation are
often elements of the hidden
curriculum

Habits and Rituals

The sound of cymbals, the video, the exotic music, the popping of Coke can lids, and the display of other objects entertain and instruct. More importantly, however, they signal a different kind of course. ‘This one will be different from the others’, they think. And it is. In this course experience there are no right and wrong answers, and grades matter less; in its place I continue to act as ‘stranger’, showing and telling in non-traditional ways, challenging their norm and slowly establishing a new one.

(Boling et al., 2013, p. 189)

Habits and rituals produce and reproduce meaningful structure in studio. They encompass common social and material engagements in studio spaces (**Interactions and Sociality** [→162]; **Artefacts and Making** [→138]), pedagogical elements that provide consistency and structure (**Foundations and Methods** [→60]), and personal quirks that reflect an individual and developing design identity [→94] (see also **Expertise and Identity** [→86]). Each involves combinations of students, educators, spaces, and social or formal means of engagement with design work.

Rituals can be accessed, described, and shaped in multiple ways within studio – from an overarching narrative (Boling et al., 2013), to signalling the types of thinking that are possible (Hokanson & McCluske, 2016), to informing the selection and performance of particular pedagogic moves (e.g., **critique** [→79]; Dannels, 2005). In parallel, individual students and educators take on and sustain habits by pointing towards patterns of personal behaviour that may mirror broader collective studio rituals or relate to an individual’s **journey** [→104] or engagement with design processes. Design scholars Halse and Clark (2008) and Goodman (2013) view engagement with design as inherently performative (**performance** [→107]), with key elements of design activity taking on anthropologically ritualistic behaviours that incorporate elements of habit and ritual.

Habits relate to an individual’s experience of studio, including quirks regarding placement or types of **materials** [→142] or preferred areas of the physical space and **place** [→198] to conduct specific activities (Modell & Gray, 2011). These habits connect to rituals or shared norms of interacting with others (**learning and designing collectively** [→166]) and rely on physical space and **dialogue** [→181] to support instructional or informal interactions. As such, habits can signal transitions from formal to social interactions,

tacitly noting ‘now is the time to...’ or orally communicating ‘this is how we do things’.

Habits and rituals are visible and aesthetic

Boling et al. (2013) consider the narrative qualities of studio education as part of the framing of studio interaction. They suggest that when habits are made visible to students they become aware of the enculturation [→285] going on, their role as a protagonist of their own learning (cf., Parrish, 2009), and new sets of norms they can use to form and characterise their developing identity [→94]. Signature elements of a studio that take on the role of habits or rituals and may become more visible or meaningful in shaping studio practices over time. Examples of these shared rituals include beginning class with music to situate and mark the beginning of that day’s learning, or the use of videos to illustrate key aspects of designerly development in students’ own narrative forms (Soza Tzec et al., 2013). Other examples focus more closely on the habits of individual students, such as choosing to sit in the same place in a studio (Modell & Gray, 2011), a preference for specific tools or processes (Bevins & Howard, 2020), or the development of strategies to provide critical feedback and a sense of community to other design students (Yorgancoglu & Tunal, 2020).

Habits and rituals support enculturation

The language of rituals has also been used to describe certain pedagogic moves within a studio context, most notably by Dannels (2005) who describes critique [→79] as a *tribal ritual*. Dannels’ connection of ritual and habit can be observed through the performance [→107] of certain kinds of activities that involve personal and collective behaviours, such as stressing the orality and informal nature of enabling new students to work effectively within the rituals of critique interactions (**Interactions and Sociality** [→162]). As Dannels notes, ‘oral genres have historical, traditional, and ritualistic aspects that newcomers are brought into the design world [...] through reenacting these oral rituals’ (p. 143). In this framing, ritual and habit become an ephemeral yet intrinsic part of engaging in studio, connecting the roles educators and students play (identity [→94]), informal learning spaces [→42], appropriate ways of speaking and interacting through language (dialogue [→181]), and ultimate goals (journey [→104]). Over time, the combination of individual habits and shared rituals inform how design students are enculturated into preferred patterns of action. Different combinations of these elements impact each student’s identity [→94] and related judgements [→98] differently. In the context of critique, the language of ritual enables expectations of formality or informality [→204], including the relationship

of particular types of critique to time [→121], location, or participants. These rituals inform and sustain a series of norms as they are orally communicated from advanced students to newcomers in studio (learning and designing collectively [→166]; confidence to speak [→176]; social comparison [→172]).

Habits and rituals can facilitate the reproduction of harm

Habits and rituals may be unintentionally or intentionally used to inflect a broader experience of being in studio. While rituals can support a purposeful and intentional narrative and emergent *habitus* [→265], at their worst, they can suppress students' agency and reproduce harmful power transaction [→282] structures (cf., hidden curriculum [→271]; critical pedagogy [→276]). For instance, the ritual of the 'design jury' during assessment can provide supportive opportunities for students to engage with industry experts, or be experienced as a demoralising hazing ritual where students are on a *firing line* (Anthony, 1991).

At their best, rituals have the potential to create a space of comfort for students – building both predictability (rhythm [→124]) and a sense of expectation that, once enculturated [→285], can be relied upon in further educational settings (Shulman, 2005). At their worst, habits and rituals can instantiate and reproduce structures of inequity and privilege. Habits can also be inspected as precursors for the enculturation of students that impact what actions or activities are considered acceptable in studio. For instance, if a student is allowed to habitually bully other students or dominate portions of studio space (see also character [→101]), these personal habits may negatively impact other members. However, these habits can also be positive, such as grassroots student-led efforts to provide supplemental instruction to their peers or engage in peer critique of their work (e.g., Gray, 2014a).

Elements of studio pedagogy, such as critique [→79] practices, are often the site of the most intense and structured rituals (cf., Dannels, 2005; Webster, 2007); however, rituals and habits can also vary by pedagogical preference, in coordination with particular affordances of a physical or digital studio, or they can emerge from student community practices over time. Habits and rituals can also be formed from uninspected yet rearticulated pedagogic assumptions revealing unintentional norm-setting that may affect studio experiences positively or negatively. Some habits and rituals – such as the 'crunch culture' of the architecture studio (Blythman et al., 2007) – have been successfully challenged. However, effecting systemic change may take a generation of studio educators or more to be fully addressed. Other habits or rituals may shift due to organisational, funding, or social pressures, for example, forcing studios to move from spaces with

dedicated individual working areas to shared spaces (see also [cost \[→51\]](#)), to collaborative versus individual modes of working, or to online modalities in the face of pandemic restrictions (Gray, 2021; Jones, 2021).

Habitus

Other outstanding questions include the role of the educational habitus, and how this structure relates to the community of professional practice. It appears that there is often a gap between these cultures of design, and if this gap truly exists, attention to potentially conflicting doxa may be at issue. This lens also points out different contexts of learning and working, but there are limited structures and existing literature in place to understand the habitus that is assumed by an individual design programme – bringing together perspectives of the surface features of the studio, the pedagogy, professors, and students, and the epistemological assumptions of the discipline. (Gray, 2013b)

Studio is a complex social ‘organism’ that is an intentional environment for [identities \[→94\]](#), [places \[→198\]](#), [prototyping \[→158\]](#) and [making \[→147\]](#) activities, and [critique \[→79\]](#) of design work to emerge and be celebrated (Brandt et al., 2013; Gray, 2022a; Shaffer, 2003). [Habits and rituals \[→262\]](#) are commonly used to make the organism of studio understandable to others, and over time, someone can be [enculturated \[→285\]](#) (or even [indoctrinated \[→285\]](#)) into a studio culture. For educators and researchers interested in studio and describing what is happening, making sense of the complexity, or even seeking to alter the current state of studio, the sociologist Pierre Bourdieu offers a valuable framing. Bourdieu sought to explain how cultures can be framed, described, communicated to others, and acted within. This property uses Gray (2013b) and Stevens’ (1995) application of habitus, a key aspect of Bourdieu’s ‘sociology of culture’ (cf., Bourdieu, 1977; 1984; 1990). Bourdieu describes the *structures* that make a cultural context coherent. Studios include a wide range of activities (**Interactions and Sociality [→162]**; **Foundations and Methods [→60]**) – and can be examined as structural entities that inhabit, reify, and reproduce a coherent sense of norms within which design educators and students

have the potential to act in meaningful ways. As Stevens (1995, p. 112) states, habitus ‘provides the feel of the game’ that is a combination of the material qualities of our existence (for example, having in-progress work [visible](#) [[→34](#)]), the socialisation and norms that relate to that material quality (for example, sharing [prototypes](#) [[→158](#)] with others), and the presence of structures that make these experiences coherent (for example, [rituals](#) [[→262](#)] such as the [crit](#) [[→79](#)]).

Researchers (Gray, 2013b; Stevens, 1995) have used the concept of habitus to reflect critically on historically normative studio practices, using the language of habitus to identify sources of [power](#) [[→282](#)] and [enculturation](#) [[→285](#)], while also identifying opportunities for student emancipation through adoption of tactics from [critical pedagogy](#) [[→276](#)] rather than encouraging indoctrination or tacit enculturation into predetermined cultural and social norms.

The language of habitus can be used to describe and analyse studio experiences

The language of Bourdieu’s habitus includes a specialised vocabulary that encourages descriptions of the underlying *structures* that define and shape social interactions within a given culture. With each type of structure we observe in studio – whether it be relating to social interactions ([informalities](#) [[→204](#)]; [dialogue](#) [[→181](#)]), pedagogical techniques ([Foundations and Methods](#) [[→60](#)]), organisation of practices and social groups ([social networks](#) [[→185](#)]), or prominent activities ([design brief](#) [[→67](#)]; [project cycles](#) [[→132](#)]; [prototyping](#) [[→158](#)]) – we can identify the:

- context(s) that these structures impact (Bourdieu’s *fields*)
- beliefs, attitudes, and norms that guide or shape these structures (Bourdieu’s *doxa*)
- and arrangements or choreographed interactions among structures (Bourdieu’s *structured* or *structuring structures*).

All of the structures contribute to a person’s experience of studio, which at a macro level, can be described as a coherent and holistically-felt *habitus*.

