Studio use in Distance Design Education

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ABSTRACT

This Portfolio of Work presents research from eleven publications and a covering paper on the subject of studio use in distance design education. The covering paper describes recent history, traditions and contexts of design education, outlining major theories and thinking that continue to influence scholarship, research and practice in the area. The publications build on this body of work and reflect contemporary scholarship and technologies, focusing on how these have affected studio learning and teaching in distance and online settings. The themes that emerge are themselves rich areas of emerging scholarship in design education, including: social comparison and learning, design presence and online learning interactions, extended and conceptual models of studio, and the importance of acknowledging the invisible and hidden learning that takes place in design studios of all kinds. Appropriate to these themes are the range of methodologies applied in the publications that demonstrate a similar breadth of approach to knowledge acquisition and construction, ranging from phenomenology and critical theory to pragmatic and empirical statistical analyses. Key to exploring both themes and methods is how this knowledge is utilised pragmatically and appropriately in a complex educational setting such as the design studio and the thesis demonstrates that, like design practice itself, both the activity and outcome of research are inseparably linked as part of the process of constructing knowledge of the phenomenon of studio. As a whole, the thesis offers a broader perspective of studio as a socio-complex educational praxis, framing studio as a conception in itself: a shared, persistent, and emergent idea that enables and supports the learning ecology that is the design education studio.
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To new colleagues from around the world in 2020.

DEDICATION

Research is not standing on the shoulders of giants; it's supported by lots and lots of little people.

It belongs to them.
# CONTENTS

Abstract ........................................................................................................ iii
Acknowledgements ....................................................................................... v
Contents .......................................................................................................... i

## PART 1: Covering paper ............................................................................ v

### 01 INTRODUCTION .............................................................................. 7

1.1 Structure of the Portfolio of Work .......................................................... 9
1.2 The publications .................................................................................... 11
1.3 Definitions and terms ............................................................................ 14

### 02 CONTEXT ......................................................................................... 17

2.1 Contemporary design education contexts in the UK ......................... 17
   Design as a black box .............................................................................. 20
   Subjective and tacit nature of design .................................................. 20
   Design as a discipline within normative education contexts ............ 22
   Training versus teaching ...................................................................... 24
   Studio space and resources ................................................................. 25
   Design as a subject is changing ............................................................ 26
   Design students are changing ............................................................... 28
2.2 Distance education at The Open University ........................................ 29
   Open Entry and student demographics at the OU ............................ 30
   Teaching at a distance at scale .............................................................. 32
2.3 Contemporary design education at a distance .................................... 33
2.4 Research Questions ............................................................................... 34

### 03 LITERATURE REVIEW .................................................................... 37

3.1 A (brief) history of design education .................................................. 38
   Design as apprenticeship ...................................................................... 40
   Design as profession ............................................................................ 41
   Modern western design education ...................................................... 43
3.2 Contemporary design education .......................................................... 45
   Design Methods ................................................................................... 45
   Design as a ‘3rd way’ of knowing ...................................................... 46
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumption through comparison</td>
<td>110</td>
</tr>
<tr>
<td>History of Theory</td>
<td>111</td>
</tr>
<tr>
<td>VDS and distance design education</td>
<td>114</td>
</tr>
<tr>
<td>4.2 Contemporary and emerging VDS research</td>
<td>116</td>
</tr>
<tr>
<td>Social learning</td>
<td>116</td>
</tr>
<tr>
<td>The VDS is not enough</td>
<td>122</td>
</tr>
<tr>
<td>Conceptual model of ‘studio’</td>
<td>125</td>
</tr>
<tr>
<td>05 SUMMARY OF PUBLICATIONS</td>
<td>131</td>
</tr>
<tr>
<td>5.1 Overarching themes</td>
<td>131</td>
</tr>
<tr>
<td>5.2 Publications A (and B): An alternative (to) reality</td>
<td>135</td>
</tr>
<tr>
<td>Reception</td>
<td>137</td>
</tr>
<tr>
<td>5.3 Publication C: Building Information Modelling Design Ecologies -</td>
<td>139</td>
</tr>
<tr>
<td>A new model?</td>
<td>139</td>
</tr>
<tr>
<td>Reception</td>
<td>140</td>
</tr>
<tr>
<td>5.4 Publication D: Everyday creativity in design process</td>
<td>141</td>
</tr>
<tr>
<td>Reception</td>
<td>143</td>
</tr>
<tr>
<td>5.5 Publication E: Reading students’ minds</td>
<td>144</td>
</tr>
<tr>
<td>Reception</td>
<td>146</td>
</tr>
<tr>
<td>5.6 Publication F: Reflection-in-Action and Motivated Reasoning</td>
<td>148</td>
</tr>
<tr>
<td>Reception</td>
<td>150</td>
</tr>
<tr>
<td>5.7 Publication H: Embodied Cognitive Ecosophies</td>
<td>151</td>
</tr>
<tr>
<td>Reception</td>
<td>152</td>
</tr>
<tr>
<td>5.8 Publications G, K, and L</td>
<td>154</td>
</tr>
<tr>
<td>Reception</td>
<td>156</td>
</tr>
<tr>
<td>5.9 Publication M: A longitudinal study of Virtual Design Studio (VDS)</td>
<td>158</td>
</tr>
<tr>
<td>use in STEM distance design education</td>
<td>158</td>
</tr>
<tr>
<td>Reception</td>
<td>161</td>
</tr>
<tr>
<td>5.10 Other publications and impact</td>
<td>162</td>
</tr>
<tr>
<td>BITE Books</td>
<td>162</td>
</tr>
<tr>
<td>Creating Distance Design Courses Guide</td>
<td>164</td>
</tr>
<tr>
<td>Report: India Report and impact</td>
<td>165</td>
</tr>
<tr>
<td>Impact B: Technology Enhanced Learning Software</td>
<td>165</td>
</tr>
</tbody>
</table>
06 SUMMARY AND FUTURE WORK ........................................... 169
  6.1 Research questions .................................................. 169
  6.2 Future work ............................................................. 173
    Teaching design at a distance ........................................ 173
    Next generation online design studios ............................ 175
    Studio properties research .......................................... 176
    Contributing to general education ................................ 177
  6.3 Last words ............................................................. 178

07 REFERENCES .............................................................. 181

08 APPENDICES .............................................................. 211
  APPENDIX A: List of Publications .................................. 212
  APPENDIX B: Abbreviations and Glossary ......................... 218

PART 2: Publications ....................................................... 221
PART 1: COVERING PAPER
INTRODUCTION

This thesis is partly inspired by personal experience and observation as a design educator and from presenting the work in this covering paper to colleagues in the UK and around the world. When I explain that The Open University in the UK (OU) is a distance education institution and that we teach design to students who are not in the same physical space as us, the response was often surprise and even incredulity. Almost all traditional design education relies on physical spaces, objects and interactions in learning and practice, hence, design education without this physical proximity was almost unimaginable to many colleagues.

The coronavirus (COVID-19) and events of 2020 changed that. The challenges of having to convert to teaching design at a distance at very short notice had been faced by many design colleagues, highlighting just how located, embedded and tacit design knowledge can be. From being a rather specialised aspect of design education research, distance design education was suddenly in the spotlight. The legacy of 50 years of teaching design at the OU clearly demonstrates that distance design education is possible. In this time, it has matured and developed with some aspects of it remaining constant and others evolving, providing new opportunities for learning and teaching, particularly in the development of online and virtual design studios.

What is less clear is precisely how this happens. This, then, is the central, and general, question that underpins my research and the main topic of this thesis: How does distance design education work?

In responding to this question and preparing this covering paper I have made use of experience gained throughout my whole career in both design practice and academia: from my earliest research work
(Bachelor of Architecture thesis) exploring the history and theory of architectural conceptualisation, to my most recent work researching student learning and activity in virtual design studios. I have relied on my own professional practice as an architect and designer, as well as my experience as a design tutor and educator, particularly in having to re-learn and re-experience what design is from multiple points of view: practitioner, student, and teacher. This continues to be a dynamic process.

As part of the writing process and other scholarship and research, I have confronted a range of implicit and tacit assumptions in my own practice, again, as both designer and educator. Such assumptions are, at least in part, reflected in broader assumptions across the wider domain of design education and research. The history of knowledge in this area is, as will be outlined, problematic and somewhat contested, particularly in contemporary design theory research, where what constitutes design knowledge (or knowledge from designing, etc.) is still debated. In design education such discussions are important but often take place in parallel to what happens in actual teaching practice. Teaching design remains very much a praxis: a blend of design practice, teaching and theory-making. This is one of the things that makes design education research an interesting and relevant area to work in.

Teaching design at a distance offers a unique way of seeing this blend in action and, rather than a limited or anterior form of design education, it allows particular insights into how students learn to become designers. Some of these insights are presented here as a blend of my own practice, teaching and research, which allows a unique view of the landscape of distance education practices that are at least as complex as those in traditional studios. This, in turn, demonstrates that such
practices are far richer than previously imagined in all modes of design education.

1.1 Structure of the Portfolio of Work

The requirements for the degree of Doctor of Philosophy by Published Work require the submission of a Portfolio of Work, comprising a covering paper (Part 1) and the publications themselves (Part 2).

PART 1: Covering Paper of the Portfolio of Work provides text that brings together the published work into a coherent narrative around distance education and the use of studio education in that setting. It does this in as ‘traditional’ a way as possible: setting out the context of study, a review of the literature and work in that area, before finally outlining my own contribution though published works. It ends with a look at remaining gaps in knowledge and future directions for further study.

This covering paper has been prepared as part of a PhD by Published Work at the OU, which must include the following elements (from The Open University Research Degree Regulations, v1.3, p 113):

i) A title page.
ii) A summary of each publication.
iii) An outline of the interrelationship between the publications.
iv) A critical review of the current state of knowledge and research in the field and an indication as to how the students work has contributed to the field.
v) Commentary on the reception of the publications, as indicated by citations and reviews, and the standing of the journals in which they were published.
Following the introduction, Chapter 02 outlines the context of the covering paper and publications, considering contemporary challenges and issues in the design education landscape in the UK (requirement (iv)), as well as providing a series of research questions that have driven the collected works. Chapter 03 provides a detailed literature review of Distance and Design Education and includes relevant literature in areas related to this (requirements (iv) and (iii) above). Chapter 04 completes the literature review by extending it to virtual design studios and including my own work as a contribution to this body of knowledge, at the same time providing an outline of the interrelationships between papers (requirements (iii) and (iv)).

Chapter 05 provides summaries of each publication (requirement (ii)) and provides further thematic ways the publications interrelate (requirement (iii)) as well as outlining the reception of each (requirement (v)). Finally, chapter 06 reflects on the body of work presented, returns to the research questions introduced in chapter 02, and outlines ongoing and future areas of research in response to gaps in knowledge and opportunities.

PART 2: Publications contains the publications included in the Portfolio of Work. A reference list of these publications can be found at the start of section 07 References, a more detailed list in Appendix A, and summaries of each in chapter 05. The Covering Paper has been written without the need to have read the Publications and this has meant that outline descriptions of their contents have been used in places.

In-text references to the publications are highlighted in bold throughout the Portfolio of Work, thus, Publication A, to clearly identify the work.
1.2 The publications

A short outline of the publications is now given to precede the contextualisation material and literature reviews, with the aim of helping to situate the work in a wider academic context. The publications cover a range of both subject areas and research methodologies, although there are common themes that connect them, which will be drawn in detail throughout the covering paper. Detailed descriptions of the publications are given in Chapter 05.

**Publication A** explores theoretical ideas around virtual and online spaces, observing that how people conceptualise physical environments has a relation to how they conceptualise online and virtual environments. This may seem an obvious observation but the unique contribution is the degree to which this is embodied in our thinking and actions, i.e. beyond surface and superficial similarities. This has a relevance to the creation of learning and teaching materials in online and distance settings, arguing that educators should focus on the translation of conceptualisations between these two environments.

This idea is extended in **Publication B** by considering an online design course at The Open University, observing that the virtual learning spaces and studio can be usefully considered as more than the individual parts; that the curriculum, teaching structures, and other trappings of higher education are as important to the success of any online studio.

The idea of studio being a conceptualisation of space/place features in much of my work and was further extended in **Publication C** to include professional virtual design environments. Digital prototyping (using virtual design models) and how teams work together in a virtual design space can also be treated as a conceptualised space and the paper provided several practice-based examples to support this idea.
The initial ideas outlined in Publications A, B, and C were given a rigorous theoretical foundation in Publication H, which considered the embodied cognitive nature of conceptualisations of reality. The work extends the idea of conceptualisation to include a deeper acknowledgement of the contexts of how conceptions are constructed. To do this, the paper applies the theory of ecosophy and updates it to account for historical criticisms, providing a new foundation for its application.

Publication D considers how creativity emerges and is expressed in an online learning community and design studio. It demonstrates that forms of social constructivist learning through design expression can take place in an online or virtual design studio. Theoretically, the work aligns with social definitions and frameworks of creativity and the publication itself contributes evidence to support such positions, as well as important observations around social learning in distance and online studio spaces.

Publication E considers one of the ways traditional dialogic studio tuition is translated to a distance setting by exploring learning and assessment material that enables the visualisation of students' thinking and design processes using digital tools. This focus on cognition in design processes has been central to OU teaching for decades and the scholarship in Publication E evidences its effect and explores examples of it working at scale in an HE institution. It demonstrates one way students and tutors engage in other forms of dialogic tuition, presenting evidence of online and distance presence, albeit expressed as design identity in a particular setting.

This idea of expressions of design identity at a distance is explored further in Publication F, which focuses on reflective practice, another key technique used in distance education to enable student learning.
Publication F explores the assessed components of reflection and briefly analyses how this is approached and treated by students. The paper suggests an alternative framing of reflection as a valuable cognitive activity in and of itself, thus challenging some assumptions made about reflection in the literature.

Publications G, K, and L, represent an arc of work exploring in detail the activity of students in a virtual design studio setting. Publication G identifies the potential and complexity of social interaction and learning that takes place in such studio at the OU, hypothesising certain behaviour patterns. Publication K extended these findings to a larger sample of students, refined the hypothesised patterns, and was the first publication to identify another new pattern: the correlation between informal student activity and successful learning outcomes. Publication L explored the qualitative aspects of student behaviours to understand the motivations behind the observed behaviours and identifying differences between educator and student perceptions of studio work and behaviours.

Finally, Publication M brings together the work from Publications G, K, and L by expanding the study sample to consider different stages of learning, confirming and updating some of the ideas previously reported. It’s significant contribution is the creation of an amended social learning model using general education theories but modifying these to fit the observed results and place this knowledge within a design studio context. In doing so it bridges scholarship traditions but theorises distance design studio in its own knowledge domain and evidencing this using a rigorous piece of replicable scholarship.
1.3 Definitions and terms

A few particular terms and definitions are worth addressing prior to reading further.

Design

The word design is problematic not only in terms of definition, as will be explored in chapter 03), but also grammatically and even syntactically (Lyon, 2011, p. 38). For example, it can be used as a verb, noun or adjective – sometimes in the same sentence. In education research this can be further complicated since learning, itself, can be designed. I have tried, where possible, to avoid ambiguous use of the word design (in particular anything such as “designers designing a learning design for a design course”) but there are, unfortunately, a few occasions where a clumsy sentence is unavoidable and the sense of the use of the word design may require some reader consideration.

As a concept, the word design also carries with it a set of prior beliefs and opinions about what design is (or is not), in a similar way to conceptions of ‘art’ or ‘justice’ or ‘fairness’. Design is a rich conceptual metaphor that is easily shared in discussion but far harder to explicitly define in any academically normative way and, whilst contemporary views of design have moved discussion and thinking forward, it is far from resolved (if indeed it ever can be). This covering paper will not provide a definition of design, but it will present a position in terms of how design is defined through the education of designers.

Studio

As will be shown in Chapters 02 and 03, defining ‘studio’ is a non-trivial matter. It is also a word that has its own preconceptions, and many people will have some pre-existing notion of what they consider a studio
to be. At this stage in the covering paper I ask the reader to be open to suggestions of what studio is and, at least, consider it beyond disciplinary-specific (such as “dance”) or purely literal (such as “room”) interpretations. The understanding of what creates and sustains an effective studio has developed relatively recently in design education literature, as well as in response to the coronavirus. It is insufficient to consider a studio (physical or virtual) to be only the ‘stuff’ it is made from and this applies in virtual as well as physical studios. A studio, as will be argued in this thesis, has to be understood as the blend of many elements, the extent of which have yet to be fully defined or described.

**Traditional studios**

I will refer regularly in the covering paper to ‘traditional studio’, meaning the physical studios that feature in most design courses prior to 2020. These studios rely on physical proximity of students and tutors in order to work effectively, hence the need for physical space and resources to operate. This will be used as a general term to describe all traditional studios used in traditional universities and most mainstream teaching institutions prior to the coronavirus.

**Virtual studios**

A number of different terms are used in the literature to refer to online and distance studios: virtual, alternative, augmented, distributed etc. As will be shown in chapter 03 there is no clearly agreed disambiguation for these terms and they very often mix properties and modes of learning. Historically, the term virtual design studio, or VDS, has been used (the specific set of historical definitions are outlined in chapter 04) and this term can be somewhat misleading. Hence, I have tried to refer to the most contextually relevant and accurate type or mode of studio throughout the covering paper. Where this has not been possible I have used the default term VDS as a shorthand.
02 CONTEXT

The general focus of this covering paper is design education in a higher education (HE) context in the UK and, more generally, the wider context of a Euro-Western educational tradition. Almost all global contemporary curricula have been affected by such Euro-Western models of design education directly or indirectly (see Hickman (2019) for examples), and the UK is no exception to this. The history and consequences of this will be explored in the proceeding chapters but the contemporary UK setting is the particular starting point.

2.1 Contemporary design education contexts in the UK

Design in the UK is typically studied as a specialist subject at Higher Education (HE) levels of study (ISCED Level 5\(^1\), (UNESCO Institute for Statistics, 2012), either as a practice-based or vocational subject, or as an academic or professional degree. In the UK, this is generally, but not always, provided by further education colleges, focusing on selected vocational and practical training, and universities or specialist HE institutions, focusing on specific vocational, academic and professional qualifications (Houghton, 2016; Cross, 1984). Named design subjects tend to be specialised within specific sub-domains relating to professional or practice disciplines (e.g. architecture, graphic design, or product design). These sub-domains are often also associated with professional bodies who, through professional accreditation or certification, may dictate educational criteria, professional standards and even curricula (Rosner, 2019).

\(^1\) ISCED is the International Standard Classification of Education maintained by UNESCO (United Nations Educational, Scientific and Cultural Organisation)
Prior to studying at HE or FE levels, in intermediate education (ISCED Levels 2 and 3 (UNESCO Institute for Statistics, 2012), secondary level in the UK, K12 in the US), design tends to be an optional, and often peripheral, subject treated as a technical, technological or practical form of study (McGimpsey, 2011; Granville, 2019). In early years education (ISCED Level 1), design will rarely feature explicitly in curricula (Addison et al., 2010; Noel and Liu, 2016) and is often associated or conflated with art, craft or creativity in the curriculum (Craft, 2001; Thompson, 2019), despite evidence that shows its effectiveness as a mode and form of knowledge acquisition in itself (Nielsen and Digranes, 2007; Carroll et al., 2010; Siegesmund, 2019; Ali et al., 2019). For a contemporary history of art and design education at these levels, see (generally) Addison et al. (2010) and (for a UK context) Kimbell and Stables (2007).