Fields describe the differing social contexts in which we experience life. In studio, these social contexts refer to [disciplinary](#) [[→238](#)] (e.g., epistemologies, core knowledge, key questions) and pedagogic praxis (e.g., dominant modes of pedagogy through [Theories and Knowledge](#) [[→218](#)], [feedback](#) [[→74](#)],

positioning of educator and student, and trajectory of engagement). Thus, fields serve as initial positioning devices for students, helping them to develop their own perception of an overarching habitus (i.e., this is a classroom; this is my role as a student). Studio educators may also project their own fields (i.e., studio is a *battleground* or *proving ground*; studio is a *safe space* to explore) which conditions their pedagogic approach. Fields can be refined over time to take on particular disciplinary emphases; for instance, the positioning of studio as a place to make [→147] or prototype [→158] things (i.e., a makerspace) versus studio as a place to have social impact (i.e., participatory or community spaces to effect local change).

Fields may allow dominant philosophies/theories of education or learning (Theories and Knowledge [→218]) and signature pedagogies (Foundations and Methods [→60]) to be identified and inspected, revealing how different disciplinary [→238] traditions of learning are coherent and meaningful. While in Bourdieu's vocabulary, fields describe larger *objective* social spaces that inform or prioritise certain ways of being, Gray (2013b) notes how different aspects of student experience in studio may also serve as particular fields of reference that relate to a broader notion of studio as habitus. For instance, encouraging learning and designing collectively [→166] in the classroom versus peer interaction outside of class time, or prioritising engagement in critique [→79] versus engagement in making [→147].

Doxa are beliefs, attitudes, and values that indicate what kinds of norms are appropriate or prioritised in a particular field. Doxa can arise, be created or adopted, and are seen as beneficial to the overall culture or community they support. Doxa can exist across fields (for instance, identifying normative critique [→79] practices in informal and formal contexts), and function as a normative infrastructure that indicates what kinds of actions are privileged in the reproduction of the structures of a given habitus.

In studio, most doxa are reproduced without explicit awareness or critical reflection (cf., Blythman et al., 2007; Gray & Smith, 2016; Webster, 2006). Since doxa are often communicated and supported tacitly, it can be challenging to know *when* certain doxa became valued, *why* they are valued, and *what* they contribute to the overall coherence of habitus. Adherence to doxa allows an actor to behave in a way that is subjectively experienced as 'common sense' or 'natural' in a field. However, knowledge of doxa alone will not allow that actor to inspect how it functions. For instance, certain studio norms – reflection [→83], making [→147], and prototyping [→158], or engagement in critique [→79] – relate to doxa. However, they have such a long history that they are not questioned as being core to what it means to participate in studio, even though these norms are central to habits and rituals [→262] and key to becoming successfully enculturated [→285] in studio. Generating awareness

of the doxa implicit in specific studio structures enables students and educators to question and remake studio as an intentionally-designed habitus. Such a redesign of habitus could focus on orienting a range of fields in particular directions and potentially shaping new doxa (perhaps ones that are more just or equitable than those currently in place; [critical pedagogy](#) [[→276](#)]) that guide future experiences of studio education.

Structured structures speak to the interactions among elements of habitus and other cultural experiences a student or educator might bring into studio with them. These interactions include instances where the structural framing of our prior lived experience either coheres with the cultural expectations of studio (e.g., a student who has a background in creative arts) or offers a sharp contrast with previous educational experiences or expectations (e.g., a student who has a low self-perceived creativity and who privileges more traditionally rational modes of thinking). Structures are not only pedagogical, but can also relate to patterns or rhythms of action in our everyday lives (e.g., help-seeking behaviours), in professional contexts (e.g., means of argumentation or knowledge-building), or in particular cultural or geographic settings (e.g., conceptions of time or social distance). Using ‘structured structures’ as an evaluative lens can aid in identifying how our unconscious and instinctive understanding of culture and our embeddedness in many cultural contexts is foregrounded when we enter a new cultural context – such as studio. When students enter a studio, they rely on a largely tacit and emergent praxis. These ways of being have been constructed in environments where they are already enculturated. When students experience sharp disconnects or a lack of [knowledge](#) [[→248](#)] they link studio structures to existing experiential structures or build wholly new structures to make sense of and adapt.

The hidden persistence of habitus is a means of control

When left uninspected, one’s felt experience of habitus can be used as a means of social control and [indoctrination](#) [[→285](#)] through [power transaction](#) [[→282](#)]. As Webster (2006) states in the context of studio, the goals of education are to ‘control entry or train individuals towards a dominant disciplinary paradigm or habitus’ (p. 287). This framing of habitus as largely unidirectional and oriented towards [enculturation](#) [[→285](#)] – where you are either engaged in the [disciplinary](#) [[→238](#)] paradigm or you are not – indicates a relative stability and degree of control in the habitus. Stevens (1995, p. 111) refers to this unidirectionality as a ‘social analog of genetic inheritance’ and states that our ‘identity is modified as we pass through the educational system and as we encounter other individuals throughout our lives.’ While there are small degrees of freedom where students can control

this identity [→94] modification – and perhaps even subvert it – with habitus, the dominant mode of engagement is ‘circumscribed by our own history, the history of our class, and the expectations of the groups with whom we identify’ (Stevens, 1995, p. 111).

A habitus of studio can be pluralistically experienced

In an analysis of studio, Gray (2013b) distinguishes the differences between a ‘habitus envisioned by the individual novice designer [student] and the habitus that is socially formed and mediated by the [existing] surface structures, pedagogy and epistemology’ (p. 198). The student’s sense of habitus points towards an emergent ‘mental model’ or ‘culture’ that is individual and subjective, yet tied to broader objective experiences germane to studio (e.g., rhythms [→124]; learning and designing collectively [→166]; immersion [→118]). The latter sense of habitus mainly refers to studio as a cultural space in which students are indoctrinated [→285]. Bourdieu’s work is primarily concerned with how cultural spaces shape action – describing a person’s connection towards existing social structures and ability to act in certain ways. However, Gray’s conception of habitus in the design studio also allows for different mental models to emerge. A developing design student may take on some but not all conceptions of the prescribed habitus, only to later be subsumed by the dominant defined habitus of studio. However, these multiple conceptions of studio may also exist in perpetuity – whether they be recognised as such or not. The degree to which these pluralistic conceptions of studio culture are seen as allowable by design students may be linked to the emancipatory capacity of studio structures that are designed (critical pedagogy [→276]), and the interest of students in engaging a performative dialectic between a stable and shared sense of studio culture and a personal ‘rebellion’ or collective action against this status.

What can studio scholars do with habitus?

The language of habitus offers a sociologically-driven vocabulary of social structures and activities to support the detailed investigation of virtually any property of studio addressed in this book. For instance, educators and researchers focused on accessibility, equity, and inclusivity may investigate:

- How do students with differing cultural backgrounds interpret, perform, and become enculturated into key educational habits and rituals [→262]? How can critique [→79] sessions be conducted in ways that value cultural commitments to individualism or collectivism?

Studio Properties

- How can oppressive structures of studio environments be interrogated and reimagined (critical pedagogy [→276]; hidden curriculum [→271])? How can component structures such as oppressive critique [→79] practices that feed into (or emerge from) other structures be understood and dismantled, creating a new structured structure of feedback [→74] that is increasingly equitable or inclusive?
- How can structural relationships in studio be used to support formal and hidden curricular goals? For instance, how can methods of instruction, feedback [→74], socialisation, and enculturation [→285] be shared across multiple educators?
- How can the language of habitus be used as a grammar to analyse, interrogate, and indicate opportunities for transformation in studio? For instance, how can existing doxa be captured (e.g., through observation or robust student accounts), explored, and then intentionally transformed to create equitable studio experiences?

Hidden Curriculum

On the subject of critique juries, many design students, faculty, and practitioners have issued an SOS alert. Desperately trying to stay afloat, students attempt to master juries by trial and error. Unfortunately, most keep trying but continue making errors. They receive virtually no systematic information to help them through this gruelling emotional experience, and yet their grades in design courses usually depend upon jury performance. Several design faculty admit that the current system is best characterized as ‘the blind leading the blind.’ Faculty and visiting critics receive no formal training in how to conduct juries, and more often than not, they simply rely upon the techniques their own professors used when they were in school, however good or bad they may have been. (Anthony, 2012, p. 4)

The hidden curriculum refers to the knowledge and practices that students learn and incorporate into their praxis without being explicitly taught. It frames education as inherently social and often deals with difficult-to-identify or challenging norms. The concept of ‘hidden curriculum’ emerged from educational studies in the 1970s, through which researchers described ‘some of the outcomes or byproducts of schools or of non school settings, particularly those states which are learned yet are not openly intended’ (Martin, 1976, p. 137; drawing on a concept coined in Snyder, 1970). This portion of the curriculum is ‘hidden’ because it is not directly visible [→34] as part of planned knowledge or skill acquisition. Still, it is felt and reproduced as part of the overall educational experience. Many critical pedagogy [→276] researchers and educators have used the concept of the hidden curriculum to indicate how education is linked to a process of socialisation and enculturation [→285] – often without explicit agency or awareness on the part of students or educators. In contemporary educational research, the concept of the hidden curriculum is also used to aid educators in considering first-generation students’ perceptions about higher education, which might prompt explicit discussions about ‘imposter syndrome’ or how to interact with professors and take advantage of office hours (Chatelain, 2018).

The hidden curriculum is always present

The hidden elements of the learning experience in studio are structural and systemic, yet frequently unacknowledged by educators or students. For example, consider the hidden elements behind what it *feels like* to be in studio, or the expectations to compete with others as part of being enculturated into studio environments (learning and designing collectively [→ 166]). Similarly, hidden structures indicate expectations of what it means to be a *good student*, with supporting mechanisms such as social comparison [→ 172] and the attitudes and beliefs which undergird social interactions in studio.

The hidden curriculum is difficult to define or pin down and is not fully contained in any one area of the curriculum (Orón Semper & Blasco, 2018; Volpi, 2020). It exists across different stakeholders, contexts, educational elements, and courses or modules and also as a manifestation of the felt *habitus* [→ 265] of studio. The hidden curriculum operates in both the mundane and the important aspects of learning, from how a student is expected to engage with an educator, to navigating library resources, to interacting with a learning management system, to utilising university resources to gain employment after graduation (Chatelain, 2018). Our focus in this property is on elements of the hidden curriculum found directly in studio, but these broader experiences of the hidden curriculum are equally present and may also impact a student's educational success.