In some other higher subject areas (beyond design disciplines), the use of design and studio methods is increasing, although very often difficult to implement unless appropriately applied (Boling et al., 2016). It could be argued that contemporary methods (e.g. ‘flipped classroom’) or approaches (e.g. student-centred learning) have many common properties to general design and studio education practice (Nielsen and Digranes, 2007) and it is certainly true that many general education researchers come to design and studio education to make use of its particular values (e.g. Boling et al., 2016). The question of what design education might contribute to other curricular areas is still largely unexplored, with the exception of isolated cases and examples.

This covering paper focuses mainly on design in UK Higher Education and acknowledges this presents two particular limitations for practical reasons.
Firstly, the focus on Higher Education means that the significant body of work undertaken in design education prior to this level of study is less well integrated. This is perhaps reflective of the wider UK educational landscape, where there remain disjunctions between design subject areas at secondary and HE levels, as noted above. Ironically, if you speak to many design educators, such divisions are rarely perceived in their own philosophies or work, instead seeing design education as a general way of developing student competencies and agency, hence having value at all stages of the curriculum (Kimbell and Stables, 2007).

Secondly, the focus on the UK setting limits the work with respect to other design education traditions, contexts and cultures. Whilst this focus is necessary for practical reasons in writing a thesis, it is also reflective of wider patterns in UK HE. As will be seen in chapter 03, most UK design education relies on dominant design education forms, often propagating from limited sources. This is reflected internationally in many other contexts (Hickman, 2019), often at the expense not only of local art and design practice and education (Mamvuto, 2019), or deeper traditions of art and design philosophy (Clark, 2019; Sinha, 2019). Awareness of such issues is changing, thanks to efforts by several authors to document and refer to previously under-represented contexts and traditions (Salama, 2017; Hickman, 2019; Staikidis and Morris, 2019), not to mention taking design theory and practice beyond this to far more plural forms (Escobar, 2018).

As will be demonstrated, the dominance of the Euro-Western model comes with certain gaps in our knowledge. Hence it is a self-acknowledged limitation in the work that this UK focus means that many other relevant contexts, paradigms, and stories are not included.
Design as a black box

The history of what became modern design, and design professions, in the UK is particularly linked to the social, economic and technological changes around the industrial revolution. Historically, professions or industrial sectors either organised or controlled the education of design professionals through economic, political or legislative controls (Cuff, 1992; Sennett, 2008). As a result, the nature, and sometimes content, of design education has not historically had to be defined or articulated explicitly: to be an architect, you studied architecture, by learning from architects, and practising until those same architects said you were an architect. As long as this system outputs architects, then it could be said to work. As Doblin, quoted in Dilnot (2017) observed, “design was what you did without knowing what you did” and this could equally be applied to design education: if we teach design in a particular way, and designers come out of this process, then we can consider that sufficient. Using this model, we only need to know that the process works; not how it works.

This ‘black box’ approach, which was still very common in design schools until quite recently, can be problematic for many reasons, not least because it permits and encourages gaps in knowledge in understanding design education. Schön, referred to this as the ‘Crisis of confidence’ in professional education (Schön, 1987; Waks, 2001; Ramage, 2017). How much is unknown and how much is ‘knowable’ remains a central problem in design education research.

Subjective and tacit nature of design

As will be demonstrated in greater detail in chapter 03, design and design education can be difficult to define in particular ways. Design knowledge is generally agreed to be an experiential and lived form of
knowing (Cross, 1982; Lawson, 2004), and how a novice designer develops such knowledge is very dependent on that individual, their experience(s), and the contextualisation of that experience. It may be hard to define but it can be easy to ‘see’ the end results of it happening. Hence, for someone with no design experience, the act of designing can seem mysterious and even somewhat incredible: ideas can seem to appear from nowhere, fostering myths about what it is that designers do.

Design educators have historically not necessarily dispelled such myths or mystery and have even relied on the tacit nature of studio learning to make up for any lack of specific learning strategies (Webster, 2008). At a theoretical level, some designers still advocate that art and design are essentially unknowable and that design can only be taught in particular ways (Wood, 2018). Unfortunately, these two very different issues can lead to problems when it comes to design education.

Firstly, the differential in power between expert and novice when such ‘unknowable’ positions are taken can be problematic when it comes to challenging design ideas and approaches, something that is important in the design process generally but critical in education (Webster, 2004). Put plainly, the double power differential of the expert also being the assessor in an educational setting has historically led to some questionable, and sometimes poor, practices (Webster, 2005; Mewburn, 2011; Gray, 2013).

Secondly, basing teaching practice on belief alone (often based only on prior personal experience of learning) is fostered when design cannot be examined or questioned. In creative design education, teachers’ beliefs about what creativity is have a greater effect on learners than any facts or evidence (Craft, 2005; Craft et al., 2007), particularly when it comes to whether creativity can be taught or is an innate property
(Bereczki and Kárpáti, 2018). Promoting the myth of design as unknowable, rather than engaging with how it is designers come to know, is argued to be similar to the logical fallacy of ‘Appealing to Authority’ (Richardson, 2012), requiring acceptance of the design expert’s word alone. Design, like many other subjects, has its own threshold concepts (e.g. Osmond, 2015), which require deep conceptual shifts in understanding or transformation of attitudes and even beliefs in students. To engage in an informed way in these deeper cognitive transformations and discuss them meaningfully with students takes a range of understandings of the ways of knowing a designer has access to as well as the frames of reference students bring.

It is, therefore, insufficient to simply ‘believe’ that design education works, for everyone, in the same way, and that it cannot be interrogated – regardless of how hard it is to convey experiential and tacit forms of knowledge. Beyond contexts of teaching students, the wider context of HE institutions and even national discourse is also affected by the types of epistemic difficulty just outlined. It is perhaps unsurprising that tensions can arise between design and other subjects in higher education contexts (Boling and Schwier, 2016; Smith, 2016). These contextual relationships continue to have significant influence on design education in the UK.

Design as a discipline within normative education contexts

The continuing increase of ‘public managerial’ or ‘technocratic’ approaches to education in the past decades in the UK (Payne and Hall, 2018; Hickman, 2019) has seen an increase in more explicit or metrified measures of results: the ‘inputs and outputs’ referred to by Gleeson and Ó Donnabháin (2009). For design education, this has partly coincided with the shifts from professional models of education to HE institutional ones: design education now largely takes place in
universities, not practice or even technical training/college contexts, and has been subject to national policies and institutional issues as well as professional requirements. In the current UK HE context, the recent reclassification of subjects by HESA still prioritises (disproportionately) science, technology and engineering subject areas (HESA (UK), 2020), a move that is reflected around the world (Coutts and Jokela, 2019; Fendler and Hernández-Hernández, 2019). UK policy preference is for curricular areas that can claim to enumerate objective outcome measures and align these with employment or economic utility (Etherington, 2019), often encouraging behavioural outcomes rather than deep learning and cognitive development (Gleeson and Ó Donnabháin, 2009).

Balancing these tensions has been difficult for design given the nature of the subject and the challenge of articulating its value using unfamiliar language (Freedman, 2019; Meager and Hall, 2019). Even Schön (1987) in his seminal book *Educating the Reflective Practitioner*, refers to ‘deviant traditions’ in art and design schools, highlighting the perception of eccentricity of these modes of education in relation to normative and dominant forms of education. From the mid-19th century to the present day, Robb (2019) would argue, educators in the UK have had to regularly argue for the value of art and design in the curriculum and design educators have been experts in ‘subverting the curriculum’ to meet students’ needs in such systems and environments (Kalin, 2019). Despite this alleged subversion, design curricula continue to be influenced by administrative and resource matters rather than purely pedagogical considerations. This is no different to some other disciplines but the particular and critical effect this has on design is important to recognise and will be explored further in later sections.
Training versus teaching

Similar issues arise around tool, product, or skills-based development, very often identified by industry and students to meet employment needs. For example, the desire to learn how to use image manipulation and graphics software is often greater than the wish to learn the underlying practice of visual communication. Gibbons, in his brief history of instructional design, refers to the “one step forward and two steps back” outcome of focusing principally on technical tools training rather than considering the need for deeper cognitive design approaches (Gibbons, 2016, p. 139), a problem that arises with each new release of technology. Biesta argues further, that a range of attributes, such as creativity, are ‘converted’ to skills by policymakers and stakeholders in order to be measured and appropriated in contemporary UK HE settings (Biesta, 2019).

In design this has become particularly pronounced with the mainstream adoption of advanced digital design tools over the past three decades. Communicating to students (or even policymakers) the fact that it’s far more productive and valuable to develop the underlying thinking ability required to apply tools remains a constant challenge; one we regularly confront at the OU where the distance component makes this more of an explicit issue through the use of some (selected) technologies. The immediate needs of industry rarely lead to a sustainable model of education due to the time lag between demand and completing a design education. Simply responding to immediate skills or behavioural need is like responding to the ‘rapidly aging facts’ referred to by Young (2003): out of date before their value can be applied effectively.

This is not intended to dismiss or diminish the importance of developing skills in design: these are critical to the development of any designer. However, developing only skills is insufficient and a negotiation
between this and other development aspects is required with any student. However, when skills alone (and particularly behavioural or superficial skills) are seen as the only purpose of education then this negotiation becomes difficult. How these tensions affect design education and research is explored in greater detail in chapter 03. In terms of the general educational context, however, such tensions lead to several practical consequences that affect design education disproportionately in comparison to other subjects.

Studio space and resources

Design education curricula are increasingly under pressure due to the perceived relative costs and resources, such as the physical spaces and the staff required to provide suitable student-centred tuition. Unlike other higher-cost subject areas (e.g. Sciences), such facilities are not necessarily perceived to be essential to the subject or can be viewed as ‘underused’ space (Shreeve, 2011; Boling and Schwier, 2016). The additional pressure to increase student numbers or teacher/student ratios can affect existing facilities and make the creation of new studios exceptionally challenging (Smith, 2016). At the national and social scales, too, design education is under pressure in terms of representation and presence in the curriculum generally (Payne and Hall, 2018), despite continued demonstrations of the value of the creative industries to the socioeconomics of the UK (Design Council, 2015, 2018).

In response to these resource challenges, many design schools, even before 2020, augmented (and in a few cases replaced) traditional studios with virtual and online design studios (Richburg, 2013). For some institutions this has allowed them to engage in pedagogical experimentation (Bradford, 1995), or support traditional studios (Bender and Vredevoogd, 2006; Arvola and Artman, 2008), or even augment
existing studios (Robbie and Zeeng, 2012; Rodriguez et al., 2018). During 2020, the rapid shift to distance modes accelerated such moves and, whilst these have yet to settle into any semblance of ‘normal’ practice, such transitions are likely to continue as institutions continue to expand distance learning courses and opportunities (Edwards and Minton, 2009).

Similarly, the continuing growth of distributed digital prototyping and design in professional practice (such as Building Information Modelling (BIM) or Project Lifetime Modelling (PLM)), requires a shift in how we prepare professional students for such collaboration (Publication C). In general terms, too, there is the ongoing importance of including in any design curriculum the basic, contemporary digital literacies required of any contemporary design student (Schadewitz and Zamenopoulos, 2009; Mogi, 2019), or even the development of basic designerly capacities (Kimbell and Stables, 2007). These latter motivations for change highlight the general and continual changes taking place in the subject and profession of design itself.

Design as a subject is changing

Design, by its very nature, is an ever-changing subject area, not just in terms of culture, fashion or zeitgeist, but as a mode and function of the contexts within which it operates. Social, technological and political changes are all reflected in contemporary design to lesser or greater degrees and even for ‘core subjects’ such as architecture, product design, or graphic design, responding to contemporary challenges is simply a part of ongoing practice.

Contemporary suites of design software allow an unprecedented level of control over how design is conducted and even the boundaries of this production, particularly at technical and operational levels. These
technologies raise questions of who can (or does) engage in design and, with technically able and literate users emerging, asking questions of what constitutes expertise. Similarly, with technically advanced but affordable and useable design tools, the ‘amateur’ producer or designer has also emerged over the past few decades (Rosner, 2019).

Even the basic ‘pipeline’ of ‘design > specify > make’ is changing, with technology blurring the boundaries between these principle phases: the so-called ‘post-industrial’ process of design (Cross, 2001). Practices and processes are adapting and changing to take advantage of new technologies, such as BIM or PLM; and an increasing awareness of the need to act on, not simply discuss, issues of sustainability might finally be instigating deeper changes in thinking about design and its role, if not influence, in society.

Additionally, new design domains are also emerging. The fields of service design, experience design, food design, information design, or even car interior material and fabric design, did not exist as specifically defined domains decades ago. Beyond specific design subjects, the success of applying design as a general set of aptitudes and approaches to other domains has led to another broadening of the design domain. Design Thinking, for example, has been successfully applied to business, politics, service design, and a range of other subject areas (Brown, 2008), albeit with a range of definitions (Johansson-sköldberg et al., 2013; Matthews and Wrigley, 2017). Beyond the core role of designer, if design support and other creative support disciplines are taken into account, this domain of change increases further (Design Council, 2015).

Without debating whether new design curricula may or may not be subjects, domains, disciplines or sub-disciplines, the general point is that, as contexts change, design and design practice is never far behind
in response to such change. It is a necessary part of design practice, and therefore design education, to respond to such change and in some way attempt to negotiate between what has been valuable in the past and emerging opportunities.

**Design students are changing**

Finally, design students themselves are changing. It has been true for some time that design students do not necessarily go on to take on traditional design jobs (Lloyd, 2011), and the value of a design education to develop a range of highly valuable and transferrable skills is well documented (Cross, 2001; Design Council, 2015). As a much wider and more extreme example, the Design Transitions movement is based on such a general critical approach to traditional design paradigms but still recognising its potential in creating positive change (See Boenhart et al. (2018) for a recent collection of work in this area).

As many commentators in education have noted, we are teaching students for a future we cannot predict (or properly imagine). Teaching only specific content, skills and other ‘rapidly ageing facts’ (Young, 2003) are arguably less valuable or sustainable than encouraging the development of more widely applicable cognitive competencies and abilities (Laurillard, 2013). Ironically, the relationship between such deep learning and the way in which education is positioned politically and economically in society, is having a final, negative effect on all creative education: as students are encouraged to act as consumers of education, it is well-defined behavioural outcomes that are often valued over aspects of personal development (Shreeve, 2011). Having said this, there is some evidence from distance design education research that students are aware of these competing tensions and that they are able to articulate the benefits of both a qualification as well as emotional and personal development (Lanig, 2019).
Because of the challenges outlined, and the exceptional events of 2020, understanding how distance and online design education works is now more important than ever. The distinction between distance and online is important here, something that will be explored in greater depth in later chapters.

### 2.2 Distance education at The Open University

The other main context for this covering paper is that of distance education and, in particular, The Open University, the largest distance and part time education provider in the UK. For almost 50 years the OU has provided innovative learning and teaching materials and qualifications in a range of subject areas. The official motto of the University is ‘Live to Learn’ and its mission statement is to be ‘Open to People, Places, Methods, and Ideas’. These sum up the founding values, and declared continuing ethos, of the institution.

The OU offers undergraduate degrees (ordinary and honours) as well as a range of certificates, diplomas and other recognition of learning. At postgraduate level, the OU offers masters, as well as taught and research-based doctorate awards. Students study individual modules, each of which is (usually) 60 CATS points, roughly the equivalent of half a traditional university year. Successfully completed modules contribute to a student’s chosen award, for example, 6 modules would normally allow a student to gain an ordinary degree.

To gain a BSc or BA in Design and Innovation (in 2021), students study core design modules as well as in a secondary subject linked to a thematic design pathway (e.g. Engineering, Sustainability, Business,

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2 CATS is the Credit Accumulation and Transfer Scheme used to quantify learning between institutions and study levels. For example, an ordinary degree will typically be 360 CATS points.
Health and Wellbeing, etc.). Students do not study discipline-specific design material, such as graphic design, product design, etc., instead focusing on core design competencies, attitudes, approaches and capacities and applying these to their own contexts. The focus of design education at the OU is to allow students to learn design by doing design, a slightly different focus when compared to other OU subjects, and even some traditional design curricula. Learning material is specifically developed in order to support independent, active learning by students. The writing, therefore, is unlike other academic texts or reference materials in that it is designed to engage students in learning throughout, rather than as purely assimilative teaching materials. Key points or concepts are usually backed up by self-assessment and practical activities and are often presented in multiple modes and media. Students are supported by a subject tutor who provides tuition, supports pastoral needs, assesses most of their work, and who organises tutorials and direct student contact. The learning material, tuition strategies, and the systems of assessment and support is ‘teaching’ at the OU.

In design subjects, the development and application of student learning is further explored through design activities and projects, many of which are assessed summatively and formatively as key opportunities for tuition feedback. This project-based learning is supported by a range of online tools and tuition opportunities, many of which are the subject of the work in this covering paper.

Open Entry and student demographics at the OU

The OU has an Open Entry policy, meaning there are no prior qualification requirements (except at higher levels of study) and that anyone can undertake study regardless of background. Support for a wider socio-economic range is available through student loans in
England and direct funding in the devolved nations, Scotland, Wales, and Northern Ireland. The change to university tuition fees in England had a dramatic effect on part-time education in the UK and, at the OU, affected both the number of students studying as well as their attitude and relationship to education in general. One consequence of this change was a change in the average age of OU students, with far fewer older students studying for ‘leisure’ or prospectively and an increase in younger students, especially between 20 and 25, thought to be students looking for alternatives to traditional university experiences.

The Open Entry policy means that OU students have a different general demographic profile to traditional universities. ‘Self-selection’ through academic and social attainment in prior schooling has less influence on the student population. When compared to traditional institutions, a typical OU student population will contain more students in full-time employment; with additional education needs; from lower socio-economic contexts; and from ethnic and minority backgrounds (HESA (UK), 2021; The Open University, 2017). Conversely there will be fewer students with named qualifications, and lower rates of English as a first language. Hence, a significant part of teaching practice at the OU is dedicated to the development and support of adult learners with a far wider range of intersectional factors and learning approaches.

As will be seen in later chapters, this rich diversity of student population is both a challenge, in terms of providing an appropriate range of learning opportunities for students, as well as a significant advantage, in terms of a community with a valuable and diverse range of experience and knowledge. This latter point highlights one of the benefits an OU design student has in their learning journey, both in terms of providing an experience and knowledge resource and in forming rich communities of practice in learning and design.
Teaching at a distance at scale

Student numbers in individual OU design courses can be quite high and the Stage 1 design module, *U101: Design Thinking*, will typically have starting populations of between 500-1000 students and is presented twice a year. To date, well over 10,000 students have studied U101. High populations such as these require rigorous systems to manage information and maintain quality, whilst at the same time providing specific learning and support to individual students. A range of well-established processes are used to ensure high level monitoring and quality controls (e.g. statistical analysis of assessment; student surveys; staff development; etc.). At this (University) scale, students can also be supported in terms of providing common resources (e.g. accessible formats; study skills), advice (e.g. course choice advice; careers advice), and administration (e.g. study records; admin procedures; etc.), all tailored explicitly to support a range of distance and online learning needs and intersections of needs.

At the other end of the scale, individual students are supported by dividing large populations into tuition groups centred around subjects and modules. A typical tutor group will contain 20 students supported by a subject-specialist tutor who provides tuition, pastoral care, and (typically) assesses student work at key points during a course. Very often it is these assessment points that form a core tuition activity, with detailed feedback (and feedforward) acting as one of the main modes of tuition. The tutor group as an educational entity is central and critical to the overall model.

It is critical to understand how these two ‘scales’ of operation support students. Historically it has been an exemplar of scaling what is best dealt with at scale whilst also protecting individual activities and processes that are best kept ‘human’. Providing a high quality,
personalised education at scale is what The Open University pioneered and this is known as the Open Supported Learning (OSL) model (Ison, 2000). As will be seen later, the OSL model is central to good distance design education because it allows a very high-quality teaching model to be provided at scale whilst at the same time ‘brought to life’ by student-centred and small tutor group learning and tuition points. This has an immediate analogy to basic aspects of design studio teaching where the scale of student population allows certain social learning to emerge in response to individual student learning and practice, a process that will be considered in detail in chapter 03.

2.3 Contemporary design education at a distance

As may be gathered from the preceding sections, the OU remains unique in how it teaches design at a distance. Although, this may now start to change as increasing numbers of distance design courses are offered (for a recent example, see Lanig (2019)), the OU is unusual in terms of how long it has done this (nearly 50 years at the time of writing) and how that has influenced the methods it has used. The first course featuring design methods, T262: Man-Made Futures, began in 1972 (Holden, 2009) and was influenced directly by the ‘second generation’ design methods movement (Cross, 2018), recognising the potential in educating designers for generic, universal, and transferrable or translatable cognitive skills, behaviours and attitudes (Cross and Holden, 2020). This universal approach remains central to the OU approach to design education (Cross, 1990, 2018) and will be explored further in chapter 03.

This landscape is changing, however: partly in response to the challenges outlined in previous sections but also as part of a general expansion of distance education generally. Tuition fees in England (in
2021) remain at levels that require significant financial commitment from students, affecting their study choice, whether through considering the costs and choices of study location, or the subject choice and how that will assist paying back loans. In response, institutions have increased their offerings of part time and distance learning options, as well as an overall increase in the general UK population seeking part time HE education (Office for National Statistics (UK), 2017).

It remains a challenge, however, to communicate the value of a general design education within the current contexts and challenges outlined above. This covering paper will argue that a better understanding of distance design education assists a better understanding of design education generally, and that providing such knowledge is an ongoing and critical step in continuing to develop our articulacy and confidence as a community of educators and designers. As distance modes of design education are adopted in traditional institutions, the need for well-informed research has never been greater, as evidenced by repeated and ongoing calls in the literature (Broadfoot and Bennett, 2003; Saghafi et al., 2012; Karabulut-Ilgu et al., 2018).

2.4 Research Questions

To respond to some of the gaps in research just outlined, recent research and work at the OU has focused on what makes distance design education successful in our context, all centred around the general question posed in the introduction: How does distance design education work? This overarching question is intended to orient the covering paper and draw together the more focused enquiries in the individual publications. These enquiries are summarised here as a number of research sub-questions that aim to guide the reader and
reflect the research scope and findings of the selected research papers, offering a structure for the literature review and discussion.

1. What research and knowledge supports understandings of studio, its application(s) in teaching, and its role in supporting effective distance design education and student learning?
   1.1. What theories and practices underpin studio use in distance design education and what evidence is there to support these?
   1.2. In what ways do virtual studios relate to ‘traditional’ design education (or theories)?
   1.3. What are the factors that enable effective and successful studio use in distance design education?
   1.4. What are the knowledge and research gaps in contemporary design and studio education, and what other trends are emerging to reflect concerns and issues?
   1.5. Does studio use in distance design education have considerations and properties unique to its own domain of knowledge? How might these relate to other curricular areas and knowledge domains?
03 LITERATURE REVIEW

The central theme of this covering paper is the use of studio in distance design education. There is, as noted in chapter 02, relatively little research in the particular intersection between studio education and distance design education. Some of the reasons for this have already been outlined and will now be explored in greater depth. Critical to understanding these gaps is the general landscape of design education research and its ‘internal’ sub-domains and research areas, as well as how these relate (or don’t) to wider education research. This is visualised in Figure 1.

FIGURE 1. Visual representation of the relationships between domains of design education research and the overlap with general education research (width and direction of arrows suggest direction and flow of knowledge between these domains).
At the centre of any enquiry into studio use in distance design education is the general domain of design education itself, making it essential to understand historic and traditional design education and the particular and enduring relationship with studio. Defining design education, like defining design, can be difficult. Lyon (2011) identifies eleven different definitions of the word ‘design’ but hints at the importance of seeking a definition as way to begin an important understanding:

“From a non-specialist’s point of view, however, trying to capture a sense of what design really is can seem both important and frustrating.”

(Lyon, 2011, p. 26)

To begin to understand this ‘frustration and importance’, it is important to understand the legacies from the history of design practice and education.

3.1 A (brief) history of design education

Design as a separate practice from making or knowledge discipline did not exist in its contemporary form prior to the emergence of industrial design in the late 19th century. Design education prior to this was embedded in specific professions and treated as part of that discipline, usually operating as a trade-based master-apprentice model (Souleles, 2013). Today, there are still some areas of design that rely on in-place and professional contexts of learning but these are now quite rare when compared to institutional (HE) offerings, sometimes creating a gap between what is taught and what is practised (Salama, 2017, p. 103). Design research emerged as a knowledge discipline in the latter half of the last century and, in parallel, scholarship in design education (Cross, 2007), borrowing much of its knowledge from a range of different and overlapping domains.
One such domain overlap is with the arts and art education and, whilst there are many synergies with general design education, there are differences that are critical to understanding how it may be applied and taught, as can be seen in the recent *International Encyclopedia of Art and Design Education* (Hickman, 2019). Houghton’s (2016) summary of six distinctive, historical curricula in art education (Apprentice, Academic, Formalist, Expressive, Conceptual, and Professional) have emerged in response to a range of cultural, social, economic and political drivers, and are useful ‘top-level’ concepts when considering the history of design education. However, they necessarily frame design as a subset of only an arts subject domain, a position challenged in recent and contemporary design education research (Jagodzinski, 2019). Even setting aside such framing, the type of design offered in institutions that may have started with art-based design education has changed the nature of the type of courses offered when compared to a liberal arts tradition.

A second critical overlap is with that of architecture practice and education, which has its own well-established history (Cuff, 1992; Lyon, 2011). In Europe, this history can be traced to some of the oldest surviving texts on the subject (Polio, 1960), where the education of an architect is recognised to require both an aesthetic (or theoretical) and analytical (or functional) grounding. This principle has influenced many art and architecture writers since and remains evident in many contemporary architecture and design schools. What was clear in Marcus Vitruvius Polio’s work is the embodied nature of design as a process of imagining *and* analysing *and* creating something tangible, *a synthesis of thinking and doing*.

Whilst the overlap with architectural education is important, the focus of this covering paper is primarily on the literature in design education research and, whilst it makes use of some literature from architecture
education, this has not been the primary source. This acknowledges the fact that architecture education, like other creative and design domains, also has a tradition of accepting that education simply happens under the supervision of architects, hence there is little motivation to investigate precisely how this takes place. As long as architects come from this process, the method matters far less, as Morrow summarises:

"...Architectural education remains guilty of insufficiently intellectualizing what it is teaching and, more importantly, how. No matter what, we still seem to want to mark 'buildings'."

(Morrow, 2007)

Architecture and design research both remain domains strongly shaped by their shared and divergent pasts.

Design as apprenticeship

Historically, individual activities involving design focused on the need to create or adapt an artefact for some relatively specific need or requirement. Such activity would have had its own particular practices and associated traditions, many of which clustered around craft and making practices (Petricone, 2019). If a 'product' was required it was crafted and made in a localised way, relying on individuals as designers and makers combined. Designs as replicable patterns of making were sometimes passed on between makers (or deliberately withheld) as a more general form of implicit education (Sennett, 2008). The practical (or practised) nature of designing through making allows it to be similarly 'transferred' through active demonstration, replication, repetition, etc. Much of this education was structured around the master–apprentice model (or novice-expert), which was more a socio-economic model of employment and economics as opposed to a pedagogical one (Souleles, 2013).
In some contexts, clustering of craftspeople to form larger groups occurred, very often linked to social, economic, or political needs. For example, the emergence of artisan groups clustered around imperial structures in China (as early as 200 BCE) demonstrated deliberately organised selection and apprenticeship processes that could be considered precursors to later studios (Gongkai and Qing, 2018), and which suggest similar patterns in other prior historical contexts. This model had as a basic ‘unit’ some form of novice-expert model, where tacit instruction formed the basis of the education of a maker or craft designer. Whilst there have been more recent interpretations and theorisations of this model, most notably Lave and Wenger’s work (1991), the basic model is still very much in evidence (Webster, 2005; Lyon, 2011).

**Design as profession**

A significant divergence between art and design education occurred around the professionalisation of architecture and emergence of other professions that would eventually become, or transform into, modern design (Funk, 2019). In architecture, systems of tutelage in Europe ensured only certain people could become architects and the curriculum and form of education was, in itself, part of the selection process. Taking the Grand Tour and working in the master-apprentice model ensured a selective intake and the propagation of the system itself. In art, this could be argued to ‘semi-formalised’ in the 16th century Italian Renaissance academy (Petricone, 2019). In architecture, it was formalised in Europe by the creation of an École des Beaux-Arts in the 17th century, the first formal architectural education institute (Cuff, 1992; Salama, 2017).

The Paris École des Beaux-Arts established the atelier model, where students were required to enrol in studios with particular specialities
headed by experts or masters. This model, the precursor of the general
design studio model, is still in operation today, for example, in the
structure of the Architectural Association (Architectural Association Inc,
2019). The modern professionalisation of the discipline in the 19th
century was supported by the creation of formal courses in Paris and
London (Cuff, 1992). This critical transition saw the start of a shift from
the practitioner to the practitioner-academic as master in the
apprenticeship relationship. The underlying model did not really change,
however, retaining the master-apprentice relationship with assessment
by a jury of experts or peers.

In industrial design, a similar progression from craft to artisan to
professional, and from informal to formal master-apprenticeship models
of education took place, driven in the UK by the industrial revolution.
With mechanisation came the need for predictability and
standardisation which reinforced the need to separate the processes of
designing an object and then manufacturing it: a component needed to
be designed once and then independently recreated many times. This
meant that the role of the person creating the original became one of
significance and, inevitably, one that carried economic and social status
(Robinson, 2001, 2010). In industrial and product design this would
remain the domain of the design engineer aligned closely to the source
of manufacture; hence the apprenticeship model was still in evidence.
Linking design to production, and thereby economic utility, reinforced
the separation of art and design along functional lines, an approach to
curriculum that is still in evidence today (Martins et al., 2019).

Formal education in engineering emerged in late 19th century (Seely,
2005) and would form a main paradigm of what would later become
industrial and product design. The ‘national design debates’ in the UK
around this time were driven by the declared need for a more
procedural and systemic approach to design and manufacture, leading
directly to the establishment of the first art and design schools (Hatton, 2019). In response, these emerging disciplines were expanded nationally through the creation of a number of societies and groups during the Arts and Crafts movements in the UK (Rosner, 2019).

These new disciplines consolidated through the formalisation of curriculum developed at the start of the 20th century at all levels of education. The centralisation this provided (even with diverse curricula) reinforced the acculturation required to define and maintain the disciplines themselves. This culminated in the 1960s with the Coldstream report (1960), creating parity between art and design diplomas and other HE qualifications (Addison et al., 2010). Although parity in some academic sense was achieved, the ‘fit’ of design education remains a challenge in terms of how a traditionally vocational mode of learning fits with pre-existing, pre-defined academic practices (Gunn, 2019), as will be explored later in this covering paper.

**Modern western design education**

Modern Western design education is often argued to be particularly influenced by the Bauhaus School (see especially (Bayer, 1975)) and this has certainly been a dominant historical narrative. However, as noted, industrialisation was already leading to the emergence of design schools and the Bauhaus was simply one of many such schools responding in a similar way to these contextual changes and drivers. What it did do (very well) was make clear the position of design education as part of a wider socio-economic system of creation, production and human activity and, in particular, set this out in terms of curriculum, pedagogical forms and even learning activities. Even in this it was not unique, for example, the VKhUTEMAS in Russia (Aristova and Zhilina, 2019) and the Institute of Design in the United States of America (Weil and Mayfield, 2020), both emerged around this time (as
did institutions in the UK) in response to emerging economic and social opportunities and needs.

Beyond the socioeconomic drivers, these institutions all initiated intellectual or philosophical positions and, of course, pedagogical approaches. The curriculum of the Bauhaus, for example, was itself influenced by more radical general pedagogical experiments in kinaesthetic learning that took place in that time in Germany (Alexander, 2017). This was accompanied by a wave of similar international work around art and design curricula as a part of general and/or early years education, for example in the Czech Republic (Šobáňová, 2019), Brazil (Barbosa, 2019a), Mexico (Barbosa, 2019b) and Egypt (Al-Amri, 2019).

The curriculum of the Bauhaus and VKhUTEMAS schools made explicit the idea that the process of design could be applied across a range of related disciplines (albeit all within a general art and design domain) and that design education could be at least partially separated from its contextualised practices. Pedagogically, these models still centred around the master-apprentice model but also now offered individual ‘domain – independent’ enquiry and exploration through a series of studios, activities, and projects. The latter core pedagogies, themselves reflective of the precursor atelier model, still remain today and would be recognisable to most contemporary design educators.

It was this shift in thinking that consolidated the studio as a place and mode of education, not only a place of practice, and that would eventually develop to the simulated practice studio in contemporary design education. The idea that design can be separated from its specific contexts of application is still debated today (Kimbell, 2011; Plowright, 2014), but the influence of this idea has been significant because, when combined with the centralisation of the master-
apprentice model in universities, it becomes a replicable, organised pedagogical model. This model still influences a significant proportion of all Western design curricula today (Cuff, 1992), and beyond (Salama, 2017; Gongkai and Qing, 2018). The Bauhaus and VKhUTEMAS and others all demonstrated that learning could itself be designed and that design education could be applied as a more formal activity with characteristics transferrable to other domains. Without this key development, later work, such as Basic Design in the 1950s (Addison et al., 2010), design methods in the 1960s, and design thinking in the 1980s, would not have been possible.

3.2 Contemporary design education

Design Methods

The idea that the process of design can be set out and described as a method has its origin in approaches taken by institutions outlined in the previous section. This was not formally described, however, until the 1960’s in the UK and Cross places the source of this work as the Conference on Design Methods held in London in 1962 (Jones and Thornley, 1963; Cross, 2007). This led to the publication of a series of critical early works, including Herbert Simon’s widely referenced Sciences of the Artificial (Simon, 1996), quite firmly conceptualising design methods as a form of scientific or analytical enquiry and practice. This was a position that led to later rejection by some of the original key contributors, most famously, Schön’s and Alexander’s rejections of design methods as being in any way analytical, positivist or deterministic. Alexander’s work (Alexander, 1965; Alexander et al., 1977; Alexander, 1979) set out alternative approaches to methods that allowed unquantifiable or unpredictable human elements that many designers intuitively applied and referred to regularly. Around the same
time, Schön’s work observing practitioners in action (Schön, 1985, 1987), argued in support of the value of praxis, pragmatics and metacognition rather than any positivist or universal method. Both of these could be considered, as Cross notes, a ‘second wave’ of Design Methods.

This work came at the same time as other key ideas and areas of thinking emerged, all attempting to expand modes of thinking and reflect the complexities and realities of human contexts. Many of these were deliberately inter- and intra-disciplinary in nature, such as: Rittel and Webber’s work on unsolvable problems (Rittel and Webber, 1973); Bateson’s work on ecologies of thinking (Bateson, 1987); Fuller’s work on systems of knowing (Fuller et al., 1975); as well as a wide range of other systems thinkers and their bodies of knowledge (see Ramage and Shipp (2009) for an excellent summary of some key thinkers).

The influence of such radical intra-disciplinary concepts in education were realised practically in two ways. Firstly, in the experimental nature of some design curricula of the time as a way of challenging existing paradigms, principally in the United States (Colomina et al., 2012), such as those of Fuller, Alexander, and Scott Brown, as well as practitioner-theorists such as Ray and Charles Eames evidenced through the influence of seminal and controversial The India Report (Eames and Eames, 1958).

The second influence saw the establishment of the value of design as a valuable form of knowledge in and of itself: a ‘3rd way’ of knowing.

Design as a ‘3rd way’ of knowing

The RCA study ‘Design in General Education’ outlined the theory behind Archer’s (1979) original idea: that “…design awareness represents an important area for educational development” (Baynes,
1975). The study set out a series of discussion areas, each of which aimed to promote and understand how the practice and study of design might be of value in general education. Indeed, it argued that design education was as important as other key educational goals of the time. Discussion 1 began with the hypothesis:

There is an area of human experience, knowledge and action, centred on man's ability to mould the physical environment through the use of tools, which is as important to his existence as such well-recognised areas of learning as numeracy and literacy.

(Baynes, 1975)

This work initiated the design studies movement in the UK as the underlying theoretical basis for much of the work to follow in the following decades (Cross, 1982). This ‘third generation’ of design methods (Cross, 2007) influenced two key educational developments in the UK: distance design courses at the OU, and the initiation of the design and technology curriculum in secondary schools.

Design as education through transformation

In 1975, the OU course T217: Man Made Futures (The Open University, 2010) began and presented design as a way of thinking across and between disciplines. At this time, it remained largely implicit and based on the early experience and ideas of its creators (how it worked will be explored in greater detail in section 3.6). What it did in terms of design theory, however, was enable early thinkers to begin to define the specific characteristics and properties of design epistemology in contrast and comparison to others, such as the work in Cross’ seminal paper Designerly Ways of Knowing (Cross, 1982). Cross, like Archer before him, outlined a ‘third area’ for education based on design as a separate discipline; in particular as contrasted with the general
disciplines of the Arts and Sciences. For Cross, the value of design education lay in its particular position between other disciplinary areas and as a valuable way for all students to contribute to knowledge construction. For further reading on this history see Cross (1999, 2007) and Archer, Baynes and Roberts (2005).