The hidden curriculum can amplify power relations

Problematically, hidden elements of the curriculum frequently reproduce power imbalances and other forms of systemic harm, potentially across generations of students and beyond the design discipline by impacting social, cultural, and political realms (Liow, 2021; Venkatesh & Ma, 2019). For instance, racism or other forms of oppression could be implicitly reinforced as part of the hidden curriculum, which might then permeate city planning or architectural decisions in ways that are potentially inaccessible to the designer themselves (Di Nunzio, 2019). Similarly, the dominant colonial roots of design may result in the ongoing colonisation of other cultures if not disrupted through the explicit introduction of decolonial perspectives (cf., Tlostanova, 2017; Tunstall, 2013). Dutton (1987, p. 17) was one of the first design scholars to describe the utility of the hidden curriculum concept in uncovering and evaluating studio practices, by encouraging educators to:

clarify the relationship between social practices and power.
That is, injustices and inequities of society are not simply
nestled in the mind, but are embodied in forms of lived

experiences and social relationships that penetrate to the innermost recesses of human subjectivity – forms that in this society tend to legitimize top-to-down models of authority and types of social control characteristic of most institutions.

This attitude towards inequity and power imbalance is focused on making elements of the hidden curriculum – critical to equitable and inclusive practice – visible [→34] by working with them directly rather than suppressing or continuing to hide them.

The concept of hidden curriculum stands in opposition to the notion that education and disciplinary knowledge can be considered *neutral*. It frames pedagogical decisions at all levels as value-laden and having the potential to reduce student agency. For instance, hierarchy and competition – which are common techniques to manage student engagement in studios as a part of learning and designing collectively [→166] – bring the potential for inequity. Competition in studio has been shown to negatively impact intersectional, disempowered groups such as women and minoritised groups – which, if left uninspected, may lead to assumptions that members of these groups are simply *lazy* or *not as good* as their more advantaged peers (Willenbrock, 1991).

Some things may be best left hidden – at least at first

Educators always bring a set of assumptions about future knowledge [→248] and expertise [→90] that a student should attain. In design, skills or competencies such as time management are often assumed to develop automatically, rather than as something to explicitly teach, discuss, or develop (Pable, 2016). Likewise, the practices, behaviours, and actions *permitted* in studio are almost entirely implicit, thereby requiring students to individually learn norms and acceptable behaviours by themselves to survive (Austerlitz et al., 2008). This is as much a curricular assumption as anything else, based on the primacy of studio as the mode of teaching (i.e., apprenticeship [→64] rather than direct instruction). In both cases, dissonance arises from the fact that neither the assumptions, nor the goals relating to the assumptions, are ever explicitly declared. Such hidden assumptions are, at best, frustrating and annoying and, at worst, unfair in terms of privileging some students over others. The difference between annoyance and oppression is in the declaration of these hidden assumptions to the student – whether it's important or useful for the student to know what they don't know (an expression of their uncertainty and ambiguity [→209] in studio), and at what stage of their academic experience it will

be important or useful. In many cases, loading too much on students at specific points in their learning journey is counterproductive. However, the extent to which this is considered or determined – beyond issues of cognitive load or workload – is, it seems, rarely discussed explicitly.

The hidden curriculum impacts student experiences of studio

Beyond the educator-student relationship, the implicit knowledge contained within the hidden curriculum is evident in other interactions, particularly with colleagues, other educators, and peers, which implicitly shapes the expectations of those new to studio (**Interactions and Sociality** [→162]). As Boling (2016) notes, when she taught her first studio, she ‘did not worry over what [she] was supposed to *do*’; instead, she ‘set problems, demonstrated basic technique, led critique and ran the lab. This was studio. That’s how it works’ (p. 88, emphasis in original). Similarly, Broadhead (2018) describes the role of friendship among design students as a vital tool to pass on implicit knowledge embedded in studio and curriculum (see also Ashton & Durling, 2000; Smith, 2015). If educators and students are not encouraged to inspect and understand their own pedagogy beyond explicit and observable enactment of studio routines, the hidden curriculum may never be discovered in any given studio. Even in cases when elements of the hidden curriculum are revealed – often due to distress, as outlined by Anthony (1991) in the case of the *hazing ritual* of the design jury – educators sometimes choose to ignore or avoid aspects which are experienced by students as uncomfortable or otherwise representing a threat to their desired identity [→94].

While portions of the hidden curriculum may be best left hidden, in some instances, revealing and articulating what is hidden in studio curricula and experiences can benefit multiple stakeholders. However, there is a significant difference in *deliberately* employing a hidden curriculum as opposed to simply ‘doing it’ without knowing or questioning it. Gray and Smith (2016) note ‘the disjuncture between the planned curriculum and what is experienced by students’ (p. 262), which can be easily ignored, avoided, or downplayed.

In addition to this student-facing tension, educators’ awareness of the hidden curriculum may impact particular pedagogical decisions. For example, if educators tacitly accept norms such as competition in studio, with a presumption that competition is a pedagogical *good* because it *weeds out* the low performers (e.g., Anthony, 1991; Willenbrock, 1991), it may become difficult to also identify ways to discourage unhelpful social comparison [→172] or other informal [→42] practices that produce outright

discrimination based on gender, race, or other intersectional identity characteristics (e.g., Anthony, 2002; Iqbal & Roberts, 2019; Sawruk, 2022).

The hidden curriculum can be shaped through reflection and action

The hidden curriculum is often the sum of many uninspected practices that are inherently power-laden and normative. However, Gray, Parsons, and Toombs (2020) argue that the hidden curriculum has the potential to be *designed* – shaped in intentional ways to limit unequal power relations and harness particular norms that can then be progressively disclosed to students throughout their educational experience. For instance, building students' skills in using design methods and developing a mindset towards methods might be shaped over multiple curricular experiences, progressing students through different attitudes towards methods that they can reflect on over time (Gray & Parsons, 2023). This approach can also be used to maximise student engagement and agency in critical educational experiences, such as identifying multiple modes of participation in the [crit](#) [[→79](#)] (Gray, 2019). Gray et al. (2020) articulate that this design of the hidden curriculum requires educators to 'attend not only to the designed curriculum [...] but also the lived experience – what is actually felt and experienced by students in terms of both learning and socialization' (p. 45). While many educators and students are unaware of the hidden curriculum they are experiencing, these norms and structures can be revealed through [reflection](#) [[→83](#)] and other instructional scaffolding. Educators can build on this awareness and engage more intentionally in evaluating the importance of hiding or disclosing elements of the curriculum, describing how these elements of the hidden curriculum impact the intended and actual student experience and how that contributes to students' learning, immediately or over time.

Critical Pedagogy

[C]ritical pedagogy seeks to transform consciousness, to provide students with ways of knowing that enable them to know themselves better and live in the world more fully (hooks, 1994, p. 194)

Critical pedagogy is a conceptual and theoretical frame for describing and structuring learning experiences. Driven by a goal of emancipating students and educators from structural inequities in oppressive systems (Freire, 1970/2000), critical pedagogy is not an *innate* property of studio. However, aspects can be found in studio practices, including educational approaches (**Foundations and Methods** [→60]; **critique** [→79]), patterns of communication (**social comparison** [→172]; **dialogue** [→181]), and assumptions of how learning best occurs (**learning by doing** [→145]; **learning and designing collectively** [→166]; **habits and rituals** [→262]). As a theoretical frame, critical pedagogy has been used to identify and address inequities in numerous types of education settings, and many of these inequities are also prevalent in unreformed studios.

Common types of inequities addressed by critical pedagogy practitioners include **power** [→282] imbalances between students and educators, or assumptions that students enter higher education with knowledge deficits rather than already having **disciplinary** [→238] and **judgement-oriented** [→98] skills that can be built upon (Cross, et al., 1994; Boling & Gray, 2015b). Additionally, inequities can be reproduced through the use of harsh **critique** [→79], **habits and rituals** [→262], or other harmful elements of the **hidden curriculum** [→271] past their sell-by date (Dutton, 1991; Gray, 2022a). Critical pedagogy's methods and vocabulary can be used to pursue critical consciousness (Freire, 1970/2000), in which educators and students are co-learners and co-creators of a student-centred curriculum. Educators and students can use critical pedagogy as a powerful lens to re-imagine a more equitable studio.

Origins of Critical Pedagogy

Critical pedagogy is derived from the writings of Paulo Freire (1921–1997), who prototyped adult literacy programmes in rural Brazil to liberate workers from exploitation by landowners and merchants. Critical pedagogy has become a dominant lens to describe educational systems and opportunities for reform drawing on Marxist, feminist, and radical pedagogies. In Freire's model, the educator goes out into the world of the

student, and with the student helps them name the world, identifying objects, subjects, and concepts that are relevant to the student. This naming of the world becomes the curriculum, but, importantly, it also includes the naming and identification of oppressors and sources of oppression. The goal is to understand the dehumanisation of both oppressors and oppressed and to enter into dialogue with oppressors. Critical pedagogy is based on a continuous process of dialogue [→ 181], communication, and empathy. Dialogue is proposed as a method of humanising both oppressor and oppressed, one that can be applied to the co-construction of new curricula. Ira Shor, one of the educational philosophers who introduced Freire's theory to North America in *A Pedagogy for Liberation: Dialogues on Transforming Education* (Shor & Freire, 1987), later defined critical pedagogy as:

habits of thought, reading, writing, and speaking which go beneath surface meaning, first impressions, dominant myths, official pronouncements, traditional clichés, received wisdom, and mere opinions, to understand the deep meaning, root causes, social context, ideology, and personal consequences of any action, event, object, process, organization, experience, text, subject matter, policy, mass media, or discourse.

(Shor, 1992, p. 129)

Viewing studio through the lens of Critical Pedagogy

[T]he design studio is not a universal, neutral, or a timeless approach to design education. It was developed by European schools and, thus, embodies European values and definitions of what design is and what a designer could be.

(van Amstel & Gonzatto, 2020, p. 275)

Critical pedagogy critiques the 'banking model' of education, which views students as empty vessels or *tabula rasa* waiting to be filled by the educator and educational system. A literal application of the Freirian model of critical pedagogy sees educators and students as co-creators of the curriculum, allowing students to recognise the power they can seize from educators in the shaping of their education. The power imbalance, bias, and privilege inherent in design studio practices are critiqued by critical pedagogy. Crysler (1995, p. 212) writes, in the context of architecture education, that:

Unlike liberal arts programs, architecture schools allow students only very limited power in designing their studies. Almost all courses are required or core courses, particularly in the early years of training. Thus, the canon is present not only in the specification of materials within courses, but also in the specification of the curriculum as a whole. Time management as a pedagogical principle is central to the entire training regime. Each student is given, through the curriculum framework, a bank account: four weeks for this, two weeks for that. Time must be efficiently managed; if it is squandered, 'failure' will result.

This example offers a literal interpretation of the banking model of education with a visible power transaction [→282] between educator and student that primarily values the educator's expertise [→90]. The power imbalance between educator and student is more visible in the quasi-residential open plan spaces of a studio, one through which the educator moves with a different set of privileges than the student. Crysler (1995) describes how, in this environment, 'faculty occupy powerful positions in relation to students because as "full vessels", they embody and control access to what students require to become "full" themselves.' (pp. 210–211). This power imbalance impacts the kinds of roles that educators are able to take on (e.g., as *drill sergeant* or *critic* rather than *caregiver and nurturer*; Gray, 2022a, p. 8), and the ways that students are encouraged or discouraged from bringing their lived experiences into studio.

Critical pedagogy can provide a framework for studio to become a realm of embodied and empathetic action – one in which the intensive affect [→200] of studio can be harnessed for pedagogical and political impact. Morrow and Brown (2012) argue that live projects or *pro bono* projects engaging students with stakeholders outside the academy can be conceptualised as examples of critical pedagogies that empower students to co-create their own curriculum in real-world settings. Stepping out of a studio is a tactic which supports the aims of critical pedagogy, since Freire's original literary workshops were deliberately held outside the educational institution in the lived environment of the students.

The most problematic legacy of pedagogies inherited from the Vkhutemas and Bauhaus schools is the deliberate treatment of students not only as empty vessels, but as vessels which must in fact be forcibly emptied of any knowledge acquired prior to arrival in the school: 'one of the common goals of first-year training (with its emphasis on making kites, shelters, and experiments with primary form) is to return the student

to a state of intellectual infancy in an attempt to produce in the budding architect what Kazys Varnelis has called an “innocent eye” (Crysler, 1995). Varnelis (1998) writes how it is a ‘natural, childlike attitude toward space that distinguishes the architect from the typical citizen, hobbled by the obsolete baggage of debased, everyday spatial (mis)perceptions and the burden of history’ (p. 212). These attitudes towards students could result in situations where students are regarded as passive subjects for enculturation, acculturation, and indoctrination [[→ 285](#)], and whose life experiences before arriving in school might be unintentionally disregarded.

In studio teaching practices that engage with critical pedagogy, students and educators are part of the co-construction of the curriculum. If studio educators seek to embrace the student-centred and constructivist characteristics of critical pedagogy, students can be empowered to engage with the pedagogical theory underpinning it (see, for example, Page, 2012).

Examples of pluralistic and diverse critical pedagogies can be found in various aspects of design education today and contribute to what Escobar (2018, p. 52) calls a design pluriverse, ‘a world where many worlds fit.’ Gray (2022a) has linked the concepts of critical pedagogy and pluriversal thinking, identifying a diverse set of knowledges [[→ 248](#)], pathways for identity [[→ 94](#)] and disciplinary [[→ 238](#)] diversification, and educational moves (**Foundations and Methods** [[→ 60](#)]) that provide new opportunities for students to shape studio practices.

Scholars in other design fields have proposed additional opportunities for conceptual engagement in alternate or pluriversal perspectives. For instance, Rosner (2018) decentres the traditional power structures of design education and seeks to privilege neglected and disempowered voices through a framework of ‘critical fabulations’, drawing upon writer and African-American Studies scholar Saidiya Hartman’s concept by the same name (Hartman, 2008). These fabulations, as a design tool, ‘are ways of storytelling that rework how things that we design come into being and what they do in the world’ (Rosner, 2018, p. 17) – using stories and storytelling as critical tools in the redistribution of power in the design studio while also revealing processes of knowledge production.

For students prejudiced by the predominantly white, European values of the design studio, other counter-hegemonic frameworks exist. Winchester (2018) uses Afrofuturism (see Dery, 1993) as a conceptual and methodological approach to more fully, empathetically, and inclusively design. Likewise, in *The Black Experience in Design* (Berry et al., 2022), numerous design scholars illuminate various ways in which marginalised and sometimes undocumented voices can be heard in the study and practice of design. O’Sullivan (2019) draws on pre-industrial indigenous

knowledge from the Pacific to show how these frameworks can help students formulate sustainable and sustaining futures; while Tunstall (2013, included in Gunn et al., 2013) provides an overview of such practices.

What can studio scholars do with critical pedagogy?

To what extent can critical pedagogy be applied to studio? And to what extent can students co-create their own curriculum in studio? Critical pedagogy can provide a toolkit with which educators and students can propose more inclusive alternatives to normative educational practices in the design studio, for example, by reimagining crits [→79], feedback [→74], and processes of reflection [→83].

Studio offers the potential for critical pedagogical engagement because it can support students to envision solutions to design problems and real-world societal challenges. Crysler (1995) writes how critical pedagogy can ‘allow different voices to be heard and to participate in a nonhierarchical fashion in the ongoing construction of society’ (p. 213) – an opportunity that is particularly valuable for design disciplines [→238]. This perspective can also raise alternative ways of enacting studio practices, for example making [→147] and engaging with artefacts [→151], participating in play [→155], and prototyping [→158].

Critical pedagogy also enables educators and students to become more aware of their expertise [→90] and identity [→94] in studio, and the **Cultures and Power** [→258] that act on and through them. Dutton (1991, pp. 174–175) writes:

it is only when students’ subjectivities become central to pedagogy can educators make these problematic and critically engaged, so that students and teachers can see how their subjectivities are constituted, promoted, or constrained by configurations of power within class, race, gender, ethnicity, and culture.

This heightened awareness of issues relating to power [→282] and knowledge [→248] can lead to increasing democratisation of studio, shifting ‘the locus of, and responsibility for, discussion and interaction from the typical teacher-student relationship to the student-student relationship’ (Dutton, 1991, p. 176). As such, there are two processes at work: ‘attacking the asymmetry of power between students and teacher [...] paralleled by efforts to realign power among students’ (Dutton, 1991, p. 176). Such a move can empower students to co-create a curriculum centred on what they deem important. Critical pedagogy can help educators and students move

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beyond the privileged position granted to the western canon and spaces of traditional intersectional privilege, such as the design studio.

Studio scholars might use critical pedagogy as a lens through which to ask:

- What strengths and consequences does the inheritance of the apprenticeship [→64] model have for studio educators?
- What mechanisms are available within the formal or hidden curriculum [→271] for students to shape their learning experiences in ways that give them agency?
- What constitutes the educator's or student's implicit and explicit authority and power [→282] in studio? How can the hegemony of historic studio practices be deconstructed, evaluated, and replaced with more equitable and inclusive alternatives?
- What new knowledge [→248], practices, and ways of being could studio educators value as they co-construct curricula with students of diverse backgrounds?
- How can strategies be constructed to decolonise design and critically question the predominantly white, Western roots of the modern design canon (Schultz et al., 2018; O'Leary & Turner, 2020)?

Power Transaction

As any commodity, it is produced and distributed according to particular voices situated in relations of power that are asymmetrical. To talk about knowledge, then, is to talk about power and therefore the legitimation of some forms of knowledge due to their association with forms of power over others.

(Dutton, 1987, p. 17)

Studio is often seen as an open space within which anything can happen in an unstructured way without rules or conditions. The opposite is true. Through both implicit and explicit structures, studio references and reproduces sources of power that impact how educators and students experience the curriculum (Dutton, 1987; Gray, 2014a; Orr & Shreeve, 2018). These practices can be considered *power-laden*, impacting the ability of students to build their design identity [→94], and shaping what enculturating [→285] norms are seen as viable or consistent with the discipline [→238]. Since these sources of power are ubiquitous and multifarious, power is inevitably present in interactions among students, educators, and pedagogical practices – amplifying or empowering certain voices, competencies, or norms over others. Power and hierarchy in studio are also shaped by broader cultural and societal forces outside studio (e.g., gender, class) and may be used to view the dynamic distribution of power in studio.

Power is activated through the habits and rituals of studio

Studio includes many structures that can be shaped through power, including pedagogical, place-based [→198], and identity-focused [→94] structures. These structures vary in visibility. Highly visible components with opaque structures are challenging to interrogate or recognise. The crit [→79] is highly visible in many studios as a core pedagogical event or ritual that defines and shapes student and educator experiences. Here, educators and students build dialogic relationships that are reified through power transactions (Anthony, 1991; Webster, 2006; Willenbrock, 1991). However, how power underlies the crit as an opaque structure can also determine disciplinary [→238] imperatives regarding which forms of identity [→94] or enculturation [→285] are privileged over others (Anthony, 1991; Gray, 2014a). For instance, the dominance of specific identities [→94] or enculturated norms might impact the structural metaphors educators and students use to make sense of and describe studio (Coyne et al., 1994), such as a place of

nurturing and belonging versus a place of competition, impacting both crit experiences and other practices. Other habits and rituals may constitute less visible structures but still demonstrate a wide range of power transaction characteristics. For example, the lack of visibility of student voices, consideration of students as a *tabula rasa* or blank slate (critical pedagogy [→276]), or the use of hazing (harmful, humiliating, or otherwise degrading) techniques to induce competition among students (social comparison [→172]).

Different roles and attitudes towards power impact the transmission and legitimacy of studio practices

The relationships between educators and students that are invoked and supported through the transaction of power are normative and asymmetric. These relationships perpetuate roles through which educators and students can perform their identity [→94] and invoke norms of enculturation [→285] that describe what kinds of activities, interactions, and design moves are considered acceptable or appropriate. As noted by Dutton (1987) and Willenbrock (1991), power transactions invoke asymmetrically privileged forms of knowledge and knowing [→248] – often surfaced using language (dialogue [→181]; confidence to speak [→176]; learning and designing collectively [→166]). Willenbrock, in a description of her undergraduate experience of architecture education, identifies that:

the students attempted to adopt the vocabulary of the professors – ‘so you can learn what it is I mean by the words I use.’ [However,] there was no effort by the teachers to familiarize themselves with the language of the students, or even to meet halfway with a new common vocabulary (Willenbrock, 1991, p. 107; portion quoted from Schön, 1985)

In this example, asymmetry is furthered because students felt they lacked the ability to challenge the educator. Other structural forms of oppression – such as the design jury – created a toxic environment where students felt that they had no voice and were trapped in a helpless state by these key pedagogical rituals [→262] (Anthony, 1991; Webster, 2006).