The call to recognise design practice as a form of knowledge construction would be echoed in the literature by Schön a few years later, especially the ‘cultural practice’ of the discipline (Schön, 1985, 1987). Schön’s work concentrated on observing and studying novice designers and design educators in a studio context. For Schön, the core elements were the relationship between expert and novice (teacher and student), the context within which this relationship existed (the design studio), and the valuable cognitive processes that this required and developed (reflective practice) (Schön, 1987, 1991, 1992). Taken together, these provide the context within which learning through ‘destabilisation’ can take place, where the stable state of one’s current knowledge can be interrupted to create new ideas (Schön, 1971; Ramage, 2017). Although Schön did not refer to it explicitly, the parallels with Kolb’s (then) contemporaneous development of the experiential learning cycle (Kolb, 1984, 2014) are striking.

There are valid criticisms of Schön’s work and in particular the methodologies (Webster, 2008; Mewburn, 2011). Looking at some of the dialogue with a contemporary eye it’s evident that alternative (and quite different) interpretations and analyses of the psycho-social interactions are possible. Moreover, Schön’s object of study was very much the one-to-one student-tutor relationship, largely ignoring a huge range of other properties, characteristics, and affordances in the studio. For example, the myriad social factors that make up studio leaning experiences are mentioned once in his key text, *Educating the Reflective Practitioner*. The change in thinking around design
education that arose from his work was, however, significant and seminal in terms of providing a theoretical, pragmatic, and subject-oriented basis for what happens when a designer is educated. Oxman (1999) argues that Schön’s work presented a fundamental shift in considering how design education took place, focusing far more on a dialectic processes – both cognitively and between student and tutor. I would argue further, and in agreement with Waks (2001) and Ramage (2017), that, regardless of the relationship, at the heart of his educational philosophy, Schön’s contribution is, in a way, to see design education as a mode of *transformation* through learning; a way of questioning a system of (personal) knowledge in order to enable new thinking to emerge.

More generally, a framing of design and design education as way of developing, working with, and working within communities and society is a recent view of design, generally, as a transformative experience. Salama (2017, p. 218) provides several examples of these and presents these as pioneering pedagogies but still as modes (or forms) of studio praxis. The potential for studio to act as a catalyst for transformation of more than simply the artificial continues to gain traction in education curricula around the world.

**Transformative design education**

Both Cross’ design methods and Schön’s practicum had in common the transformative potential of design education, something that can also be seen in the early work of Archer. All of this early work paved the way for another radical experiment in secondary education in the UK. In 1988 Technology as a compulsory subject (including design) was introduced in UK Key Stages 1-4 (ISCED Levels 1-3). From the start, this curriculum was different, recognising that the design process as an enacted experience was the valuable educational outcome, not any
explicit or purely behavioural (or even information-based) learning outcomes. This was operationalised through Attainment Targets aligned to competencies, rather than normative assessment-driven behavioural outcomes. Students would act as designers and, through the design process, demonstrate competencies through attainment, reflecting the view that developing cognitive and meta-cognitive capacities is of critical importance in design education (Ball and Christensen, 2019).

Unfortunately, the ideals set out in the curriculum design went far beyond what could be met by the teaching community, cultures, and structures of support. Teachers were faced with an unfamiliar subject area, an alien culture of knowledge and practice, new assessment methods, and all without any guidance of the kind they had come to expect in other subject areas. All of this was, as Kimbell and Stables summarise, “…undertaken with more enthusiasm for design & technology than expertise in assessment research.” (Kimbell and Stables, 2007, p. 9). Details of this history and further references can be found in Kimbell and Stables (2007) and McGimpsey (2011), and many of these issues remain in design, technology and craft education at this level of study (Granville, 2019).

The work of the Technology Education Research Unit at Goldsmiths, University of London (TERU), was important over this period, paralleling and contributing to the curriculum work just outlined. This work contributed most significantly to the general understanding of early development and assessment of design capabilities in the subject (Kimbell et al., 1996): i.e. not simply behavioural outputs or skills, but the “qualities that empower people to change the world” (Kimbell and Stables, 2007, p. 13). TERU is a relatively rare example of successful research funding applied to pre-HE levels of design education that also bridges gaps between subject areas as well as levels of education.
These challenges persist today as outlined in the report *Designs on the Curriculum? A Review of the Literature on the Impact of Design and Technology in Schools in England* (Harris and Wilson, 2009). Sadly, it demonstrates that the true value of design, as a ‘third way of knowing’ in UK general education, has yet to be fully realised. In part this was because of the failure to implement (operationalise) what was a very creative and forward-thinking curriculum in UK secondary schools. This example demonstrates the importance of having the conditions and contexts within which such curricula can thrive (or not) – successful curricula are far more than the learning material alone.

Hence, attempts to apply modes of design learning in other subject areas in general education have also achieved mixed successes, almost always because of misunderstanding of design as a process or method of enquiry. For example, the misapplication of design to a pre-determined (scientific) outcomes in studies such as Kolodner (2002) and Breukelen et al. (2016) can be compared to the open-ended enquiry of applying design to systems thinking as a *system of thinking in itself* (Hmelo et al., 2000). Design education remains a practice that depends on the instructor’s experiential knowledge of what it is to have gone through a design process (Anning, 1996) and many of the cases presented in Boling et al. (2016) confirm precisely this. It is perhaps unsurprising that introducing a curriculum without the prerequisite opportunity for enculturation would be destined to fail.

There is, however, a further, deeper reason for the failure to fully realise the goals of a ‘proper’ design and technology curriculum when the social and political contexts of education are considered. The goals of traditional educational establishments have largely been scholarly goals (as defined by scholarly institutions themselves) and, when alternative goals are presented (as defined, say, by designers, practitioners, artists, etc.) challenges and tensions arise (Kimbell and Stables, 2007,
These tensions are still in evidence today across all parts of the educational landscape.

The overall effect on design education at HE level tends to be that students studying design come from a more fragmented background of study compared to traditional domains of study. This means that it is rare for such students to have had any real or true experience of a design process as it should be in order to address open-ended and uncertain areas of enquiry. It also means that the modes of knowledge acquisition required in design are not developed until this latter stage of study, an increasingly challenging situation for both students and teachers, particularly where other behavioural modes of enquiry have been inculcated. How design is learned and/or taught is a difficult topic and, whilst it may be well understood by its practitioners, communicating such knowledge remains a challenge.

3.3 Contemporary design education research

As noted in the preceding sections, the reliance on tacit and implicit learning and teaching has allowed design subjects, at one level, to maintain their authority with respect to subject expectations. Largely this is simply because it seems to work: architects and designers continue to emerge predictably enough from architecture and design schools. This has often been at the expense of properly interrogating how and why these methods work. As will be seen in later sections, some would advocate that creative art and design cannot be interrogated in such a way: that the domain is not subject to normative modes of enquiry (Baldacchino, 2019). This view, held historically, still remains prevalent in some contemporary arts and architecture education (Salama, 2017, p. 83).
This is certainly one position to take, but in doing so, the ability to make any further claims beyond this is given up: if design is to be unquestionable then that necessarily means no answers can be asserted or claimed. Any and all opinions on the matter are also equally valid. This leads directly to the specific criticism outlined by McGimpsy (2011) around the ‘silences’ or ‘absences’ that emerge when no research takes place. By not even allowing the questioning, we admit to gaps in knowledge, whether real or perceived, by others.

There is, of course, an important distinction to be made between refusing to engage in research and being unable to engage in research. Both of these gaps in enquiry exist in design education research and have very different motives. The former has led to some poor practices in design education, often around the perceived need to maintain power in a discipline for the sake of control, rather than for the benefit of the discipline (Webster, 2007, 2008). The latter knowledge gaps arise from the particular form(s) of knowledge that comprise design activity and education, and, in particular, how these are (or can be) passed on to students, in particular ways, and housed in particular institutions, settings and contexts. Hence understanding the contemporary context of design education and research is necessary to understand the specific gaps that emerge in its literature and body of knowledge.

Design education research contexts

Section 3.1 demonstrated that the practice of design and the education of designers are inextricably and particularly linked. The practice of design connects to the academy (and vice versa) through elements common to both: behaviours, activities, tools, etc. Brandt et al (2013) refers to studio practice as one such a link, or ‘bridge’, between an academic community and a community of practice. Such links could be considered central to any contemporary understanding of professional
(or practice-based) education, although, as noted, tensions remain around how these interrelate. In the UK, this interrelation has a particular impact on both design education and its research, and, as a result, what constitutes its body of knowledge. Many design tutors (studio tutors) are also practitioners, blending their professional work with teaching. This has the immediate benefit to students of links and proximity to practice, as well as the benefits a current view of a profession can bring. But the downside is the difficulty in having time and resources to engage in scholarship or study of design pedagogy, sometimes even limiting engagement with communities of practice in design education. Research in design education is particularly affected by the balance between practitioner and educator in design education.

Lyon (2011) outlines several potential and important reasons for this in her work. Firstly, that there exist (between practitioners and academics) different preferred modes of knowledge, particularly when comparing written to visual or creative modes. Secondly, this is compounded by the specialisation of research language, which can make it difficult for practitioners to engage with traditional (mainly written) academic research. Finally, that the time and resources to engage in research of any kind are difficult to find, particularly in the UK, given the high proportion of part time and ‘atypical’ design & creative arts education staff (University and College Union, 2020).

Lyon particularly noted that the design educators involved in the project viewed scholarship as a privilege or some special activity; that it was not normal to engage in even basic scholarship and research as part of their teaching practice. All of these points lead to a perceived (and actual) gap between the practice and research of design education (Lyon, 2011, pp. 65–70), a finding noted by others (Shreeve, 2011).
Finally, Gunn (2019) observes a further impact on design scholarship arising from the types of research activity that attract funding and the structures of funding organisation in the UK. These additional factors lead to difficulties around support and development of scholarship in design generally and design education particularly, further exacerbating gaps in knowledge and research capacity. This reflects a wider view of the subject and its position in traditional academic institutions, a point made in chapter 02 with respect to earlier stages of education by Kimbell and Stables (2007).

Design practice, education and research

One particular consequence of these factors is the type and extent of design education research conducted. With limited time, it is perhaps unsurprising that fully realised, or longitudinal, research programmes are rarer than smaller-scale pieces of scholarship. This is often exacerbated by the fact that designers as educators often prefer to share their ideas rather than study or explain them in particular or rarefied ways. Many early distance design studio papers are of this form with only a description accompanied by a limited explanation, as will be explored in chapter 04.

These factors of time and resource, combined with those outlined in the preceding section, have negatively affected the attention that has been paid to design education research when compared to other subject areas. McGimpsy (2011) outlines three critical issues that arise as a result. Firstly, that it encourages a tendency to focus on only effective teaching methods in specific contexts, which do not necessarily represent effective learning in broader design contexts (or sometimes even replicable ones). Secondly, that the lack of research means that policy, and some practice, is driven by what literature there is, whether biased or not. Thirdly, the ‘silences’ in research allow claims to be made
without good evidence bases or any suitable broader body of knowledge.

In addition to the those just outlined, there also exist common issues prevalent in almost all research domains. For example, publication bias towards certain types of method and result (Crilly, 2019); lack of rigour in design research methods, replication and methodology (Cash, 2018); and, of course, curriculum design very often based on limited research, or research that supports existing beliefs (Archer, 2000; Lyon, 2011).

To state it simply, design education research as a domain, or discipline, would benefit from greater rigour in certain areas. This has been reported several times, most significantly in national reviews by Wilson and Harris (2004; 2009) and echoed in design education by Knowlton (2016), McGimpsey (2011), and Davies (2013). In fact, it could be argued that the call by UNESCO in 1948 for ‘information regarding improved methods for teaching the arts’ was an early call for better informed research (Steers, 2019). Most recently, and comprehensively, a large scale literature review by Sawyer (2017) identified a general lack of rigor in design education papers, a pattern that can be clearly linked to the issues just identified.

As McGimpsey noted specifically, case studies in design education are very common and these still make up a large percentage of submissions to conferences and journals, a point summarised well by Šobáňová, when observing that “…most specialised discourse on art education is still made up of overview or theoretical studies, or, examples of good practice with commentaries” (Šobáňová, 2019). Note that this is not to criticise the value or even methodology of case study; it is that the scholarship involved in creating a rigorous and useful case is less well applied than it could be in art and design education (Boling, 2010; Howard, 2011; Gray, 2020), for the reasons already outlined.
A final problem in design education research is its isolation. This has arisen, as noted, from a subject area that has been (and sometimes remains) resistant to certain types of interrogation, exploration or interaction. The result has been (at least) the partial isolation of design education from mainstream education research, as Wilson observed on moving from general to design education research: “It was not until I read about design studio learning that I started to call it by that name and to think about it as a cohesive model.” (Wilson, 2016, p. 132).

Design and other education research

There are a number of ideas that come to design education research from general education research, although this remains relatively rare for the reasons outlined in the previous section. Listing all of this work is beyond the scope of this covering paper but a few selected, key theories are provided to demonstrate the literature and the uses of the ideas in design education research.

**James and Dewey: experiential pragmatic empiricism.** William James and John Dewey’s work has influenced nearly all the writers and researchers in this covering paper (Meager and Hall, 2019). Without these thinkers, later work by Vygotsky, Papert, Kolb, Pierce, etc. would not have been possible and Schön’s doctoral work was on Dewey’s legacy as a systems thinker and educationalist, which clearly had an influence on his later work (Waks, 2001). The relation to design education is in their work on design and education separately: design, in terms of alternative modes of knowledge, particularly experiential and systems knowledge; and in education, their work in forms of constructivist and emergent learning as an experienced activity. In this sense it is perhaps closer to a craft or apprenticeship model of learning (Sennett, 2008; Mason, 2019), and this certainly influenced later developments and improvements by Lave and Wenger (1991).
**Constructivism** (or **Situated constructivism**). Constructivism has a direct relevance to design education with its focus on ‘knowledge rather than to knowing’ (Papert, 1991) and its foundational ideas based on Piaget’s work on child development (see especially Piaget and Cook, 2011). By this view, learning is an experiential process of ‘making sense’ of experience and activity in relation to our existing ideas and knowledge. This form of experiential learning has a direct synergy to design education, identified, for example, by Oxmans’ work on design cognition and education (Oxman and Oxman, 1992; Oxman, 1999). To a design educator this may appear obvious, but the extent to which design is a process of ‘coming to know’ as opposed to simply applying facts can still come as a surprise to many educators (as evidenced in (Boling et al., 2016)). For some researchers, design education is necessarily and intrinsically constructivist and can only be understood in those terms (Boling and Schwier, 2016; Sawyer, 2017; Orr and Shreeve, 2018) and contemporary work continues in aligning such theories in design contexts (Islam, 2019).

**Social Constructivism (Zone of Proximal Development).** Social constructivism regards the context of construction to be critical in learning and, in particular, that learning happens socially in contexts with others (Festinger, 1954). Such social learning mechanisms had been developed by Vygotsky in educational contexts, and given explicit learning theories and frameworks, such as the idea of Zone of Proximal Development (ZPD) (Vygotsky, 1967, 1978). This theorises a range of student proximities with/to other students and/or teachers, from the individual to a knowledgeable grouping, and suggests that students learn best within particular ‘zones’ along this range. ZPD has been applied to work in virtual studios (Bronack et al., 2006) and the potential synergies between the theory and proximities (physical and social) in a design studio are perhaps obvious. Without going into detail on ZPD, Festinger’s theories of learning can be usefully applied directly in
distance settings and, in particular, in online studios (Publication M). What have yet to be fully explored are perhaps the modes of proximity evidenced in contemporary distance studio settings (synchronicity, connection, interaction, transaction, presence, etc.).

**Legitimate peripheral participation.** Lave and Wenger’s seminal work on situated learning was a critical restating (or reframing) of apprenticeship and activity-based learning models (Lave and Wenger, 1991). Central to their work was idea of legitimate peripheral participation, an extension of Vygotsky’s concept of learning proximally, but analysed and theorised to provide a very clear social constructivist view of learning in context(s). This ‘real’ context was critical to Lave and Wenger’s work in that they explicitly set out ‘from the middle’ in attempting to understand practice-based learning, describing it succinctly as “…learning as increasing participation in communities of practice…” (Lave and Wenger, 1991, p. 49). A major finding across **Publications G, K and L** was the positive correlation between ‘passive’ student interactions (only viewing other students' work) and student outcomes, where we concluded that this was a form of legitimate peripheral participation in the online studio, requiring social learning and the formation of a community in order to function.

**Communities of practice (CoP).** Lave and Wenger also developed the concept of **Communities of Practice**, part of their work in legitimate peripheral participation as the context within which such learning operates. Such social constructivist theories of learning, that consider specific communities (such as designers) or contexts (design practices) and how they construct knowledge as a collective, are directly applicable to design education and have been explored by a number of researchers (such as Schön and Shulman, for example). Applying CoP ideas to design education engages the particular challenge of which community is being referred to: that of the profession or of education.
Or, as argued by Brandt et al., some combination of both: a ‘critical bridge’ between two communities of learners and professionals (Brandt et al., 2013). Direct use of these theories in a distance studio has been applied (Publication M), providing a theoretical basis for how these are established operationally in a virtual studio setting.

The importance of Lave and Wenger’s ideas, I would argue, still have great relevance and value to design education research – especially Lave’s more recent update (Lave, 2019). Their position, distinct from Vygotsky, sees experiential learning as changing both student and teacher, a negotiation that will be familiar to certain ‘types’ of design tutor or teacher, and evidenced in (Publication D) through the inter-dependent co-creation of both the community and the artefacts within that community. Like other education theories, it is rarely fully explored in relation, or applied, to design theories. A rare counter-example is legitimate peripheral participation, which has been translated in a design studio setting to ‘listening in’ (Rogoff et al., 2003) or the ‘apprenticeship of listening’ (Shulman, 2005). But in these works the nature of the interactions contributing to ‘collective generation’ of the community are largely implicit and assumed. Making such assumptions and not outlining implicit knowledge is an ongoing and general challenge in design education research.

The above list of general education theories is by no means exhaustive and it serves to highlight a few examples that are directly and readily applicable to design education research. In design education literature it remains relatively rare to make use of general education theories in design education, there are notable exceptions, such as the work presented in Boling et al. (2016). This was produced (largely) by education researchers and teachers who had applied studio methods in their own (non-design) curricula, hence brought such theories to their work as a matter of course. In each case, however, the theories in
themselves were insufficient to capture or explain the full complexity of the praxis and learning demonstrated. What is beginning to emerge is that for many general education theories, their application to design education is either incomplete or requires adjustment in some critical way. That is, many general education theories simply do not fit when applied to design education contexts, an argument made quite clearly by Gunn (2019) and that is now being evidenced by research.

To engage further in intersections of design and general education can be a significant challenge, not least because of the challenges around being explicit about design education.

3.4 Defining design education

Contemporary Western design education remains embedded in academic institutions with relatively few exceptions of education in practice. This has meant that a relatively small group of scholars has been responsible for core concepts in design education. Many of these concepts are retained from historical and experiential sources and with few challenges along the way. In the arts tradition, it remains the case that questioning how design education works is, at best, a contested subject, perhaps most famously summed up in the book Why Art cannot be taught? (Elkins, 2001).