In idealistic terms, the educator and student engage in an exchange of perspectives. Practically, however, these exchanges (or dialogic [→181] transactions) are also power laden, relying on social roles that are inherently asymmetric (Willenbrock, 1991; Webster, 2008). Examples of power transactions emerging in a critique event such as loudness of one’s voice or the use of demeaning tactics similarly reveal that studio infrastructure

can privilege certain roles and suppress others through the ways they are normatively described, thereby encouraging certain forms of enculturation or indoctrination [→ 285] as a studio norm. For instance, there is an expectation latent in the notion of apprenticeship in studio that the transfer of knowledge and competence will be largely uni-directional in nature, with knowledge flowing from the learned educator to the student, who is a blank slate (Dutton, 1991). Similarly, many design disciplines [→ 238] assume a unitary set of competencies that must be *proven* by the student, but are *fully known and understood* by the educator.

This fundamental asymmetry between student and educator is always present, regardless of how resistant to it the actors might be. This is a key aspect of power to recognise: that it is always present and cannot be completely removed or hidden (Orr & Shreeve, 2018; Smith, 2016). Hence, it is worth viewing power as another property of studio that has to be considered as part of any teaching practice. In doing so, it is important to position power as a dynamic force that necessarily changes over time. As Orr and Shreeve (2018, p. 120) summarise:

The point at which a tutor decides what grade the student's work receives is a key moment of powerlessness for students. Interestingly, after the marks are awarded and the summer show is exhibited, power flows back to the students; the work is theirs, and the lecturer's role can become invisible again.

Social, historical, and cultural power influence studio experiences and curricula

Studio exists in a socio-politico-economic context and these dimensions often have a significant, though invisible, influence on all aspects of curriculum. Since design is inherently a world-building activity (Willis, 2006), what happens within a studio can impact the world, and vice versa. As noted by Serpa et al. (2022) 'Design can be both a practice of freedom or a practice of oppression, depending on who designs and whose intentions are prioritised. When this practice underestimates, excludes, disrespects, or deceives people who are part of oppressed groups, it intensifies oppression' (p. 1). This recent observation is supported by historic notions of critical pedagogy [→ 276] (Freire, 1970/2000), where the replication of underlying educational structures – with cultural and societal components – is continued for reasons other than empowering and enabling students.

In the last decade, calls for the decolonisation of design practices and the introduction of additional knowledges [→ 248] has also brought greater attention to the power transactions implicit in design education (see also Lima, 2023; Tunstall, 2023). The dominance and influence of specific Western curricular paradigms, and in particular the dominance of Eurocentric design curricula around the world, is still in evidence (e.g., Al-Amri, 2019 in the Middle East and North Africa; Barbosa, 2019 in Brazil; Šobánková, 2019 in the Czech Republic). Historically disempowered groups have also not had their stories adequately told through design curricula (see, for example, Berry et al., 2022). Recent disciplinary research and scholarship is now responding dynamically to such issues by diversifying representation in the curriculum (Rittner, 2020), re-examining historical paradigms in design curricula (Cornú, 2020), and engaging in empowering studio practices such as dialogics (Freire, 1970/2000; Fernández-Cárdenas, 2014, 2018).

Enculturation, Acculturation, and Indoctrination

[T]he studio reflects the core beliefs of a discipline, classroom, studio facilitator, and group of students. (Cennamo, 2016b, p. 252)

Enculturation is the acquisition of the norms and characteristics of a culture by a person from another culture. In design, different disciplines [→ 238] can be considered different cultures, each with its own trappings, expectations, behaviours, actions, and norms. In many disciplines these cultures and norms exist for important reasons, such as ensuring the quality of professional services offered, or to maintain the safety of those affected by a designer's work. Enculturation is also, therefore, a way of controlling entry to a discipline or profession through the replication of acceptable culture (Trowler et al., 2012), which can lead to both positive and negative outcomes (Webster, 2005).

Much of the learning that occurs through enculturation is through the acquisition of tacit knowledge [→ 248] delivered through implicit means.

For example, learning the ‘language’ of a discipline – its technical terms, acronyms, symbols, and slang – is part of any design education. By utilising this ‘language’ in a meaningful and contextualised way learners demonstrate their membership of a community. Studio is an important site for enculturation because it allows a culture to be made visible [→34], demonstrated (performance [→107]), and practised (play [→155]; risk and failure [→227]). The trappings, expectations, behaviours, and norms noted above can all be presented and performed in studio as a way for the encultured expert to demonstrate expectations (social comparison [→172]), and allow students to try out and adopt these for themselves. Webster (2004) describes the desk crit [→79] as a form of ‘ritualised transaction’, where the expert educator acts as the paradigm for, and gatekeeper to, a professional or disciplinary community. Importantly, enculturation can lead to positive and negative learning experiences, and much of this depends on how studio is operated and how other properties are applied to it (such as power transaction [→282] or habitus [→265]).

Positive enculturation can prevent harm and improve educational quality

The general expectation of design pedagogy is for students to adopt the dominant disciplinary culture for themselves and propagate this in their practices. Many design professions have structures to support how students are inducted into a profession, often linked directly to curricula through frameworks or specifications. These act as a further gatekeeping mechanism to check who can (or cannot) join that profession. Historically, this was used as a socio-political control as much as a professional one (Sennett, 2008). This enculturation can be a positive experience for many students, offering confidence that they are progressing and doing the ‘right’ thing (Ashton & Durling, 2000; **Interactions and Sociality** [→162]). This ‘right’ thing can vary significantly by level of study and discipline. It also emerges within groups (and identities [→94]) in studio, all contributing to what could be considered a ‘studio culture’ (Vowles et al., 2012).

In early stages of learning, more straightforward behaviours and activities such as listening-in [→170], social comparison [→172], or discipline-based [→238] activities offer students examples of expected behaviours (Gray & Howard, 2014; Jones et al., 2021). In later stages, enculturation can occur in more in-depth ways, such as developing an overarching habitus [→265], set of judgements [→98], or expertise [→90], often occurring within shared practice in studio (learning and designing collectively [→166]).

Studio is a site of enculturation that arises within groups of students through shared identity [→94], experiences, or belonging [→189]. The cultures

that emerge from these social properties enculturate social and pastoral behaviours and lead to disciplinary learning. Gray and Howard (2014) demonstrate how students make use of disciplinary and designerly language in informal learning spaces [→ 42]. Brandt et al. (2013) give a specific example of students developing judgements [→ 98] towards what is *good and bad design* as a contingent quality within studio and as part of the student community – not as an extrinsic quality dictated by the profession. McClean et al. (2013) extend these social observations further, arguing that the culture that is established in any studio is critical to how the balance and visibility of power [→ 282] is deployed, explicitly linking the development of disciplinary knowledge construction to peer learning and enculturation.

Negative acculturation and indoctrination can impose illegitimate control

When enculturation depends on the authority of a particularly dominant culture, this becomes *acculturation*. Existing cultures are replaced or suppressed in favour of the dominant one. Negative aspects of acculturation can occur when the imposed culture is ill-defined and subjective, representing a potentially illegitimate form of control (Gray, 2022a). This negative acculturation then means that control and power organise around who decides what is *good*, and the judgement [→ 98] and expertise [→ 90] of gatekeepers becomes an essential mechanism by which someone can enter a culture (Stevens, 1995; Willenbrock, 1991). This applies to the education studio and the profession.

The more subjective characteristics of a culture, particularly when they are implicit or hidden, can be particularly problematic in an educational setting because students have no way of seeing or knowing what is expected. This can lead to an excess of uncertainty and ambiguity [→ 209] and students resorting to learning by pure trial and error, which is inefficient and results in failure that is not supported as effectively as it could be (simulation [→ 232]; risk and failure [→ 227]). Acculturation involves high levels of replication and propagation, which reduces possibilities for change or evolution in a culture (Ward, 1990). The resulting stasis can be problematic if it is not accompanied by some critical or reflexive mechanism to prevent repetition of problems or negative aspects of that culture (Salama, 2021; Webster, 2008).

Acculturation without permission is indoctrination

Where acculturation is carried out without acknowledgement or thoughtful consideration it becomes *indoctrination*, the uncritical enforcement of a dominant culture. Indoctrination can be used to explicitly replace or suppress existing personal, social, or professional cultures. In the

history of design education this can be seen in the dominance of Western, Modernist curricula worldwide and in various cultures and contexts (Salama, 2017; Gongkai & Qing, 2018; Cornú, 2020). These examples highlight the link between degrees of acculturation, enculturation, indoctrination, and power transactions [→282] in studio.

McClellan and Hourigan (2013) explore how students' acculturation into studio develops. They argue that the early establishment of culture in studio has a lasting impact on future student behaviour and enculturation, and that this can be negative or positive. McClellan et al. also identify the benefits of flattening power hierarchies to foster plural cultures in studio as represented by individual students (critical pedagogy [→276]). Davies and Elmer (2001) similarly outline the significant value in acknowledging and making use of the plurality of cultures that can be present in studio to expand its learning potential.

the 1990s, the number of people with a mental health problem has increased in the UK (Mental Health Act 1983, 1990).

There is a growing awareness of the need to improve the lives of people with mental health problems. The Department of Health (1999) has set out a strategy for mental health care, which includes a commitment to improve the lives of people with mental health problems.

The aim of this paper is to describe the development of a self-help manual for people with mental health problems.

The paper is organized as follows. First, we describe the development of the manual. Then, we describe the manual and the results of a pilot study.

Finally, we discuss the implications of the manual for the development of self-help manuals for people with mental health problems.

Development

The manual was developed as part of a research project funded by the Department of Health (1999).

The project was designed to develop a self-help manual for people with mental health problems.

The manual was developed by a team of researchers, including a psychologist, a social worker, and a mental health nurse.

The manual was developed over a period of 18 months. It was developed in three stages.

In the first stage, the researchers identified the needs of people with mental health problems.

In the second stage, the researchers developed a draft manual.

In the third stage, the manual was piloted with a group of people with mental health problems.

The results of the pilot study are described in the next section.

The manual is now available to people with mental health problems.

The manual is available in both printed and electronic formats.

The manual is available in both English and Welsh.

The manual is available in both hard copy and CD-ROM formats.

The manual is available in both large print and Braille formats.

The manual is available in both audio and video formats.

The manual is available in both hard copy and CD-ROM formats.

The manual is available in both large print and Braille formats.