One critical outcome of this lack of reflection is that informal and implicit learning mechanisms, regardless of how effective they might be, are rarely stated in such a way as to provide a clear definition of either design or design education (Houghton, 2016). Design is, primarily, an activity that ultimately depends on the practitioner experiencing that activity as part of the learning or training process. Hence, modes of instruction that are non-verbal, non-written, non-'academic', can work perfectly well (and often better) in certain contexts.
As also already pointed out, this does not mean that enquiry into such modes is futile, but it does leave us with less rigorous language and concepts to begin such enquiry, particularly if we wish to explore an academic definition of what we are studying, or if we are ‘translating’ for academic purposes. Defining design education, like defining design itself, is a non-trivial matter; problems arise if you don’t define it, and they arise if you do.

Problems with not defining design

The lack of a clear definition for design education has led to many calls to provide greater clarity and definition (such as McGimpsey and Knowlton in section 3.3 above). But, aside from the frustration the non-designer may feel at trying to understand something important (Lyon, 2011), there are three more relevant and practical consequences.

Firstly, it promotes the myth of design as something that is unknowable, mysterious, or only accessible to a select few. For many design educators and instructors, it is simply obvious and true that to learn to become a designer a student simply has to do it. As Boling (2016) observes of her own assumptions after returning to design education: “This was studio. That’s how it works.” One direct consequence of this approach is that, if students don’t ‘get it’, then they rely on exceptional tutors and tuition to continue to come up with alternative ways of (re)conceptualising the learning. Schön, quoting Tolstoy, was quite unforgiving in this matter, suggesting that all tutors must:

“…by regarding every imperfection in the pupil’s comprehension, not as a defect of the pupil but as a defect in his own instruction, endeavour to develop in himself the ability of discovering new methods”

(Schön, 1987, p. 105)
This is quite a strict position to take and, in most cases, it simply doesn’t happen like this, for all students, at all times. Students are usually assumed to have some minimum level of competency in terms of learning (explicitly and tacitly) and historically this was further narrowed to mean the tutor’s, atelier’s or institution’s preferred method of teaching. Those students unable to learn under particular modes of teaching were then assumed to not be ‘cut out’ for design, a judgement very often demonstrated in a very public way (Webster, 2005).

The second problem, related to the first, is that exceptionally inappropriate power imbalances in education systems emerge where the authority and the means by which that authority is defined is entirely on one side of the student-teacher relationship (Boud, 2001; Webster, 2005). Ward (1990) argues this point further, considering that such hidden expressions of authority are the ‘overt curriculum of community design’, aligning with Chomsky’s ‘alternative purpose’ of education as a form indoctrination (Chomsky, 2012), not to mention the structural and systemic aspects of this outlined famously by Freire (1996). Such indoctrination is the more extreme form of acculturation that takes place in a community of practice or profession described by Lave and Wenger (1991), an often necessary and positive part of design education and any situated (professional) practice. The balance of this as a positive indoctrination is the relevant issue here.

The final problem that arises is the view of design as something purely creative and genius-like and, particularly, something that cannot be questioned, defined or critically interrogated. This idea is still held by many (Coyne, 1997), but recent theory and research suggests design as a cognitive act and process can be considered without any such “wonder tissue” (Dennett, 2013) or as “…an occult activity” (McLachlan and Coyne, 2001). This problem very often coincides with issues of power and control, one that is challenged by viewing design as
something available to everyone or even attainable by anyone. Considering design to be a ‘normal’ activity, perfectly accessible to anyone, is central to teaching design at the OU, as noted in chapter 02 and will be explored in detail in section 3.6. Publication D builds on the work of Coyne (1997) around ‘normal’ creativity in design processes and identifies that creativity in design can be constructed socially in learning contexts, in that case, the community of a design course at the OU. Creative design, by this view, can be learned through the guided development of an individual as part of a community of learners, hence, the design expert as special or genius is not the only model that can develop designers.

The central problem with the ‘ill-defined’ position is that, at some point, education systems require some tangible expression or outline of what teaching should take place or learning is hoped for in students. As noted in chapter 02, the educational, professional, and student contexts of design as a taught subject are changing, demanding far greater definition around what design education is.

**Problem of defining design education**

The counter problem to not defining design education is, ironically, defining it. The fluidity and uncertainty around design education, which is problematic to its definition, is also absolutely essential to the understanding and practice of it. Design is a *practice* and some aspects of it can only be understood through doing design. This means that design education is, at least in part, necessarily constructivist (Papert, 1991), a position repeatedly supported by many design education researchers (Lyon, 2011; Boling and Schwier, 2016; Sawyer, 2017). Specifically, the experience of designing is gained and applied by students in the construction of learning.
Furthermore, the ‘construction’ here is not only with respect to context, it changes as the student (and even tutor) interact. As Smith notes, “I tell different students different things, and I answer questions for some students that I might not for other students.” (Smith, 2016, p. 68). Orr et al. (2014) supports this position based on studies from UK National Student Survey data: that design education is necessarily a student-centred form of constructivist teaching, requiring students to co-create their own learning.

One effect of this is that it’s difficult, if not impossible, to communicate to novice designers what it is they are going to experience and learn because they are the ones who have to construct that experience and do that learning. Indeed, the major challenge of any design educator is getting across this ‘meta’ learning model.

*The paradox of learning a really new competence is this: that the student cannot at first understand what he needs to learn, can learn it only by educating himself, and can educate himself only by beginning to do what he does not yet understand.*

*(Schön, 1987, p. 93)*

This sums up a pedagogical philosophy or approach implicit in almost all design education: the ideal tutor (not teacher) arranges for the student to have the ‘right sorts of experience’ that will allow the student to learn for themselves.

Very often this is in direct conflict with students’ prior experiences of education and this can lead to significant cognitive dissonance (Festinger, 1962) in some students, where they believe education to be a more directed or deterministic process of transmission. This dissonance in students became apparent to the team at Georgia University in their instructional design course, aimed at experienced
educators wanting to use design methods to create learning material (Rieber et al., 2016; Clinton and Rieber, 2010). They addressed the issue through a series of induction and development initiatives, including openly presenting and discussing the issue, peer mentoring (at two levels), and a building up of design activity across a longer period of study. Recognising the need for design-specific learning modes and developing pedagogies to support these are possible and, it could be argued, necessary in an education context that ignores them.

Unfortunately, students will prefer modes of teaching they have been enculturated to and this is often exacerbated by extrinsic pressures and motivations, many of which tend to be separated from students’ own intrinsic drivers. This is a well-documented problem in creative education (e.g. Lepper and Greene, 1973; Bonawitz et al., 2011), but national policy very often ignores these findings in favour of less balanced motivating factors. For example, metrics around employment often focus on income rather than personal development or even professional competence. Where the focus is placed only on the measure, not what should be valued (Meadows, 1997, 1998), tensions between extrinsic and intrinsic motivation often arise.

Simplistic metrics are easy to align with simply-stated learning outcomes to offer an apparently deterministic form of education that can be presented easily as a product. In the UK, for example, this has aligned with the rise of ‘managerialism’ in higher education, often leading to a view of learning as a positivist transaction between educators and students (Trowler, 1998). Shreeve outlines the predicament in design education by noting the attitude shift accompanying some contemporary, managerial academic practices – that a culture of trust is replaced by habits of accounting and bureaucracy (Shreeve, 2011), a point echoed by (Gleeson and Ó Donnabháin, 2009). In the UK this relationship has changed in the past
decade following the introduction of Tuition Fees and this has an impact on what education is considered to be. As Shreeve states:

“The idea of ambiguity and threshold concepts (Bull et al, 2009) which require students to be able to deal with ambiguous situations does not sit well with notions of transparency and knowing exactly what your money will buy.”

(Shreeve, 2011)

In stating precisely what students will learn, a number of assumptions are made philosophically, ontologically and even ethically. These are rarely declared explicitly and very often reflect beliefs and preference rather than pedagogical underpinnings. In a subject like design, where the development of competencies, attitudes, and approaches are critical, such assumptions rarely account for the complexities of the process of human learning that is required. For example, the development of plurality of interest and curiosity that a designer brings to the world is at least as important as the ‘content’ provided in any design course (Young, 2003). Hence, the constructivist (emergent) component in design education is at least as important as the behavioural elements.

This, then, leaves us with a challenge similar to the Design and Technology teachers of 1988 in the teaching of capabilities: defining design education needs some form of description somewhere between certainty and openness.

To define or not define, what is the question?

One of the issues in trying to define design education lies in the process of definition itself, in particular, who is defining it, why something is being defined, and how it is defined. The act of definition in the case of
complex concepts such as design requires consideration of all of these aspects and a single definition will rarely treat each ‘bit’ of the complexity appropriately. If ‘how’ is the main driver (e.g., how do we set standard formats for learning outcomes), then ‘why’ (e.g., what is the purpose of the learning in the first place?) may receive less attention. Seeking ‘completeness’ of definition is rarely the goal in any event and the range of motivations can vary significantly by discipline.

In the UK context, two major drivers have influenced this area. Firstly, the issues already outlined with respect to how higher education is perceived and transacted as a commodity. Secondly, the role of accreditation in the UK in some design disciplines and the clearly-defined criteria, categories, competencies, content, etc. comprises the definition of an accredited professional. Both of these motivations for definition retain the dilemmas inherent in trying to define an educational transaction between teacher and learner (Gleeson and Ó Donnabháin, 2009). For example, one central dilemma for any definition is that the outcome defined is not solely dependent on providing teaching as the object; in order for an educational outcome to be met, learning has to also take place. Even if we do define some relation between what is to be taught and what is expected to be learned, is it acceptable to do this alone and ignore any other personal, social or even ethical aspects of student development (Wildavsky, 1987)?

At a practical level for many design educators in the UK, then, tensions can arise when trying to define design education for specific extrinsic needs, such as specific forms of learning outcome (or targets, goals, intentions), particularly where such forms must fit some particular paradigm that may not be suitable for the subject itself. It is very often in this ‘operationalisation’ of a subject that the clearest tensions arise, particularly in design for two particular reasons.
Firstly, in design and many other professional subject areas, it is the
development of individual capabilities, attitudes and dispositions that
matter as much, if not more, than behavioural aspects of learning, such
as skills (Kimbell and Stables, 2007). In design, it is insufficient to
simply know information or to have ‘learned something’: it is in the
application of knowledge that the practice of design is developed.

A common tension that arises is around the overt focus on only
behavioural skills outcomes, as noted previously. Such skills are often
far easier to state and measure (e.g. ‘able to use software package X’) and
in stating are assumed to be easier to measure (i.e. ‘student can
use software package X’). Unfortunately, what such superficial
outcomes can miss is the value of the skill applied in context or the
cognitive ability that enables a skill to transfer across other design
domains. The irony is that the latter is more representative of what is
required in a creative industry that is constantly updating and adapting
to new ways of working (Design Council, 2014).

In a design education context this tension is often mediated by having
learning aims that recognise development towards some final objective,
not necessarily an objective in itself. This difference is a subtle but
critical one, as noted in the reflective case presented in Sochacka et al.
(2016), particularly where an art and design curriculum comes into
contact with positivist dominated subject domains. The crisis between
professional and academic education observed by Schön in the 1980s
has by no means been resolved and the tensions between cultures of
knowledge still exist.

The second difficulty in defining learning outcomes is that what any
individual student needs to learn is almost always particular to that
student in a practice-based discipline. To state precisely what a design
student will learn in many cases is not only impossible, it's far less
valuable than recognising what has actually been learned and to incorporate this into the learning process itself. Such reflective learning practice is at the heart of Schön’s idea of reflective practice or Laurillard’s conversational framework (Laurillard, 2002). Some authors would argue that any design curriculum and studio is about the development of this judgement as a core praxis in design (Cross, 1990, 2004; Smith, 2015).

In both points above, it is far less the objective of outcome that matters than the recognition that striving toward the objective – the experience of learning – is the valuable activity in and of itself. Cross argues this by applying the work of Peters to the cognitive value of a design education:

> It is as absurd to ask what the aim of education is as it is to ask what the aim of morality is... The only answer that can be given is to point to something intrinsic to education that is regarded as valuable such as the training of intellect or character. For to call something ‘educational’ is to intimate that the processes and activities themselves contribute to or involve something that is worthwhile...

> People think that education must be for the sake of something extrinsic that is worthwhile, whereas the truth is that being worthwhile is part of what is meant by calling it ‘education’.

_Peters (1965) in (Cross, 1982)_

For Cross, like many other of the design education writers referred to in this covering paper, it is the learning experience of a design education that is far more important than transactional, extrinsic outcomes. This is similar to the argument made in art education by Robb, who suggests that the philosophical versus pragmatic motivations behind art education must necessarily coexist, rather than oppose (Robb, 2019). This grand ideal is one many design educators might find it hard to argue against, but it is worth observing that the realisation of this is in
an appropriate manner (disciplinary or otherwise) another matter is a non-trivial exercise (Gunn, 2009).

The further challenge is how to communicate this beyond the design education community where, in the reality of art and design courses, such balances are achieved regularly. Setting aside any pragmatic need, the issue itself is arguably one of accommodation and balance. It is unacceptable to require only behavioural or positivist outputs just as it is unacceptable to be completely unclear or elitist about what is to be taught.

However, whilst design educators might be comfortable with such balance and accommodation it can remain a challenge to communicate this with other colleagues in an institutional setting. Orr and Shreeve’s recent book Art and Design Pedagogy in Higher Education (2018) is one such attempt and a contemporary summary of the tensions in design education (intrinsic and extrinsic). Central to such tensions is the design education paradox around the uncertainty inherent in the creative process (the creator cannot know what will be created) whilst at the same time needing enough clarity to permit the description of intended learning.

Orr and Shreeve’s book has been criticised for its “…tendency to let art and design education off the hook in its lack of clarity about what it offers students” (Ashwin, 2018). This reflects the general sort of criticism outlined in this section and one that has persisted throughout the latter part of the 20th century. I would argue it is an accurate but slightly unfair criticism in that it fails to fully contextualise its position in the history of design education research (Jones, 2018) or the particular knowledge modes and contexts that make up design education (and by extension, research). In many ways design research itself is still a young discipline, at least in terms of having to ‘explain’ itself in a purely
academic setting. Beyond this, the discipline of design defining its pedagogy on its ‘own terms’, decades after Archer and then Cross proposed the idea of design as a distinct discipline of knowledge, remains incomplete:

As with the messy space of practice, some middle ground needs to be reached. Design research, if it is to exist independently of other research domains, has to be rigorous and consistent - but the basis upon which such rigour is constructed is not necessarily the same as other disciplines. The issue of ‘where’ design knowledge might reside, raised by Cross 30 years ago, must be tackled."

(Jones et al., 2016).

This then suggests both the problem and solution to asking, ‘what is design education?’: the question itself has to be acknowledged as being asked within a particular context and mode, and a particular form of answer is therefore expected. But the types of answer design can give, if seen as a disciplinary question, are not necessarily of this form. In design, the final outcome of any design process is unpredictable; if it were otherwise it wouldn’t be design. As we have seen above, this is at least partly true in design education: the specific learning experience any individual student has is inherently unpredictable or undefinable.

Having said that, simply because a design process leads to an unpredictable outcome it does not follow that the process or experience is entirely unknowable, and it certainly doesn't mean that we can't be confident about reaching some general outcome. The fact that these outcomes may be fundamentally different to learning outcomes in other subjects is a large part of the problem here. Hence, design educators being confident about uncertainty and ambiguity, for example, is the important and central message presented by Orr and Shreeve (2018). In a contemporary HE setting in the UK this tension between
performativity and individual student experience is a constant challenge, despite the fact that it is possible to mediate between such tensions, at scale and at a distance (Publication E).

To take account of this apparent tension in normative education contexts, Lyon (2011) argues that a special case for art and design education is made based on its particular nature as both a discipline and as a form of professional education. It could be argued that Lyon’s call is simply an updating of earlier calls to treat design as its own mode of knowledge but the central point here is the unique nature of enquiry by, and through, doing, making, and creating. Neither a sciences nor humanities approach covers precisely this intersection of human activity. As Archer stated over 50 years ago, given this is one of the commonest human activities, it does seem slightly strange that it so under-represented in general education.

It is through publications such as Kimbell and Stables (2007), Lyon (2011), Orr and Shreeve (2018), Boling et al (2016), Farias and Wilkie (2016), and Salama (2017), that a new confidence around articulating the value of design education and research is emerging. Common to all of these is an attempt to explore, make sense of, and articulate aspects of design education rather than define it.

**Some steps towards (and around) definition**

Whilst we may yet struggle with some definition of design or design education, we can still observe what it is design educators do to enable designers to learn. We can further note that, whilst the theoretical debate might continue, educators still have to teach studio, set assignments, assess design work, etc. In other words, the ideas are often worked out in the learning contexts themselves, such as the early work at The Open University. It is even, perhaps, in this working out of
details that much design education is created. To return to McLachlan and Coyne:

*From a hermeneutical perspective authority is decided in context, in a situation, and through debate, the full workings of the interpretative process, terms that accord better with the contingency of the accidental move than with the fixity of essentials.*

(McLachlan and Coyne, 2001, p. 99)

I argue here that this is true in design education and in the specific example of learning outcomes: they should be written, interpreted and assessed in context, critically debated, and never fixed along those three modes of articulation and development. Hence, like many other authors, I end without formally defining design or design education in purely behavioural, positivist, or transactional terms. Neither should it be an un- or ill-defined entity: its practice and applications must be questioned and, like design itself, through such questioning, it becomes a living practice, evidenced by the things that are produced by it. This conception of design, rather than definition, will be developed further later in the covering paper, bringing it up to date with contemporary design and studio education in section 4.2.

For now, whilst we have a contingent conception of design education, we can turn to observing certain elements produced by design educators that appear consistently across almost all curricula. One of these is the studio.

### 3.5 Studio Pedagogy

Historically, the studio as a place of practice was also necessarily a place of education. Its transfer to the academy, as already noted, began in the 19th century as a place of education through simulated (or
One thing that almost all design education writers and researchers tend to agree on is the centrality of the design studio to design education (Cuff, 1992; Oxman, 1999; Goldschmidt et al., 2010; Crowther, 2013). In Salalma’s review of architectural education, all of the cases given in the pioneering typologies chapter make use of studio as the central mode of education (Salama, 2017). Shulman’s (2005) highly cited work on the ‘signature pedagogy’ of design outlines the centrality of the studio as the place of design education, as well as a few other professions. The idea of studio as a signature pedagogy has been since repeated by a number of other authors (Crowther, 2013) and, whilst there are other framings of signature pedagogies in design (Shreeve, 2011), the focus of this covering paper is on the core concept of studio as a central, persistent and signature pedagogy in design education (Hetland et al., 2007; Gray and Smith, 2016).