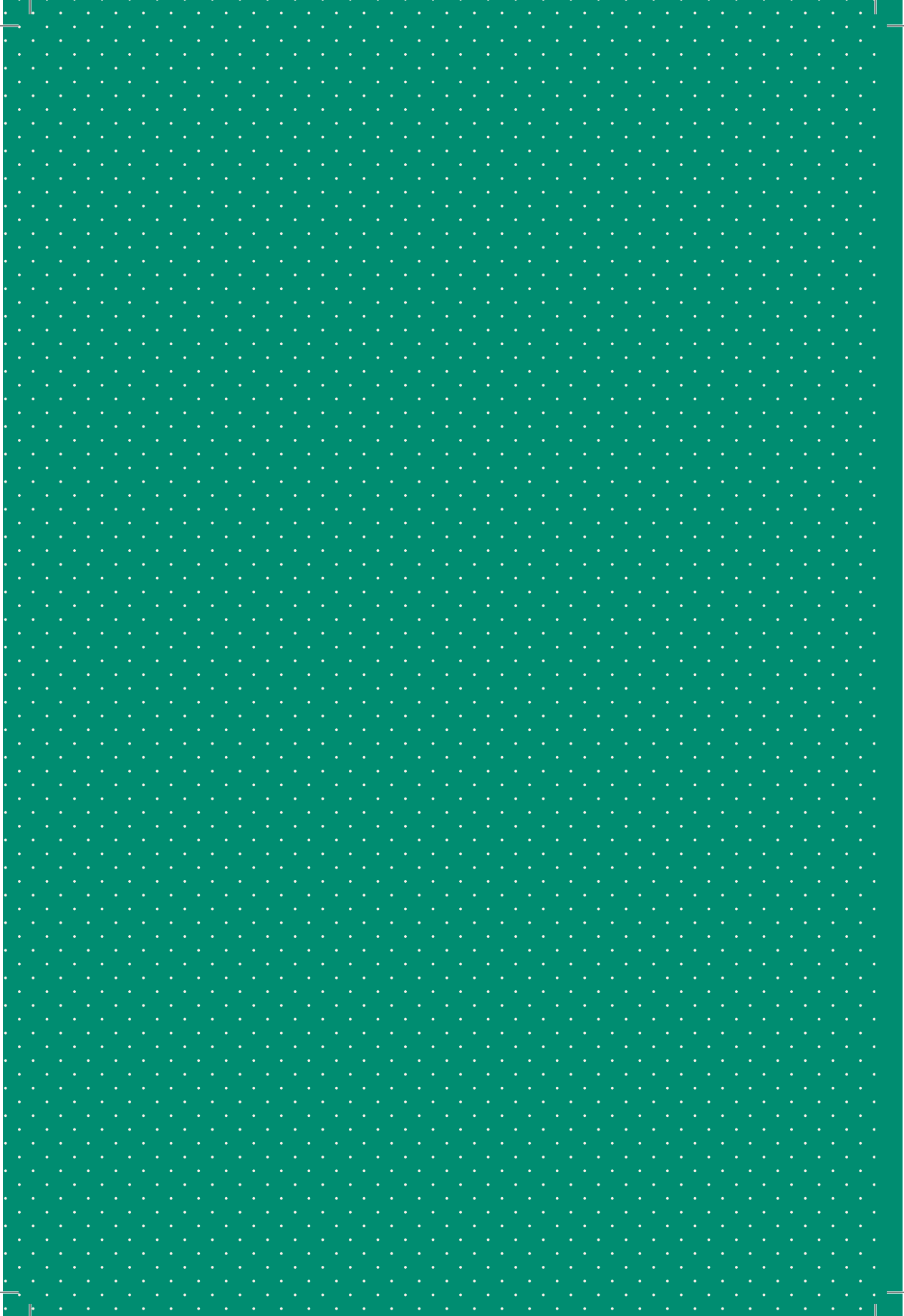
The manual is available in both audio and video formats.

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The manual is available in both large print and Braille formats.

The manual is available in both audio and video formats.

The manual is available in both hard copy and CD-ROM formats.



Narratives

...the first of these is the fact that the ...

...the second is the fact that the ...

...the third is the fact that the ...

...the fourth is the fact that the ...

...the fifth is the fact that the ...

...the sixth is the fact that the ...

...the seventh is the fact that the ...

...the eighth is the fact that the ...

...the ninth is the fact that the ...

...the tenth is the fact that the ...

...the eleventh is the fact that the ...

...the twelfth is the fact that the ...

...the thirteenth is the fact that the ...

...the fourteenth is the fact that the ...

...the fifteenth is the fact that the ...

...the sixteenth is the fact that the ...

...the seventeenth is the fact that the ...

...the eighteenth is the fact that the ...

...the nineteenth is the fact that the ...

...the twentieth is the fact that the ...

Albert and Lara plan to team teach in studio

Albert straightens a few papers on his desk and prepares to walk the short distance from the building where he teaches undergraduate courses in mechanical engineering to the Art and Design Complex where his colleague Lara is waiting for him. He's looking forward to today, but he's a little apprehensive as well. It's going to be interesting to visit Lara's class!

Last October Albert and his colleague Lara served as members of a sustainability workshop on campus. During one of the small group discussions in that workshop, they had recognised the obvious crossover between his area of study, product sustainability, and hers in commercial product design. They agreed to collaborate on an internal grant supporting a new course in sustainable design. Having won the grant, they will be team teaching together next season. Lara convinced him that they should cross-list the course between their departments, but teach it in the design school using her studio. She has recently renovated her studio as a maker space, installing heavy duty 3D printers, laser cutters, and other tools, both digital and traditional **[A]**.

[A] Studios offer spaces for [creativity](#)^{→222}, [prototyping](#)^{→158}, and [making](#)^{→147}. Makerspaces also exhibit studio properties not only because of the [surfaces](#)^{→48}, [artefacts](#)^{→151}, and [materialities](#)^{→142}, but also because they encourage users to [learn and design collectively](#)^{→166} and [learn by doing](#)^{→145}.

The maker studio will be a useful space for this course, Albert agrees, but then Lara insisted that he come and visit so that he can observe how a studio actually runs. Albert is not sure this is necessary. He has overseen an engineering lab for years. He lectures on engineering principles, sets technical problems, and sends his students to the lab to solve those problems using physical materials in addition to calculations, then he judges their solutions when they have finished.

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How different could it be for Lara? Albert thinks as he arrives, checking the room number and pulling open the door. Wait – did he get the time or the room number wrong? This class is already in full swing and – checking his watch – not due to start for another five minutes. The large room in front of him is bustling with activity, students moving around purposefully, but without a coordinated goal as far as he can see. A few are just chatting together, so... maybe class is about to end? Or has not yet begun? Unsure, he starts to back out of the room when he spots Lara not far away, waving him in. ‘Welcome!’ she calls. A few students glance over, but most continue on with whatever they had been doing as he zigs and zags around work tables to join Lara.

‘Class has started already?’ he asks.

‘Not really,’ Lara laughs. ‘But their work stays here in the studio for the most part so when they’re ready to get going, they show up. Some of them were probably here last night or this morning – maybe both. **[B]** It’s almost midterm and they have a big crit coming up, so we’ve got a little panic going on. **[C]** And we’ve got a few drop-ins doing some making, I think in preparation for the carnival next month.’

[B] Studio is an [informal learning space](#)^{→42}. Students commonly use studios outside of their formal class time, building [habits and rituals](#)^{→262} of [informality](#)^{→42} that inform their learning both when educators are present and when they are not. The mention of a ‘panic’ also highlights the fact that studio is a place of [affect](#)^{→200}, of feelings and moods, and that particular attention needs to be paid to students’ [wellbeing](#)^{→214} in informal learning spaces.

[C] Studio is a place where [critique](#)^{→79} takes place. Studio students are [enculturated](#)^{→285} into an environment that has a [hidden curriculum](#)^{→271}, but also a [rhythm](#)^{→124}. Studio is dominated by [project cycles](#)^{→132}. Students anticipate important critique events that are part of an overall rhythm of project cycles that includes formative and summative [assessment](#)^{→234}. This rhythm, along with students’ competitive expectations, becomes part of how they engage in the studio space.

She walks through the space, gesturing for him to follow. He assumes she will head for the desk roughly midpoint along one wall and call the class to order, but that’s not what she does. **[D]** As several more students arrive, she nods to them and then begins stopping at one workspace after another, spending several minutes at each speaking with the students. **[E]** She introduces him briefly to each of them, as if she’d brought someone into *their* space, then quickly pivots to address

Albert and Lara plan to team teach in studio

whatever the students are working on. He notes that each of these short discussions is different. In some, she probes for a status report on how the work is coming along and what problems are cropping up; in others, a student will immediately present her with a dilemma and seek advice or talk about the approach they plan to take towards resolving the problem. Issues range from technical to logistical to conceptual, which does not seem to faze Lara. [F] After a while he thinks he knows why; she doesn't have to know the answer to their questions. She asks them what they might do, what they are trying to accomplish, or how they can think about a problem differently. Often she seems genuinely puzzled and trying to work out a decision together with the student. [G] *Is she even teaching?* he wonders, dismayed. Lara had struck him during their work together so far as capable and knowledgeable. Right now, though, she does not seem in a hurry to guide these students to a successful project outcome, and he wonders if possibly she does not know herself what the solutions to their design problems should be. [H]

- [D] Studio has **no front** ^{→46} and includes different forms of **synchronous and proximate** ^{→128} engagement. Even in studio spaces where traditional instruction or **apprenticeship** ^{→64} might take place, most of the activities of studio de-centre any one point of focus, allowing students and educators to interact in a range of different ways in proximate space.
- [E] Studio is a place for **desk critique** ^{→79} where students engage in **dialogue** ^{→181} with the educator to get just-in-time **feedback** ^{→74} on their project and process – part of an overall enculturation that values conversation about process and outcomes that is both formative and social.
- [F] Critique ^{→79} is a **method and foundation** ^{→60} upon which much of studio pedagogy is built. Critique can take many different forms with many different potential points of focus, depending on the needs of the student and expertise of the educator. These kinds of ad hoc student interactions form a broader culture of engagement in developing student work, with a significant portion of **active teaching** ^{→71} occurring through informal **dialogue** ^{→181} between the educator and student in which **knowledge** ^{→248} is activated, **judgement** ^{→98} is developed and possibilities for **creativity** ^{→222} are nurtured.
- [G] Studio can be productively viewed through the lens of constructivist and constructionist learning theories that are part of **general education theories and concepts** ^{→242}. These largely informal interactions reveal that the

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educator and student are both engaging in discovery and reasoning about the design context together – consistent with inquiry-based approaches rooted in constructivist learning theories. The focus is on how [knowledge](#) ^{→248} is built together through social, [extended, and distributed cognitive](#) ^{→38}, and material processes, with the potential for many different framings of the problem and a range of acceptable solutions.