Defining the Studio

At the risk of further repetition, the design studio, like design and design education, has no single, formal definition. Indeed, Boling and Schwier argue there is not, and cannot be, a full and complete definition:

*The reader looking here for a template or guide book on studio teaching will be disappointed – by intent. There is no single, generalizable set of guidelines that we can, or want to, offer.*

*(Boling and Schwier, 2016, p. 20)*

Boling and Schwier outline the contextualised and emergent responsiveness required by studio practice and teaching, suggesting that this makes it impossible to deterministically predict or define, an observation made by other authors (Brandt et al., 2013; Cennamo, 2016). Salama and Wilkinson arguably extend this to question the boundaries and constituents of studio in their introduction to studio by
concluding “…it is imperative that design studio pedagogy needs to be encountered in its broadest sense” (Salama and Wilkinson, 2007).

Hence, we have at least two further areas of complexity in terms of definition: the activities and interests (and their operationalisation), and the constituents and contexts of operation of the studio. As is the case with definitions of design and design education, a normative or ontological definition of ‘studio’ is, at least, exceptionally complex and, at worst, inappropriate in most cases. Like the word design, there also tend to be significant conflations of phrases such as ‘design education’ and ‘studio education’ in literature and practice, where insufficient separation is made between places and modes of learning.

Alternatively, seeing studio as an emergent set of activities, practices, behaviours, attitudes, etc., that are evident in contemporary design education practice, is perhaps more useful (Gray, 2016). This last view of studio is perhaps as close an approach to definition of studio education as is proposed for this covering paper. With this in mind, a selection of key concepts around studio as a pedagogical entity or form is now presented to give a sense of the range of thinking and approaches.

**Apprenticeship- and activity- based studio**

Cuff’s history of the architecture studio remains a key reference text (Cuff, 1992) and it highlights the historical importance of studio in design education. It sets out certain core properties of the studio traced back to the Ecole des Beaux Arts, in France at the beginning of the transfer of design education to academia (section 3.1). Many of the properties outlined are reiterated and supported by later authors and include the studio as a place:

- to operate a simulated environment
• of design problems or projects
• of design process stages as part of a method
• for the relationship of master-apprentice
• for demonstration and activity
• for critique and judgement of work

Of course, not all of these activities or properties necessarily require a studio but, when applied in some combination or setting, can form a design education studio, either as a spatially located activity or set of activities. However, a few critical elements are missing from this list, mainly around the learning, social and affective properties and affordances of studio. Cuff’s history and studio definition are relatively practice and teaching oriented, focusing on the behaviours and outputs of students and how those relate to practice. A deeper understanding of what (and how) learning actually takes place in such a setting requires consideration of more than the teaching intent.

Schön’s work could be said to start with a similar approach: by observing what is apparent in (then) current studio practice. But Schön takes this further by interrogating the motives and intentions of the parties involved in an attempt to understand what happens intrinsically as well as extrinsically, albeit not without a few methodological issues. Without repeating a summary of Schön’s work (see section 3.2), his definition of studio can be summarised around four organising themes:

• physical space
• mode of teaching
• program of activity
• and culture

Each of these are relatively broad conceptual categories that, as with Shulman’s later work, could be applied to a range of educational settings, not only design studios. Schön, like Shulman, was not
DEREK JONES

researching design education exclusively but saw studio as a common pedagogical form shared across places of professional learning.

It could be argued that Schön and Cuff’s work represent a turning point in the visibility of studio as a pedagogy in itself, at least in terms of research into it as an object of interest framed from an educational point of view. From this point, the studio was opened further for inspection by design education researchers and interrogated and understood as a place of pedagogy as well as professional teaching or practice.

The forms of this practice have tended to centre around certain key assumptions, albeit informed and expert assumptions based on years of experience. By drawing attention to the pedagogical aspects of the studio such assumptions began to be framed in terms of learning and teaching. The work of Goldschmidt is one good example of this, observing the centrality of:

- learning by doing
- the design assignment (or project)
- the pinup (a semi-formal discussion around work produced)
- the crit (or critique)

All of these require the studio as their place of operation as well “the heart of” all design education (Goldschmidt, 2002; Goldschmidt et al., 2010). What Goldschmidt does, moving on from Cuff and Schön, is to enquire further into these instructional moves in order to explore them as learning and teaching activity in themselves. They remain centred firmly around studio but reflect the wider move to inspect the particulars of learning and teaching in greater detail, in particular what it is that makes an ‘expert’ designer (Goldschmidt, 2003).

A more recent categorisation based on the intent and purpose of studio is presented by Salama and Wilkinson, where they observe the relation
between historic and contemporary provision of architecture design education, summarising four types of pedagogical approaches or studio viewpoints (Salama and Wilkinson, 2007):

- academic
- craft
- technological
- sociological

Although these categories relate specifically to their work in Architecture, they are important in terms of framing or understanding the underlying (or surrounding) cultures and motivations of different studios in other domains of design. Each has distinctly different combinations of properties, actors, objects, activities, etc. Such differences are as much ways of maintaining a core community, identity or culture of practice as they are about pedagogical moves, an issue emphasised in Salama’s in-depth follow up (Salama, 2017). As will be seen later there is perhaps a similarity between these historic approaches and those found in early virtual and online studios (see chapter 04).

Studio as (signature) pedagogy

In referring to the studio as a pedagogy, Shulman’s work on Signature Pedagogies (Shulman, 2005) remains a key reference point in design education literature. It considers the particular pedagogies in key professions, such as design, and positions the studio as a culture of practice, very much emergent with respect to creating the most appropriate educational setting for students to be inducted into a professional setting.

Shulman explores a range of characteristics of the studio from a broader curricular point of view and identifying structures that emerge:
DEREK JONES

- Surface structures (actions, objects, events);
- Deep structure (the underlying ideas, concepts, and intentions);
- Implicit structures (the attitudes and approaches expected of a particular profession);
- ‘what is missing’ (the how the signature pedagogy differs from other modes of education).

Whilst this framework is useful in an academic way, Shulman does not develop it further or apply it rigorously to a range of studios, hence it remains a highly cited but theoretical and untested point of reference. Shaffer (2007), however, did take the model further and connect it to the operationalisation of studios to provide some much-needed detail to each of the ‘top-level’ conceptual classifications from Shulman:

- Surface structures: the spatial arrangements, tools, objects and artefacts (including timing) associated with a studio;
- Pedagogical activities: the individual interactions, group activities, and structured events as well as the overall curriculum planning;
- Epistemological understandings, including the values, opinions and beliefs around that emerge in the above as well as those that remain implicit.

A further development was made by Brandt et al. (2013), which developed Shaffer’s work by providing discipline and studio specific elements from observations in different studios. Critically, this study identified overlapping communities of practice in both education and professional settings, providing a critical adjustment to Lave and Wenger’s work. Similarly, Shreeve’s Landscapes of teaching project (Shreeve, 2011) took a similar approach to Shulman in the sense of understanding design pedagogy by exploring its practice across examples and instances, through discussion with art and design
educators (in 2005). Shreeve identified several signature pedagogies, including the already mentioned studio practice in addition to: ambiguity and uncertainty; the crit; dialogue; materiality among others (Shreeve, 2011; Shreeve et al., 2010).

The above models all present collections or systems of elements or properties that recognise the studio as more than a list of parts but acknowledging the need for some way of organising these to make some sense of the broader conceptualisation. They are included here as a summary of major ideas in studio and they remain a useful framework for thinking about studio education that goes beyond the purely behavioural or descriptive.

**Studio as a socio-complex**

The studio aims to be both a simulation of professional setting as well as a ‘protected’ space where students can learn to be designers. As such, the studio is deliberately isolated from other domains to ensure this protection. But such isolation is never complete and the boundaries between studio and multiple contexts are permeable. Students (and tutors) bring their own values and contexts to the studio, whether these are cultural (Davies and Elmer, 2001) or socio-economic (Carvalho et al., 2009). The culture and socius that emerges within any student cohort are often particular to that community and students are clearly aware of how these interrelate to their personal development (Sidawi, 2012). Then too, there is the professional culture ‘transferred’ from one generation of designers to the next through ritual and traditions, both explicitly and implicitly (Dannels, 2005; Cennamo, 2016) It could be considered a truism, therefore, to state that a studio is socially complex. How to make sense of such a socio-complex is another matter and there are no complete models that present or approach the studio in this way. Indeed, it is only relatively recently that work on social aspects
of the physical studio, particularly affect, has emerged as central to the pedagogical reading of studio (Marshalsey, 2017).

There are, however, a number of individual works that develop aspects of the social in studio practice. For example, Mewburn (2009) applied Actor Network Theory to explore the complexity of interactions between students and tutors. Dewberry (2012) explicitly links an ecology of mind to design thinking through Bateson’s observation that the world ‘comes to be … what is imagined’ (Bateson, 1987), echoing Postman’s call to consider education generally as such an ecology (Postman, 1974). Gray (2013) uses Bourdieu’s concept of habitus (Bourdieu, 1977) to explore the practice and craft of critique as an educational practice. The idea of the studio as a socio-complex is observed by Farias and Wilkie (2016), where they identify the emergence of creativity as an entity in public discourse and position studios as sites of cultural production. These approaches all reveal, at the very least, the importance of considering the ‘social press’ (Williams, 2013), the socio-complex of individuals in a group, in a context, to a purpose, critical to any creativity-driven practice.

There is no doubt that social learning and support is critical to understanding studio pedagogy and further research is still required to develop this within a design education context. What is emerging is its centrality to design education and particularly as applied in online and distance studios (Publications G, K, L, and M), not only those in physically proximate spaces as will be explored in detail in chapter 04.

**Studio as a concept**

The studio has also been viewed by organisational methods that start with the materiality of studio, where the embodied qualities of studio are the organising principle, such as the types, properties and qualities of
studio spaces (Taylor, 2009; Williams, 2013; Thoring et al., 2018). Corazzo (2019), explores such properties further, identifying six themes emerging in studio education literature (making, bridging, meaning, enabling, backgrounding, and disciplining). Here, the organisation of properties focuses on the action and intention of the studio, not its purely material or behavioural properties, recognising that it is the former that is the underlying value of a studio. With any physical interaction there is necessarily a cognitive, personal and affective component that is just as important as the material (Davis and Markman, 2012; Aizawa, 2014). How the affective or even phenomenological aspects of studio are considered can still be difficult since they are necessarily more subjective than, say, measuring the area of a room. However, contemporary researchers are now becoming aware of the need to engage with such intangibles (Farias and Wilkie, 2016) in order to recognise the sorts of experiential affect reported by countless students and educators, whether this is atmosphere (Ash, 2016), presence (Hokanson and McCluske, 2016), or extended cognition (Marshalsey and Sclater, 2018; Radzikowska et al., 2019).

Hence, contemporary design education researchers are adopting new methods and approaches in order to “…move away from the ‘studio as container’” (Wilkie and Michael, 2016) and inquire into the less tangible qualities of studio. Considering the studio as an embodied cognitive idea, for example, is central to my own work and Publications A, B, H, and G, all start from and develop this idea. This work, although heavily theoretical, has some very practical outcomes and has been applied to the design of the online studio OpenDesignStudio at the OU and in other work (Jones, 2020).
Complexity of studio

The overall point to take from this section is not to advocate any particular approach to theorising or understanding the studio, but to underline the complexity of studio in and of itself: as a human practice. As such, it is messy, ill-defined, and open to (re)interpretation; whilst at the same time simple to describe in certain important ways. As Wilkie notes:

“In short, the studio remains a peculiar and remarkable lacuna in our understanding of how cultural artefacts are brought into the world and how creativity operates as a situated practice.”

(Farias and Wilkie, 2016, p. 1)

Shreeve and Orr (2018) in their latest book on design education arrive at a similar point and determine that the uncertainty around the ontological nature of studio is a necessary part of studio itself. Uncertainty here, as in design, is not the same as ignorance – it is a necessary part of the practice and knowledge of any designer or design teacher.

A common feature, then, in more recent framings of design studio is a praxis that exists beyond (but in addition to) any superficial or singly defined properties. This praxis, as outlined by Shulman, retains certain habits and recurring elements that give it the stability needed for Schön’s destabilisation of learning to take place. Hence it is important to be aware of as many factors as possible that constitute such praxis in order to construct knowledge of how learning takes place. In Publications G, K, L, and M, the understanding of studio widened in response to findings and their contribution to the idea of studio as a praxis whose boundary is far wider than the ‘object’ itself. In other words, the virtual or online studio software itself is an insufficient
condition to support design practice: the learning environment, content, activity design, tone of material, cohort makeup, and many other factors, are all (potentially) necessary conditions. This simple extension of studio to ‘more than’ the visible elements is an example of the wider praxis that studio comprises. If it is evidenced in virtual studio settings then there is a good chance will be found in traditional settings.

Of course, in the particular example just given, there is a particular and unique condition to this mode of studio: the fact that the participants are not physically present. In order to consider how an online and distance setting allows the emergence of studio praxis, it is important to understand how design is taught, and learned, at a distance.

3.6 Distance design education

There is comparatively little research into distance design education as a specific intersection of either design education research or distance education research and this simply reflects the lack of distance design education courses at HE levels generally, at least prior to the pandemic of 2020. A further reason is that, when distance methods are used in design education, they are rarely considered distance education methods and more often thought of as an augmentation or extension of ‘normal’ design education. The distance component is often ignored or given far less attention.

A further difficulty is that quite a bit of distance design education tends to be published in a broad range of literature rather than single or selected sets of journals, and this can isolate it from more relevant work in design education. For example, there is a distribution of literature in journals addressing intersections of education, learning technology, information technology, and even education theory, making it difficult to
locate specific pieces of research in the specific intersection of distance and design education.

This has led to critical gaps in knowledge around understanding how distance and online design education works and even a cursory review of contemporary work reveals there is no consistent history, collection or body of work. This is changing, driven largely by changes to technology and their effects on practice and changes to design education (explored later in section 4.1), as well as more recent transitions in response to the 2020 pandemic, the full effects of which have yet to be realised (Jones, 2021).

Design education has been offered at a distance at the OU in the UK for decades making it a relatively unique example using this mode of teaching. The following section outlines some of the ways in which this has developed and is currently deployed. The intention is not to present the OU context as the only view of distance design education, but to use it as a frame to organise the literature and ideas in a contemporary landscape of distance design education.

**History of distance design education at the OU**

As outlined in chapter 02, the OU has taught design since 1972 as part of the *Technology Foundation Course* and then later in 1975 with the presentation of the first full design course *T262: Man Made Futures* (Holden, 2009; Cross and Holden, 2020). This was a significant turning point in both design education and design research, albeit one that is rarely commented on. Influences on this course were, as outlined in section 3.2: early work in design methods, design as a way of knowing; and design as a form of personal development and transformation in education. This theoretical underpinning came from a range of international thinkers and researchers, and it was at The Open
University where this became an operationalised reality, or “touched the ground”, to paraphrase the OU’s Foundation Chancellor (Crowther, 1969).

At the time, there was almost no question in the minds of the early authors as to whether or not design education could be taught at a distance. As Holden outlines, the vision was not only to teach design, but to develop and expand the idea of design beyond that provided elsewhere – a different vision of design:

_The first words of the first Open University Design course, Man-Made Futures (T262), launched in 1975 were a quote from Victor Papanek, "The main trouble with design schools seems to be that they teach too much design and not enough about the social, economic and political environment in which design takes place." (Holden, 2009)_

This was quite a radical position to take considering the contexts of design education then (and even now), which relied firmly on studio models and indoctrination into professions and practices. Many of the studio elements outlined in section 3.5 do not necessarily depend on a physical studio. Indeed, by removing the physical studio, one is forced to ask what does constitute design education when certain assumptions or affordances are removed. At the OU in the 1970s such questions were answered in the form of new design curricula and learning materials and the elements described in this section are those that are still used in contemporary work at the OU (for a more detailed exploration of this early work, see Cross and Holden (2020)).
Design methods

By taking design methods as the central approach and applying a student-centred constructivist model (without naming it such), the early authors of T262 were able to move beyond physical studio as the only site of design activity and learning. Design methods provided the structure and framework for student ‘learning by design’ to take place. In the traditional studio, the design of a structured learning activity is important but not critical since it can be modified in the studio through tuition, often dynamically in response to student need. At a distance, the design activities for learning must be local to the student without teaching or tutor presence, so the initial design of these is critical to ensure independent learning can take place.

Students study ‘chunked’ elements of learning material designed to summarise and invite ‘thinking through doing’, such as mapping complex problems and situations or engaging in activities as part of design projects. The key to this ‘method of methods’ is one of scale and how students make use of smaller actions to ‘build up to’ to larger-scale activities, which can in turn be placed together to form a process. The different ‘scales’ of reflection required whilst adding design activity together at has been identified as a key component of the design process (Tang et al., 2012; Smith and Browne, 1993) and, by setting it out explicitly, it can become visible to students, hence support their learning (Jones, 2020). This ‘chunking’ of activity, the building up of small design activities to projects is a feature that remains in current courses at the OU and can also be seen emerging in other distance design courses (Groom, 2011; Daalhuizen and Schoormans, 2018). That ‘learning chunks’ and methods seem to have some correspondence here is no coincidence; both rely on a certain scale of concept, material and thinking that is manageable (cognitively) whilst also allowing thinking ‘space’ for new ideas to emerge.
Anyone can be a designer

The OU was created to offer learning to any and all students, especially those who could not (or did not) go to traditional institutions, and this is reflected in the Open Entry policy outlined in chapter 02. This was, in turn, reflected in the early design curriculum through another core idea: that anyone can learn to be creative and to be a designer. To quote the content from *T262: Man-Made Futures* once again:

"...the designer in any of these situations will not necessarily be an engineer or architect, or any of the generally recognised design professionals. He or she might be a manager, politician, protestor, consumer, lawyer, trades unionist, pressure group, butcher, baker or candlestick maker. Sometimes, almost certainly, the designer will be you." (*T262 Module material quoted in Holden (2009)*)

As noted in section 3.2 above, the designer as a specially talented or lone genius is as much a myth as the one that considers only some people to be creative (Craft, 2001, 2005; Craft et al., 2007). This view was arguably controversial in terms of challenging existing power structures and authority defining what constitutes design, who may practice it, and who determines what it is (Mewburn, 2011; Webster, 2005). But the value of the underlying cognitive and thinking capacities developed in designers, and set out by Archer and others in the 1970’s, as well as the research it led to, demonstrates its value in education, a value that is still actively researched (Ball and Christensen, 2019).

Whether these values can extend far enough to be considered design expertise remains an open question. For example, Rutland (2009) demonstrates that a design education is an insufficient context *on its own* to enable the development of competencies such as creativity, giving an insight into the importance of understanding limitations and conditions of a contextualised design education. Such limitations are
implicit in the way the literature refers to ‘novice’ designers, usually defined by comparison to the design ‘expert’ (Cross, 2004). This is an entirely sensible approach, considered historically as central to the master-apprentice model, and it works perfectly well in maintaining existing design disciplines. But what it leaves unquestioned and unexplored is the basic assumption that this is the best and only way to do it, ignoring any other relationships that might be useful (Dorst and Reymen, 2004).

Research at the OU demonstrates that different ‘qualities’ of knowledge can emerge in a distance education setting where the expert is not continuously present (Publications D and L). This knowledge is similar to the type of emergent learner knowledge described by Lave and Wenger (1991) or the collective knowledge recognised by Salama’s discussion of VDS experiments, where the multiplicity of work is, in itself, of greater value than the individual parts (Salama, 2017). By this view, design education is considered as part of the constantly changing landscape of design practice, where intra-disciplinary competencies blur existing domain boundaries (Cross, 2001), as well as questioning what such domains might be in a contemporary creative economy (Lloyd, 2011; Design Council, 2015). This perhaps confirms, or at least contributes to, the necessity of the provisional definition of design education given in section 3.4.

What is argued here is not that any single stance or position is to be preferred over any other, but that a wider range of approaches are now emerging and being tested, particularly in response to the transitions in teaching mode seen in 2020. Academic work, theoretical and empirical, is still required to understand such approaches, how they relate to traditional design education, and what their deeper value might be to students.
Student-centred

The idea that ‘anyone can be a designer’ leads to particular challenges in distance design education, especially combined with an Open Entry Policy where any type of student can enrol, as is the case at the OU. Helping students make sense of a complex praxis such as design requires the novice designer to abandon any simple and deterministic conception of education and instead approach it as more of a constructed and emergent form (Orr and Shreeve, 2018). In design, this constructivist shift is required by the subject itself: as Holden notes of the first OU design course, it moved from a subject focus (objects) to their interrelation with people (socio-technical) (Holden, 2009). This was expressed in the design of the course itself by taking a student-centred approach and designing a student journey, experience and thinking. This was complimented by the tuition group approach which still provides emergent opportunities for student learning in activities and tuition spaces and activities. In many ways, a form of incomplete design is required to ensure the emergence of learning, a method still in use when producing current design courses at the OU.

The aim behind this approach is to encourage students in developing their own competencies in learning and being aware of this development in and of itself. In distance education generally this process of becoming a self-learner is well-recognised as critical to success (Simpson, 2008; Hill et al., 2009; Wang et al., 2013) and this has a direct analogy to the development of design expertise in design education literature (Goldschmidt, 2003; Cross, 2004; Dorst and Reymen, 2004). This is perhaps best summed up in a disciplinary sense by the excellent German conceptualisation Gestalterpersönlichkeit (Lanig, 2019), the development of the personality of the designer. Such development of a disciplinary-specific approach to one’s own learning and development, is critical in a
distance setting and relies on the development of reflective and reflexive practices, recognised in both design and distance education literatures.

Although it is appropriate to be critical of reflection as it has been theorised (Webster, 2008; Mewburn, 2011), it has also been reframed more recently and positively in a number of ways, such as critical practice (Webster, 2004), collective practice (Jornet, 2016), and as a behavioural activity useful to developing other cognitive processes (Publication F). As with many other design education theories and ideas, it is not necessarily which interpretation is correct or true that is important, rather that we continue to enquire into and research such theories rather than simply accept them (Beck and Chiapello, 2018; Jordan and Laureline, 2018). Reflection, framed here and applied at the OU, becomes an aspect of student-centred self-learning.

**Tutor as enabler rather than expert**

The traditional expert-novice apprenticeship model is, unsurprisingly, affected when the expert is at a distance and not physically proximate to the novice. As with design methods, early distance design courses had to address issues arising from the absence of proximity to an expert guide. Assimilative content that uses experts is one partial alternative (audio and video recordings, case studies, interviews, etc.) and research shows that broadening examples, cases and perspectives in this way can have a positive effect on widening participation (Spiller and Moffat, 2018). This type of material is still used today but it cannot be relied on in isolation or as a proxy for the apprenticeship model, where the interrelationships and emergent learning that can take place in proximity with an expert are the valuable part of that pedagogy.
The tutor as expert remains a dominant property of studio and, whilst some authors argue its centrality, others challenge this (Goldschmidt et al., 2010). For example, Mewburn’s key work critiques both the theoretical underpinning of the expert tutor outlined by Schön (Mewburn, 2011), as well as its practical application to effective studio crit behaviours (Mewburn, 2009). Similarly, Webster’s in-depth work on the tutor-student relationship, in particular, draws attention to the problems that can emerge with such a relationship, which is necessarily founded on a difference of power (Webster, 2004). Webster concludes that only one out of the three types of tutors she identifies are considered to be of benefit by students: the ‘liminal servant’, a role and type that takes a strongly constructivist approach.

This role of liminal servant aligns closely with that of an OU tutor, where the overlap between subject specific knowledge, general study support, and pastoral care is important (Tait, 2004). The OU model of tuition has, since the earliest courses, fostered this through the tutor group model, and its ability to scale tutor-student connection for large courses (Publication D, E and F). An OU tutor will meet face to face with a tutor group and establish a pastoral and educational relationship through direct and indirect communication, a range of tuition events and activities, and the assessment of and iterative feedback on student work. In essence, despite the logistical challenges, this is very similar to a studio model of tutor and tutor group with the obvious differences declared and addressed from the start of the relationship.

Although the tutor will also engage in traditional expert-novice discussions, the development of independent and collective expertise is encouraged in parallel. This, as noted, is a key element of developing self-learning in general distance education but it also reflects recent research exploring social learning, small group design tuition and the benefits of moving away from a purely one-to-one model. By explicitly
encouraging reflection with and between peers, the benefit to students comes from constructivist guidance rather than direction (Brandt et al., 2013; Gray, 2013). In such models, the tutor is not only a subject expert but a critical facilitator of constructed learning, allowing the development of individual competencies in a group setting and without some of the negative dependencies on the expert that can be found in other models (Liow, 2019).

At a distance it is also the presence of the tutor that acts partly as a proxy for not being physically present, where tutor actions, interactions and signs (expressed through whatever media used) are what make up such presence (Munro, 1991; Armellini and De Stefani, 2016). The idea of presence has been extended to include social (Huang, 2017) and cognitive (Armellini and De Stefani, 2016) presence and can be usefully used to make a significant different to student success at a distance (Kear, 2010), hence the reason that design presence is hypothesised in (Publication M).

With the development of technology, the opportunities to improve presence have also expanded and improved. Online meeting spaces, messaging and, of course the use of online studios of different types have all ‘reduced the distance’ in distance education, offering new ways in which to express or develop presence. Even design assessment can be critical vehicles of and for presence, particular where richer interactions to support feedback or conversational learning are employed (Publication E).

Assessment

Assessment in art and design can seem, to the uninitiated, an ambiguous and subjective process. Design is popularly viewed as a particularly subjective domain and this belief is often translated to
attitudes towards its forms of assessment. But a more nuanced understanding of the complexity of art and design assessment is required to fully understand its purpose and mode (Boughton, 2019). A full treatment of design assessment is not presented here but one specific issue in both traditional and distance design education is of particular relevance: whether the assessment focus is on the outcome or the process a student goes through. Traditional design assessment tends to favour the former and this remains the case for many design schools and institutions, not least because these outputs form student portfolios often used in professional settings after completing their education.

Publication E sets out the case for focussing assessment on process in distance design education and provides a case study of how we achieve this at a distance. Central to this argument is the idea that good process will inevitably lead to a good final outcome and that making this process visible at a distance is a far more important focus in terms of learning. This has the additional benefit of encouraging other learning opportunities as well as pastoral interactions. However, as (Gleeson and Ó Donnabháin, 2009) observe, it is all too easy to focus on only products and outcomes when this becomes the strategic priority of an educational institution. As Publication E showed, there are ways to achieve both, whilst also doing this at scale and without affecting the personal attention to the student required in design education.

This attention to individual student need at scale is a particular strength of the OU and there is a unique synergy between the general approach to assessment and how it supports design specifically. Most formal OU assessment is designed to be both formative and summative, with a reliance on the formative aspect as a key vehicle for tuition. This is principally achieved through tutor feedback on design and project work and is sufficiently comprehensive and detailed to proxy many of the
synchronous interactions that can take place in a traditional learning setting (Publication E).

Tuition through assessment is a particular form of teaching based on the idea that feedback (Ramaprasad, 1983) is an effective method of initiating learning (Sadler, 1989; Gibbs and Simpson, 2004). At the OU, the training, monitoring and development of tutors in providing high quality feedback is a critical part of its success and central to the Supported Open Learning model (see section 2.2). This remains central to the contemporary model, albeit updated to take advantage of new media and methods.

In design, this detailed feedback requires exceptionally clear articulation of feedback points, particularly in terms of actionable feedback. This is an action-based version of feedback similar to Sadler’s adjustment of Ramamprasad: “…when it’s used to alter the gap” (Sadler, 1989). Hence, tutors must have a very clear understanding of student work, how that can be related to learning aims, and how to suggest tangible ways for students to make future change to close the feedback loop (Publication E).

Criticisms of Distance Design Education

As has hopefully been demonstrated, there are many ways in which distance design education is supported to ensure successful student experiences and outcomes. There are, of course, certain physical and logistical difficulties associated with this specific mode of learning.

**Synchronicity.** The distance aspect has a critical effect on synchronicity of interactions, whether between tutor-student or student-student. In a traditional studio the reliance on others for immediate and timely feedback on what a student is doing at that moment is assumed to be critical. At a distance, however, being able to obtain immediate
advice on a particular issue, or for a tutor to intervene when spotting an issue, is a challenge and this is central to working with tacit knowledge (Venkatesh and Ma, 2019). Of course, constant and continuous access to tutors is not possible in a traditional setting and it could be further argued that over-dependency on tutor advice can have a negative effect. However, at a distance, the opportunities for tutors to engage in regular synchronous contact are practically limited. Precisely how this affects student outcomes and development is as yet unclear.

The general topic of the proximity of student-tutor tuition would benefit from extending it to explore distance context(s) as both a comparator as well as a contrast. The work in Publications A, E, F, G, K, L, and M all touch on issues of synchronicity and proximity, albeit there remains a need to bring such work in this specific area together to form a coherent set of ideas or theoretical frame. As has emerged during 2020, student perception of synchronicity, presence, and proximity can be very different to educators’ perceptions and a fundamental shift in how we conceptualise all of these terms may be required. Initial evidence and lessons from 2020 and the response to the global coronavirus pandemic suggest that many other balances of synchronicity, proximity and even presence may be more effective than the simplistic models often assumed to be the only way to go about design education.

**Artefacts and materiality.** In much of the literature outlined above, the artefact, or materiality, is critical and central to studio teaching and practice, whether this is a sketch, model, design object, or drawing, etc. Its importance is principally as a representation and contingent construction of knowledge; as a way of expressing ideas and thinking in a more tangible and developed form (Prats and Earl, 2006). Once tangible, it becomes a medium for the development, exchange and critique of ideas in the studio. In contemporary distance design this can be supported by online tools and services, where the artefact can be
digital in nature but no less real (or any less representative of a concept) (Prats and Garner, 2009). In U101: Design Thinking, for example, students are directed to sketch and prototype a series of common activities in order to think/make individually and then share these collectively in order to engage in an exchange of ideas and critique. Most importantly, the design of some project tasks forces students to use these artefacts with users and ‘clients’ in order to see first-hand reactions to their work. Such mechanisms of utilising artefacts at a distance are central to contemporary distance design education at the OU (Publications E, G, K, L, and M).

There are, of course, obvious limitations to how far this materiality can be taken at a distance: it is simply a fact that some physical design practices (screen printing, metalwork, sculpture, etc.) require certain materials and types of physical artefacts, and where the limitations and logistics required to support these are impossible to duplicate at a distance, at scale. The success of many virtual studios, however, suggests that material and physical methods can work well at some level in non-specialist subject areas. What is clear is that our understanding of these boundaries is incomplete, possibly because we have never yet had to explore them seriously until recently. The events of 2020, once again, provide many examples of alternatives to normative materiality and physical proximity that have never been considered.

**Expertise.** As outlined above, the role of the expert in traditional design education is central to many design schools and the proximity of relationship to expert is one that can be difficult to replicate at a distance. But the role of the expert as *an educator* is still being challenged in terms of how such expertise can be used to inform or enhance learning. The particular challenges of supporting experts to develop the additional expertise of teaching have already been outlined
(chapter 02) and this remains an outstanding challenge in all modes of design education. It is also worth distinguishing learning from experts and the development of expertise by the student, a mechanism recognised in the literature as a critical part of any design education (see (Cross, 2004) for a summary and overview of work in this area). Again, precisely how these two interrelate has never been fully explored (Dorst and Reymen, 2004).

It remains an open question as to how far we can utilise distance design thinking in supporting the development of design expertise. At the OU, where the development of non-specialist design expertise is offered, this can be a particular challenge. The debate as to how design as a form of thinking and knowing can be generalised or has to remain a specialised cognitive activity still continues today and an important distinction between the novice and expert designer is important (Kimbell, 2011). A critical distinction between the tradition of the academic study of design cognition and the recent rebranding of design thinking applied to other domains has to be made here (Callahan, 2019) and each can be related directly to the early work of Lawson and Archer respectively. The former supposes a simplified recipe of design that anyone can apply at any time without practise. The latter presents a form of knowledge construction; an embodied cognitive act (Publication H)) that requires practise and experience.

There is no doubt that distance design education is effective at initiating and introducing the subject and process of design to novices. Similarly, there is no doubt that many graduates from the OU carry out expert design work as well as design work in areas that would not be considered traditional design domains. However, work has only recently started to really understand how this develops at a practical level and the conditions under which it can truly develop expertise in any student (e.g. Publications E, F, and M).
04 VIRTUAL DESIGN STUDIO USE IN DISTANCE DESIGN EDUCATION

This chapter continues directly from chapter 03 with an extension of the literature review, focusing on the specific sub-topic of virtual design studios (VDS). It brings this review up to date to show how contemporary work in both traditional and virtual studios are shaping modern design education research. It ends by identifying particular themes in contemporary VDS research to which the publications in this portfolio have made particular contributions.

Chapter 03 highlighted the fact that the design studio remains central to design education. Hence, it could be assumed that studio pedagogy is also central to distance design education and, thereby, that a virtual studio might be critical to this. The reality, however, is slightly more complex than simply translating a physical studio to an online version and assuming everything will work as expected. As outlined in chapter 03, what makes up a studio is more than the superficial, physical, or even behavioural parts. Indeed, an examination of the case studies in the literature show clearly that a VDS on its own is rarely a necessary condition for a distance design course (Publication M). Why this is the case highlights assumptions and issues in both traditional and virtual studio research. When brought together, the work goes beyond traditional definitions of studio and reflects contemporary shifts in understanding of studio as a more complex praxis.
4.1 VDS research

A brief history

Research into general VDS use emerged around the same time as early adoption of online studios in teaching practice and Broadfoot and Bennett, citing Laiserin (2002), argue that this occurred in the mid 1990s (Broadfoot and Bennett, 2003). This coincided with the more general emergence of the internet, world wide web, and driven by the link between general adoption and wider accessibility to products and technology, followed by a wave of systems and services in response to user demands and desires. By the early 2000’s this had developed into what some commentators referred to as web 2.0, where user-centred and created content (including early social media) generated and began to drive development.

Early VDS use can be traced along this general path of development, and very early models could be considered to be the ‘Innovators’ Rogers’ (2003) referred to in his theory of innovation. As such, early VDS tended to be highly specialised and operated by exceptionally committed individuals, as can be seen in the case studies presented in Wojtowicz (1995) or Frazer and Tang (1998). These early studios were followed quickly by the ‘Early Adopters’ (or perhaps ‘Early Majority’), as outlined in Broadfoot and Bennett (2003). A further example of early adoption is the VDS Studio Model in Wilson and Jennings (2000) augmented by early ICT, internet and web technologies (e.g. multimedia content on CD-ROM; email and small online group discussions). These VDS solutions focused more on replicating basic behaviours and approaches in traditional studios using content-based elements and a series of technologies that attempted the replication of communication in a studio context.
This last example highlights a limit in applying Rogers’ model to VDS development: the quick iteration of studios and the creativity and drive of the people involved don’t quite match the smooth curve applied to the larger and general population in Rogers’ curve. The Studio model in Wilson and Jennings had a clear social and class group intention that was seriously limited by the technology’s ability to support this, a finding matched in other early VDS examples (Cheng, 1998; Kvan, 2001). To use Rogers’ language: the social ‘push’ was not matched by the technological ‘pull’, and early VDS practitioners, it seems, recognised the potential complexities and limitations of forcing a technical paradigm on a socio-complex such as the studio. This did have an effect on attitudes to emerging VDS, particularly in terms of their perceived as well as actual limitations, as will be shown later in the Chapter.

The emergence of social media and services around the early 2000s informed a series of more socially active studios and even replaced or acted as proxies for certain studio activities. For example, the use of online image sharing services such as Flickr can be considered a form of VDS (Fleischmann, 2014; Robbie and Zeeng, 2012). Such services responded to user feedback and desires to share (and compare) in a communal environment. Where such sharing aligns with a particular topic, aim or purpose it can develop and enhance the shared identity of that community. With a few other conditions, such as experienced users and peer rating systems, it can support some of the key conditions required for a Community of Practice (Lave and Wenger, 1991). The affordances of such social media sharing platforms readily translated to learning contexts and strongly influenced a series, or type, of VDS. Examples of this are KIBIS (Akar et al., 2012), and, of course, the first version of the OU’s OpenDesignStudio (Lotz et al., 2019). Both rely on a simple social repository-based studio where work is represented, visible to others, and interacted with, in a group setting. With
appropriate curricular support such spaces can be very effective in supporting social learning in design (Publications D, J, K, M).

Another studio type that developed in parallel to the social repository model outlined above could be considered a ‘process and interaction’ model. In this type of studio, the focus is very much on the communication and interactions between stakeholders rather than only the outcomes or shared artefacts. The purpose is very much focussed on existing studio practitioners’ practices, extending the mode and range of this practice through technology. This form of studio was explored in the early days of VDS use (Wilson and Jennings, 2000) and examples of this type of studio are the case reported in Achala Kul et al. (2004) or the Immerse Lab from Chandler and Ward (2019). The design process type of studio also seems to have proliferated during the 2020 pandemic, possibly due to the fact they can work well as synchronous tuition spaces, hence may have been a more immediate and familiar replacement for traditional studios.

What often accompanies the process studio is an ‘augmented social studio’, very similar to the social repository type. Instead of artefacts as the only focus, however, the augmented social studio focuses on connecting the community of learners, very often as an extension of existing social networks or making use of a specific network. An example of this is Schnabel and Ham’s (2012) Social Network VDS, which makes use of the value students place on existing social media networks as a means of connecting and augmenting their studio experience. Other examples are given by Fotaris et al (2015), and Pektas (Pektaş, 2015; Pektas, 2012). Yet further examples of this type of VDS could be said to be experiments in virtual worlds as spaces of education, such as those shown in Peachey (2008). These can be utilised in design education, albeit they tend to be around some particular aspect or activity in studio practice (Publication A), such as
groupwork (Hobbs et al., 2006). Beyond these immediate examples, the use of virtual or augmented spaces has perhaps yet to realise its full potential or, perhaps more accurately, have this value recognised as something other than purely technological or behavioural.