- [H]** Studio engages in [transformative pedagogy](#) ^{→111} to set learners on a [journey](#) to form their [character](#) ^{→101}, their [identity](#) ^{→94} and [expertise](#) ^{→90}. This transformation requires a shift away from only achieving tangible outcomes, but rather shifting students' perception to focus on the ill-structured nature of design work.

Albert notices something else puzzling on this meandering circuit of the room. Students working nearby seem to be eavesdropping on Lara's conversations with others. Some even put their own work down, concentrating on listening-in. And whichever student she is speaking with does not seem to mind this intrusion. **[I]** As far as he can tell, the projects underway are different both in kind and in their stages of development, so it's not clear what one student may hope to glean from her discussion with another one. He's a little concerned that when it comes time to judge their work, Lara is going to have trouble deciding which has done their own work and which have filched their solutions from others. As Lara continues her back and forth with individual students, Albert looks around more closely. On one wall he spots a whiteboard where it seems clear Lara has given a lecture previously, mapping out some processes or methods using diagrams. Around the rest of the walls a profusion of sketches and notecards are pinned anywhere there are not shelves of materials taking up space. **[J]** Students visit both occasionally, sometimes taking materials out of bins, and at some places gathering in twos or threes to discuss whatever has been pinned up. **[K]** He finds himself impressed with how self-directed and busy most of them seem to be, and realises that Lara makes a point of visiting those who appear less engaged than the rest. **[L]** She even speaks briefly to one of the 'drop-ins' from across campus, not even enrolled in this class, who is trying to solve a problem with one of the digital sewing machines.

- [I]** Studio as a place for [habits and rituals](#) ^{→262}, [enculturation](#) ^{→285}, and [listening-in](#) ^{→170}. The social environment of studio encourages students to become enculturated into social norms that celebrate eavesdropping and engagement in critique conversations in multiple configurations with

Albert and Lara plan to team teach in studio

varying numbers of students. Thus, the quality of being able to ‘listen in’ is a habit that is supported by the broader [critique](#) ^{→79} rituals of a studio, which ultimately aim to create independent learners and practitioners, a basic principle of [critical pedagogy](#) ^{→276}.

- [J] Studio can be productively viewed through the lens of [proximity and synchronicity](#) ^{→128}, and [materialities](#) ^{→142}, where [process is made visible](#) ^{→34}. Studio includes a wide range of prototypes and other physical artefacts and tools that support design work. Through these material cultures, student progress and process becomes evident and accessible to the educator and other students. Engagement in these physical resources – alongside other social and instructional elements – encouraging different kinds of proximal relations, both as a form of interaction and as a means of [extended and distributed cognition](#) ^{→38}. Multiple facets of the space also work together to create a space supportive of [creativity](#) ^{→222} and [serendipity](#) ^{→212}.
- [K] Studio has a [rhythm](#) ^{→124} and is a place for [making](#) ^{→147} and [materiality](#) ^{→142}. Studio space celebrates tangible and physical [artefacts](#) ^{→151} and [prototypes](#) ^{→158} that can be experienced by multiple students. The rhythms of engagement with these materials break up long work sessions, where students move from individual work to social engagement for the purpose of [social comparison](#) ^{→172} that relates proximally to one or more physical artefacts.
- [L] Studio is a place for [active teaching](#) ^{→71}. An educator’s engagement in studio involves a sensitivity towards where individual students are at in their process, including an awareness of what activities and [feedback](#) ^{→74} each student needs to further their [expertise](#) ^{→90} – even if the student doesn’t yet feel this need themselves. The dialogic nature of these encounters change and mature with student development and agency, ideally becoming peer or co-interactions between educators and students, a core aspect of [critical pedagogy](#) ^{→276}.

Near the end of what Albert feels to have been more than the two-hour class period, Lara moves to a central point in the room and raises her voice. When the quiet hubbub dies down, Albert realises how constant it has been up until now. Lara reminds the students of the time for the upcoming midterm crit, exhorts them to be on time with their materials so that the external reviewers will not have to wait for them, and repeats information posted on the door as he entered regarding which night-time hours are available for them to come back and work on their own. She admonishes them to clean up after themselves in the adjacent

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workroom where several specialty machines and computer workstations share a second large space open to this one. [M] Then she gives them a quick recap of her expectations for crit in terms of visual representation of their work and of their verbal presentations. [N] As she does so Albert recognises, at last, an element of teaching familiar to him – she's giving them a talk with some concrete information in it.

- [M] Since studio is a place for *making* ^{→147}, a wide range of tools might be used to support these material practices, from formal and tangible equipment such as speciality machinery and computers to everyday items such as paper and whiteboards.
- [N] Studio is a place for *learning by doing* ^{→145}, whereby students engage in *formal critique* ^{→79} where they must have *confidence to speak* ^{→176}. Studio interactions point towards broader *project cycles* ^{→132} and milestones at which *time* ^{→121} students are expected to *perform* ^{→107}. While critique engagement is a ubiquitous part of studio engagement, formal critique events foreground both social pressure and formal *assessment* ^{→234} which requires students to be able to discuss their work.

Some students leave after this; some do not. And Lara does not formally end the class either. Instead, she walks Albert out of the room, stopping twice for a last-minute consultation with a student. When they arrive in the hallway she turns to him suddenly, 'Oh my gosh, I'm sorry Albert! I've got a committee meeting in a few minutes. Tell you what – send me a calendar invitation and we'll debrief about the class, OK?'

'Ok,' Albert agrees. He leaves the building to head back to his own building. *I have so many questions*, he thinks. Starting with, what the heck was going on there and why did I say I would be part of it?

Zoe teaches a hybrid studio

At 8.00 am on a midweek morning Zoe juggles a book bag, a lunch sack and an armload of rolled-up prototype sketches as they pull out the entrance key to their departmental shared workspace. Turning the lock, they enter a large open plan room and head for their preferred location on the far side. There they stop at one of the desks available to educators on an as-needed basis in lieu of the traditional office space that they and their colleagues used to occupy. A studio tutor, they have taught product design for more years than they like to count, and as they sit down they reflect that in the last 4–5 years their work has changed in more ways, and more quickly, than in all the previous years combined. It's not just this 'hot seat,' first-come first-served workspace they use now, either. Course enrolment limits were raised and materials budgets tightened simultaneously during an economic pinch four years ago [A]. Then they and their colleagues had rushed their studio courses online two years ago when a worldwide pandemic had precluded teaching face to face. They couldn't say they had enjoyed those years, or been fully successful in adapting their teaching to a distance format, in spite of tools and resources hurriedly assembled by the university. Admittedly, though, they had learned a lot – which was a good thing, because these courses have not returned entirely to their on-campus format, and it is not clear they ever will.

[A] Studio has a high personnel and resource *cost*⁵¹, because of its comparatively low numbers of students assigned to each educator, and technicians who support the workshops and tools used by students.

They're teaching hybrid studios now and they can see the advantages of this format for the university. Fewer studio spaces are required, for example, because half the class comes to campus each week while the rest work at home in an alternating schedule; it's probably a net savings to the university [A], although likely not to the students.

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Originally intended to ensure that social distancing could be maintained, these face to face sessions with half the class at a time have actually resulted in livelier exchanges between the students – both in class and online. Zoe has noticed how quickly the students have identified themselves as ‘The Mondays’ and ‘The Wednesdays,’ to the extent that each group has designed logos for themselves, and within these two groups more of them than previously contribute actively to discussions and mutual support of one another [B]. So, even though rumours abound that the larger of two departmental studio spaces is about to be reassigned for use by the central campus, which seems like a signal that the hybrid format will be adopted permanently, they are beginning to wonder whether it will, in fact, be a total disaster. Perhaps it will not require worse compromises than other formats – only different ones [C].

[B] Studio spaces and pedagogies support the emergence of a strong group or shared **identity** ^{→94} and a sense of **belonging** ^{→189}. The emergence of the Mondays and Wednesdays groups illustrates that studio identities are flexible and contextual. This renewed process of enculturation into a hybrid form of studio has given rise to new **social networks** ^{→185} being formed between peers in the now smaller groups. The resulting reshuffling of **power** ^{→282} relationships between peers has given some students **confidence to speak** ^{→176} and others opportunity to **listen in** ^{→170}. It has opened new avenues for **dialogue** ^{→181} and **learning and designing collectively** ^{→166}.

[C] **Cost** ^{→51} of studio can be measured in different ways, but some of its cost-benefit is immeasurable by typical institutional metrics. Any changes to studios may be unpredictable or risky in the eyes of some, or unavoidable and necessary to keep in line with societal changes and its impact on the **discipline** ^{→238} for others.

Zoe takes a seat and begins the routine they have developed for starting each day of teaching. Plugging their university-issued laptop into the connectivity sockets on the desk, they power up. They click open a pre-set configuration of digital tools that allow them to check in on students, mark their assignments, and record their feedback [D]. This is a Wednesday, so they will head downstairs later for a live class, but this morning they will spend a couple of hours browsing an online space called The Walls, where students post work in progress as well as work they want to share with others [E]. At the start of the pandemic, Zoe and a fellow tutor adapted an online service, now integrated into the university’s course management system, to create The Wall, a huge

Zoe teaches a hybrid studio

online white space into which images can be posted, grouped, and repositioned by anyone in class. It was intended to duplicate the function of the long hallway outside their two physical studios where crit was held [F], and where students pinned up a welter of sketches, comps and reference images over the course of a term [G]. Soon after rollout of The Wall, students had requested private spaces online to collect their own work in progress, and semi-private walls available by invitation only soon followed, as did archival walls created to save everything that had been posted in previous terms. Now renamed The Walls, this digital space is home to many thousands of images [H]. Zoe makes a mental note each time they enter to check the quota on their server space in case it is time to ask for an increase [I].

- [D] Not just students, but educators as well, spend considerable time ^{→121} on tasks and follow the rhythm ^{→124} of studio, which is often dictated by project cycles ^{→132}. Even if student work is viewed online, the basic mechanisms of feedback on assignments, including crit ^{→79}, as a key foundation and method ^{→60} of studio remains.
- [E] Studio is a place ^{→198}, structured by spatial and temporal experiences. Users experience immersion ^{→118} in studio through the design and use of the online studio, The Wall. This is because the interface acts like a surface ^{→48} which makes interactions visible ^{→34}. This visibility is promoted through the synchronicity of actions and proximity ^{→128} of information and people in social networks ^{→185}. This helps students to make social comparisons ^{→172} to peers in online spaces as well as fostering collective identity ^{→94} and individual creativity ^{→222}.
- [F] The properties of studio surfaces ^{→48} make further engagements such as the critique ^{→79}, feedback ^{→74}, dialogue ^{→181}, or reflection ^{→83}, possible.
- [G] Artefacts ^{→151}, prototypes ^{→158} and playing ^{→155} with (digital) materiality ^{→142}, as well as making ^{→147}, are all forms of extended and distributed cognition ^{→38} being supported here by digital affordances.
- [H] Students' performance ^{→107} is rehearsed in public, private, and semi-private studio spaces ^{→54}. Being able to track and revisit the designs shared in these spaces creates a memory and history of activities and interactions, which reinforces a sense of belonging ^{→189}.
- [I] Another important cost ^{→51} in studio, tightly tied to pedagogy, is the IT infrastructure and the resources the learning design might require to work properly in a particular studio setting.

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All being well quota-wise, Zoe proceeds this morning to visit each semi-private wall to which they have been invited recently. On some of these are scanned versions of paper prototype sketches handed in last week, those now lying on the desk next to them. Unrolling the bundle, they consider wryly how hard they used to argue with first-year studio students to sketch by hand as well as with digital tools. But this is a second-year class and Zoe is gratified to see the students using paper-pencil sketches for their earliest ideation where fluidity is critical [J]. A number are also using their walls to share more refined, usually digital, prototype representations they have developed post-paper, and they refer to both as they plan process feedback for the students [K]. Midterm critique is coming up, so the students have questions in the form of digital sticky-notes. Zoe responds to each of these using audio notes which are quicker and more personal than typed ones, then they move on to the next wall [L]. If they are honest, they miss the intentionally aimless walks they used to take through the studio, being stopped frequently by students with questions or requests to look at a developing idea [M]. This still happens in the live classes, but it's limited; when they see half the class in person only once a week, they find themselves reserving those times for more structured interactions, such as for the hybrid crit they will be holding today.

- [J] The inherent tentativeness or **uncertainty and ambiguity** ⁻²⁰⁹ in paper-pencil sketches encourages students' **creativity** ⁻²²² and play with **materiality** ⁻¹⁴² without becoming fixated too quickly. Encouraging sketching is an example of providing safe environments to take **risks and experiencing failure** ⁻²²⁷, to learn through **reflection** ⁻⁸³ and improvement of early mistakes.
- [K] The **feedback** ⁻⁷⁴ provided on sketches and digital **prototypes** ⁻¹⁵⁸ is an example of how reflection is encouraged and supported. This feedback exemplifies **active teaching** ⁻⁷¹, wherein different responses must be offered to each student who is at a different point in their **journey** ⁻¹⁰⁴, and their development towards **expertise** ⁻⁹⁰.
- [L] While much **feedback** ⁻⁷⁴ is formalised in **crits** ⁻⁷⁹, the formative desk crit, exercised by Zoe online in audio notes, is an important vehicle to practise **disciplinary** ⁻²³⁸ language and give students **confidence to speak** ⁻¹⁷⁶ in a synchronous crit.
- [M] While online studios offer many properties that are alike in physical studios, the **serendipity** ⁻²¹² of bumping into people, situations, or activities to inspire dialogue are

Zoe teaches a hybrid studio

more difficult to recreate online in that they require particular attention to enable them. **Synchronicity and proximity** ^{→128} are experienced differently online compared to a physical studio, which has implications as to how students and tutors **learn and design collectively** ^{→166} and how tutors engage in **active teaching** ^{→71}.

During the hybrid crit, students in the onsite class present their work, each speaking for five minutes about the sketches they have posted online and in the physical studio. The other half of the class will participate online simultaneously, viewing a fixed-camera feed from the face-to-face studio while their fellow students present. They will offer feedback via a notes feature in The Walls, attaching comments on top of, and alongside, the digital sketches that presenters have posted **[N]**. A few days ago, Zoe contacted the external jury members for today's crit, reminding them when and how to log in online. In the past they might not have recruited external jurors for a mid-project crit, but another unexpected benefit of the hybrid format has been that it is easier for practising designers to find a couple of hours to join the class, versus when they had to travel to the campus. The online format of crit also allows external jurors to review the work students have posted before the crit begins **[O]**. Zoe has been gratified to note that they do so, and it seems this – or something about the format – has reduced a problem of long standing in the studio. Privately they term it the Problem of the Knee-Jerk Juror, in the sense that many respond to students based on spending only moments appreciating their work, and in the sense that they tend, frequently, to be jerks about it. It's true that the students seem to feel they cannot 'read' the jury online as well as they can face to face, losing the chance to adjust presentations mid-stride **[P]**. Zoe files this tension away to be hashed over with the programme steering committee later.

[N] An online studio can become a **place** ^{→198} if students become sufficiently **immersed** ^{→118} in engagement with it over **time** ^{→121}. An online, shared **surface** ^{→48} on which students engage, for example, can easily become a place where a range of social learning emerges: **listening-in** ^{→170}, **social comparison** ^{→172}, **learning and designing collectively** ^{→166}.

[O] Crits are a key part of the **habits and rituals** ^{→262} of studio, regardless of whether they are online, offline, or hybrid. Inclusion of practitioners in crit can help students envision design **identities** ^{→94} and underscore elements of **enculturation** ^{→285} into the field. This can also result in tricky **power transactions** ^{→282} to be navigated by educators.

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[P] Some forms of **critique** ⁻⁷⁹ reproduce harm, such as biased or unconsidered **judgement** ⁻⁹⁸, and this may look different in virtual or physical studios, which may, in turn, support **character** ⁻¹⁰¹ development differently in students. As an example, an in-person presentation might be adjusted on-the-fly, perhaps negatively, to suit a particular juror, whereas an online asynchronous critique might afford the time to digest and push back on feedback, if only privately.

Confirming RSVPs for all the jury members, Zoe indulges in a stretch, arms overhead, then switches their online view and spends a few minutes in the Ask a Tutor space online. They activate the First Year filter so they can see items that have arrived overnight from students comparatively new in the programme. These students sometimes stall when they encounter a dilemma, so Zoe likes to jump on their questions quickly, assessing which require immediate support. The first message is titled 'Seriously? How do you expect us to even do this?' and they can guess the gist of the message before opening it. Students are frequently astonished that project briefs received in studio are not accompanied by lectures on design principles or process guides detailing the steps to arrive at a design solution **[Q]**. Sure enough, this message is what they expected; assigned to 'Design a Secure, Self-Opening Lock,' the student is demanding that 'self-opening' and 'secure' be defined in full detail, complaining that there are too many use cases for this brief and asking what they seem to consider an unanswerable question, 'how do you expect us to design a thing when you have not taught us how to design?' **[R]** Recognising the extreme discomfort a student can feel when beginning to develop a sense of how to frame and reframe a problem, Zoe answers the message with a few process pointers, but without telling the student what to do or undermining them in resolving ambiguity independently. After adding the recommendation to look at other students' work in the open sharing space, or read through previous questions on this topic in Past Posts, Zoe moves on to other questions. Today there is a question about navigating The Walls, one asking about possible assignment modifications from a student with chronic illness flare up, another responding to his prior feedback, and one from a student who happened to find the perfect image for a project in a discarded magazine in the studio but worried he might be cheating if he used it **[S]**.

Zoe teaches a hybrid studio

- [Q]** Online studios are also places of **affect** ^{→200}, where students' emotional reactions to events are just as important as traditional studios, and the **synchronicity and proximity** ^{→128} of students and educators is mediated through online interactions and spaces. Online studios require **active teaching** ^{→71} to respond in **time** ^{→121} to student issues, the difference being the **visibility** ^{→34} of queries in online interfaces.
- [R]** Another **habit and ritual** ^{→262} of studio is posing a **design brief** ^{→67} that uses **uncertainty and ambiguity** ^{→209} to bring students out of their comfort zone, to de-centre them so they start a **journey** ^{→104} of **transformative learning** ^{→111}. This journey is filled with **affect** ^{→200} and emotion.
- [S]** To help students when they take **risks and experience failure** ^{→227} when they address vague or contradictory briefs, studio tutors make use of **active teaching** ^{→71} (including attention paid to students' **well-being** ^{→214}) and encourage students to **learn by doing** ^{→145}. This may involve **social comparison** ^{→172}, for example by looking at other's responses, or by reading past posts. Students **listen in** ^{→170} on conversations to compare their problem or approach to those of their peers.

Sensing their eyes about to cross, Zoe changes gears, pulls an apple out of their lunch sack and begins to munch while considering the brief they will be assigning soon to their intermediate class. The brief will have to conform to the curriculum committee's requirements, of course, but they have had a brainstorm recently and think they may revise some elements of it. What would happen, for example, if they leveraged the spontaneous Monday/Wednesday identification of the groups in this class and introduced an overt competitive element into the upcoming project, maybe through a Call for Proposals (CFP) as happens frequently in practice, although each half of the class is too large to work as a single design team **[T]**. How about assigning points to each individual prototyped solution and awarding the 'contract' to the group with the highest cumulative score – maybe judged by external panellists? Possibly, Zoe muses, but there is already plenty of competitive tension between individual students in the studio. Would this structure leverage that tension in a productive way, encourage outright toxicity, or marginalise students already at a disadvantage for one reason or another? **[U]** Maybe what they really wanted was just a stronger connection with design practices outside the studio. They could write the CFP and require individual students to demonstrate how their solutions address it – this would not be substantially different

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than a regular brief, but could frame students' perspectives differently. Deciding to think it over further, Zoe opens their lunch sack again to begin the meal proper before heading downstairs to the studio and beginning what they think of as today's Half and Half crit – half onsite, half online. It really is a new normal, they muse, biting into their sandwich.

- [T] Studio [simulates](#) ^{→232} professional design practice using teamwork and competition but doesn't copy it completely, because a studio's main objective is to provide a safe space to learn that comes close to the [disciplinary](#) ^{→238} realities but still shelters students from the harsher consequences of practice.
- [U] Studio's [hidden curriculum](#) ^{→271} can be managed and designed if educators are aware of the [habitus](#) ^{→265} of studio. Reflection through the lens of [critical pedagogy](#) ^{→276} on the [power transactions](#) ^{→282} that might be involved in, for example, a competitive framing for a [design brief](#) ^{→67}, may lead to changes in how studio is enacted.

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