What can be seen looking across the types and development of online studios is a general trend towards user-centred approaches. Indeed, the early frustration at the lack of such support followed immediately by its adoption as soon as the technology caught up is perhaps telling. This trend, with the full integration of design activity or curriculum (the wraparound) is argued to signal the emergence of what could be considered contemporary distance studios and demonstrates many of the properties and features outlined in previous chapters, particularly around the student-centred nature of almost all studio designs. When combined with technology applied in a creative discipline such as design, they emphasise the social nature of studio. This social constructivist model of VDS was explicit in the development of OpenDesignStudio at the OU in the course U101: Design Thinking with the intent that:

*In the new course students will be offered opportunities to create their own narratives and ways of understanding design issues and processes.*

*(Holden, 2009)*

This clear articulation of the fact that studio is completely dependent on the activity and contribution of its actors is, I would argue, a signature feature (and even pedagogy) of the contemporary virtual design studio.
Technological, practice and knowledge development

As is perhaps clear from this brief history, VDS development has been inextricably linked to technological progress and in particular information computing technologies (ICTs) and the development of the internet and world wide web. With any new technology there usually follows the repurposing of it from known contexts to maintain the familiarity of existing preferences when applied to new domains (Hekkert et al., 2003). This is also true in design education as evidenced in early VDS, which relied on the transfer of traditional studio properties and practices using new technologies (Wojtowicz, 1995; Malins et al., 2003).

However, there are inevitable consequences to such rapid development and the speed of iteration and proliferation of solutions has also led to gaps (or entire missing sections) in knowledge informing this work. As is the case with a ‘pedagogy of abundance’ (Weller, 2011a), the research cannot keep up with the practice. Hence, the very technology that has allowed VDS use to develop and expand can also be a limitation when it comes to passing on knowledge and experience. The rapid development of internet-based services has progressed at a far greater rate than the broad adoption of these by users. A key feature of design itself, knowledge through prototyping, has led to a lot of failed experiments but with very little record of these, or at least a deeper understanding of the reasons for such failure. As Hart summarises:

*Despite the availability of some simple and easy to use Web 2.0 technologies today, combinations of tools are poorly researched and the creation of an online design studio still very much relies on a practical exploratory approach.*

*(Hart et al., 2012)*
The effect of this trial and error approach is that it is easier to lose evidence and cases, which has an impact on knowledge, and especially future knowledge. The lifespan of early online studios in particular was not particularly long: all of the studios outlined in (Wojtowicz, 1995) have now disappeared, leaving little or no evidence for researchers to make use of. Furthermore, the issues affecting design educator-practitioners and education research outlined in section 3.3 also have a direct effect on collecting and studying the few VDS cases there are. This disappearance of our digital legacy may also represent a cultural loss in terms of being a critical part of a wider information singularity (Floridi, 2014). If we consider studio to be a praxis and reflection of a community of practice, then the preservation of this becomes a matter of concern: what is, and is not, being preserved in newer cultures of studio is perhaps an important and underexplored consideration.

The factors just outlined mean that there are very few in-depth studies or detailed pieces of scholarship in this area, leading to a loss of direct and potential knowledge, specifically:

- there are very few case studies using a common method or approach to setting out basic descriptions and functions of VDS;
- there is no clear archive of cases because examples are distributed across a range of literature types and subject areas;
- there is no ‘meta’ research on typologies, theoretical frames, or epistemologies of studios (or cases).

This has had a specific and ongoing impact on work across studio modes and domains, limiting what can be studied, sometimes allowing assumptions to fill these knowledge gaps. For example, assumptions arising in one mode are often applied with little or no thought to how they might operate in another, affecting the pedagogy without realising it (Little and Cardenas, 2001).
The above issues are particularly problematic when it comes to any form of comparative research. Just as distance design education is simply assumed to be anterior to normative studio practice and knowledge, so too are online and distance studios. Such assumptions have been challenged during 2020 but the legacy of enculturated factors that influence perceptions of online and distance studios remain deeply ingrained.

(En)cultural Assumptions about what studio should be

As outlined in chapter 03, defining what is meant by studio is problematic and even contested. This becomes particularly relevant when researchers embedded in traditional studio practice and research bring prior enculturation(s) to the study of virtual and distance studios. Many of the major assumptions made around studio praxis and teaching are implicit and received, rather than explicit and constructed (or even critiqued). Hence it can be difficult to disambiguate existing beliefs and applied theory in order to conduct rigorous research.

Take, for example, the name of the object of study and what it reveals: ‘Virtual Design Studio’. As argued in Publication A, the word ‘virtual’ infers that there is a ‘real’ studio and one that is not real. From this position a duality is immediately constructed that is often used to describe deficit in one when compared to the other. For example, the belief that design education can only take place face to face is still firmly embedded in instructors’ beliefs (Fleischmann, 2018). This assumes that the lack of face to face is entirely negative and has little or no positive qualities, even though evidence to the contrary exists. Indeed, for some students, controlling contact points can be a positive aspect of their learning, depending on how it is applied (Simpson, 2013), a fact that has been recognised by many in 2020. Neither is it entirely positive: as with many aspects of social learning, the utility of any particular
aspect or property of the teaching depends on contexts and people in a
dynamic rather than static way (Publications G, K, L and M), a point
well made by Fleischmann in that paper.

Hence, in some ways, even taking a VDS seriously in the first place
remains a challenge for some design educators and researchers. To
give a further example of this and its influence on contemporary
research consider the limitations in project-based learning identified by
Ma (2016):

“(1) the eLearning system is difficult to use, (2) developing
eLearning material is time consuming, (3) they cannot be benefited
from the eLearning system owing to that the system does not work
with project-based learning, (4) studio-based approach cannot be
realized in the eLearning platform.” (Ma, 2016)

In this example it is clear that studio tutors’ opinions of distance
education are very much conflated with their opinions of the technology
that (in this case) simply does not support what should be an underlying
quality or capacity of studio. This is a very common issue where the
distance component is not separated from the technical or modal
components and the resulting analysis conflates the two
inappropriately. The experience of teaching design at the OU
contradicts each of the points made in the quote above; but this is
achieved using material that is produced using significant development
resources and time to create a distance learning environment, not an
adapted physical environment. To put this another way, the entire
resources that go into day-to-day teaching in traditional studios are, at
the OU, applied to the design of distance curriculum prior to its use.

This perhaps gives a sense of the scale of difference between the
conceptions of VDS that arise from these contexts or starting points.
Bridging the gap between such cultures of alternative design pedagogy is a critical issue in contemporary research.

Assumption through comparison

As can hopefully be seen from the previous section, there tends to be an *a priori* disposition toward comparisons of VDS to existing traditional practices, one that is still promoted in contemporary literature (e.g. Han, 2019). This position tends to be biased, perhaps understandably, in favour of the traditional setting based on the comparer’s own studio experience. It may also explain why there are very few studies exploring objectively or rigorously the differences and similarities between traditional and alternative studios. A number of papers claiming to carry out such comparisons exist but very often these are limited in scope, are actually presenting a (new) VDS, or have no real comparator basis or theory. For example, the title of Broadfoot and Bennett’s (2003) well-cited work, *Design Studios: Online? Comparing traditional face-to-face Design Studio education with modern internet-based design studios*, does not really do what the title suggests. Instead, it is more a collection of (then) contemporary studios, comparing them to one another informally interspersed with references to theorists in VDS use (Kvan and Cheng – see next section). No traditional studios are used as comparators and, instead, it seems to be an informal aspect of an assumed studio that is used when a comparison arises.

Hence, it can be difficult to find rigorous comparisons that go beyond anything other than a techno-disruptive paradigm (Weller, 2011b, 2020), and even harder to find specific studio instances that relate to attempts to generalise or theorise comparison(s) between traditional and virtual studios. This is further complicated by the difficulties in defining studio, as noted in 3.5 and the lack of certain forms or engagement with studio definition.
However, this is beginning to change and, even before 2020, a body (and community) of work began to emerge building on previous research and using greater rigour. For example, Saghafi et al. presents a relatively rare comparative study of traditional (they refer to physical, or PDS) and virtual studio use and the study examines the experience of students as the comparator, organising findings (albeit briefly) across nine dimensions. This work recognises the complexities of comparison and, in particular the potential limitations of binary contrast and the need to see the emergent and constructivist benefits of both:

“Based on participants’ opinions, neither PDS nor VDS on their own can respond to all the needs and preferences of students and tutors. Each mode of delivery has special qualities and learners have different learning styles that respond to these in different ways.

(Saghafi et al., 2012)

As a final example, the work of Fleischmann (2018, 2019) demonstrates contemporary design education research that places itself in a wider context of similar research (in both general and design education domains) as well as applying rigorous methods and approaches to a comparative study. In doing so, it attempts to move away from simple binary considerations of physical vs virtual and consider the affordances of both on their own terms.

History of Theory

Theory of VDS practice is also relatively rare in the literature. Where it occurs, it tends to be relatively superficial, either collecting reflections or observations, or creating loose models without critically referring to wider literature or work. It should be noted that this is a recognised issue in education technology research generally, where:
Many studies either were wholly bereft of theories or made vague use of theory. Where theory was explicit, the articles were more likely to use theory to conceptualise the research, to inform the data collection or analysis process and to discuss the results.  

(Hew et al., 2019)

The title of Kvan’s (2001) seminal and still regularly cited paper, The Pedagogy of Virtual Design Studios, is more a list of practical elements of consideration in any VDS rather than a theoretical or rigorous overview of the VDS as a learning mode or pedagogy. Another well-cited work by Maher, Understanding Virtual Design Studios (Maher et al., 2000), presents very early VDS examples in (mainly) architectural and practice-based settings. Like Kvan’s work, it is principally reporting cases, but it differs in that it also attempts to organise some of this work. It remains very much focused on the practice of representing and communicating design in a practice setting and does not fully consider the detailed pedagogical implications. Having said that, this is an early example of categorising elements associated with design studios (representation, communication, artefacts, etc.) and then applying these to set out different forms of VDS use.

Another early paper with a title that offers more than the content is Sagun et al’s (2001) A Framework for the Design Studio in Web-Based Education. This paper makes the claim of considering “…the sociological, ideological, epistemological and pedagogical aspects of a design studio…”. On detailed reading, however, the paper is a summary of some considerations with little in-depth literature referencing or context setting, and it has a particular studio case study to promote (the ‘Studio of the Future’). Practically, this is a case study paper and the points made are more teaching practice matters than an outline of a pedagogical framework.
The examples given are not intended to criticise these authors or works in isolation: their contribution to the domain is important and relevant. It is simply the fact that it takes time for cases to build up, scholarship to emerge, and theory to be developed in a new domain. Its absence in this early work is obvious in hindsight. It is only more recently that the community of design researchers has begun to apply more rigour to the theory as well as the methods in VDS research. The work in **Publication M**, for example, had the particular aim to develop theory and method in this way, which, in turn, can be applied in future research as well as design education practice. To achieve this, the work had to make use of general education theory and then adapt it to suit the specifics of a design education context.

This history of VDS use has left certain legacies to practitioners and researchers. The technical legacy has resulted in particular types of studio emerging, very often reflections of traditional and physical counterparts as well as directly influenced by emerging technologies (rather than driving them). The research legacy tends to provide an enculturated view of VDS through the lens of traditional studio teaching beliefs, as well as far more descriptive cases than tested ideas or theories. Finally, the theory legacy leaves researchers with only partial and untested ideas, hence no real theoretical basis or framework for education in a VDS, whether anterior to, or part of, a traditional studio.

Despite this, the use of virtual or augmented design studios is rapidly increasing (Arvola and Artman, 2008; Robbie and Zeeng, 2012; Rodriguez et al., 2018) and each approach is slightly different in terms of how it applies and makes use of the VDS. The lag in the emergence of research noted previously has led to certain key gaps in understanding. However, as noted, this is changing, with a renewed confidence in the research literature, community, and practice. This has been accelerated by the changes in practice in response to coronavirus
(Covid-19) in 2020 (Jones, 2021) and is reflected in the specific intersection of online and distance studio use in design education.

VDS and distance design education

As might be imagined, the very specific intersection of research into VDS in distance design education contexts has relatively few contributions in research, reflecting the historic rarity of this educational intersection. It may seem obvious that a distance curriculum will have a different approach to studio use when compared to traditional curricula, but this is an assumption rather than a matter of research or knowledge and is not necessarily borne out by evidence. Each of the augmented studios listed above, when looked at with hindsight, blur the boundaries of what is traditional and virtual in any studio context (distance or otherwise). It is the negotiation and experimentation around such boundaries (including what constituents are being bounded) that marks contemporary VDS practice and research.

One such contemporary model is to take an existing Virtual Learning Environment (VLE) and add a VDS to augment it. This is the model presented in Schnabel and Ham (2012), where the Deakin Studies Online VLE (an adapted Blackboard system (Blackboard, 2020)) is augmented using social media and communication tools (e.g. Ning, Facebook, Skype, etc.). This work is also an example of applying the findings to wider literature and theories (on social online learning in this case). A similar augmented VLE model is used by the OU, using a heavily customised Moodle VLE with a VDS as a plugin to this (Lotz et al., 2019).

A further extension of a social media augmented studio is given in Fotaris et al. (2015), which uses the DeviantArt platform as a repository type VDS and social media space. This approach is uniquely suited to
the distance graphic design course run by the authors, and the mode of study and learning outcomes visibly align with the outcomes expected in that subject domain. Again, the work presented goes beyond the story of only creating a new technology or VDS; it is a more mature study of student design practice in a blended learning environment and, importantly, within a design community.

A rare, specific example of a longitudinal study of distance curriculum is given by Lanig (2019), where a pedagogical theory of how learners progress in design education is also clearly articulated. In this work, the focus is not on the pitfalls, deficiencies or limitations of distance learning; neither is it on the technologies or mechanics that support it. Instead, it focuses simply on the student’s experience of moving from novice to expert regardless of mode of study. It is arguably the student journey that is brought together in the VLE in this example. Lanig’s findings present a subtle and nuanced view of contemporary design education, advocating strongly, and convincingly, for a focus on design competency and personality development in students.

At the other end of this student-centred scale are Massive Open Online Courses (MOOCs), of which there are a few notable examples. An early example is DS106: Digital Storytelling, which has been running for years as a sustainable, perpetuating community of student-practitioners (Groom, 2011). Here, the focus is almost entirely on the social constructivism that emerges from the community of learners that constitute it. Like the general design course at the OU, DS106 offers an opportunity to approach a subject, relying on the learner and community more than any extrinsic teaching curriculum. The major difference is in the overall structure and aim, which, for DS106 is very much an open-ended and undefined one. Both models have their particular benefits and challenges and balancing student-centred enquiry with guided learning is a particular challenge at a distance.
MOOCs are perhaps at the extreme end of the distance learning and proximity spectrum when it comes to design education since they rarely rely on any synchronous form of design expert contact with students. Hence the focus shifts entirely to learning experience and relies heavily on individual student motivation. Whilst some distance design curricula, such as the OU model, rely on specific methods to encourage student learning (such as assessment), many of these are not available or have limitations in a MOOC setting. For example, motivation through requiring assessment is unavailable or exists in some specific format to suit the mode, a well-recognised issue leading to issues around retention in general MOOCs (Pike and Gore, 2018). Hence, the results presented by Daalhuizen and Schoormans (2018) are an important contribution, in demonstrating a clear link between online learning material and initiating experiential learning, particularly as a practical step taken in understanding how (experiential) learning can take place at a distance in a particular context.

4.2 Contemporary and emerging VDS research

The examples of studio outlined in the previous section reveal a series of thematic directions in contemporary VDS research in distance design education. Three of these are now outlined, bringing the covering paper up to date with contemporary research, including the relation to the publications presented in this thesis.

Social learning

As noted in the history above, the evolution of the VDS took a strongly social turn very early in its development in response to learning and teaching need, and as soon as the technology could support it effectively. This reflects a recognition of the importance of social aspects of studio as well as the complexity of the conditions under
which effective social learning can take place. Recognising this importance is one thing, but a deeper understanding of such aspects requires an intersection of both traditional and virtual studio research, or some other closely related intersection of domains. Whilst the studio as a site of social interaction has been recognised as a necessary condition for collaboration (Broadfoot and Bennett, 2003), very little research literature goes quite so far as to require it as a necessary condition of design education. As noted previously, in Schön’s seminal work there is only a single reference to social learning and even this was peripheral to his focus on the expert-novice relationship. The work of Lave and Wenger, near contemporaries of Schön, argued for its centrality in both education and the creation of any learning community (see section 3.3), but this has never been fully translated to design education contexts or theory, except as extracts of their core concepts.

It is becoming clear, however, that social affordances, properties and matters in the studio are critical and central to their operation and what has been an under-represented area of research and study is now coming to the fore. Davies and Elmer (2001) identify the necessity of a social context for the materialisation of design ideas, linking these two key signature properties of studio. Other studies have demonstrated the meta-cognitive learning that can take place in a social studio, whether this is confirmatory and informal peer learning in the traditional setting (Ashton and Durling, 2016), semi-formal and subject-oriented peer learning in a VDS (Chiu, 2010), or the formation of character and personal attributes in a social setting (Richburg, 2013). More recently, the importance of social learning has been highlighted in studios transitioning to online and distance methods (Marshalsey and Sclater, 2020; Wragg, 2020). All of these studies highlight the centrality, even necessity, of social mechanisms in any design education studio.
Beyond the society of the studio itself, Richburg also points out that, as the subject of design expands and becomes more socially complex, there will be an inevitable impact on studio settings, if not pedagogy. This is a point made by Budge (2013), whose work demonstrates how the augmentation of physical studio using social media is a far richer part of the development of the practice of creative design itself, recognising that practice has incorporated social and mobile media for decades (Budge, 2013; Castro, 2019). By this view, the social is not simply an augmentation of practice, it is central to its formation and is often the context within which it operates: both are becoming ubiquitous in contemporary practice.

This interrelationship of both the practice and social aspects in studio are developed in Gray and Howard’s work (Gray and Howard, 2014; Gray, 2013), arguing the studio is a social habitus of practice (after Bourdieu (1977)). For Gray and Howard, informal social student relations are central to the construction of the habitus and, critically, are constructed by students in negotiation with the formal aspects of the curriculum, a finding partially repeated in Publication M. Hence it is not a simple case of the social learning informing practice or practice informing learning: rather it is the interaction (or co-creation) of both that may be a necessary condition for good studio learning to take place. Research into such informal peer critique has been extended into online studios (Fotaris et al., 2015) and in Publications G, K, and L, which all explore the importance of social mechanisms in VDS use, lining it to positive student outcomes. Publication M takes this a step further, making use of existing social learning theories from general education research and abductively developing an adapted theory of social learning to explain studio behaviours in a distance design education setting.
The arc of work in **Publications G, K, L, and M** presents an important contribution to VDS research and the social and affective properties that emerge in a distance setting. Firstly, it establishes a clear correlation between informal, peer-peer interactions in the VDS to student success. Secondly, it connects several social learning theories to explain the behaviour of students in a VDS: students use social comparison, then go on to engage in further ‘listening-in’, and as these become habitual actions, they develop and express social presence, which, in turn, can lead to communities of practice emerging. Finally, it suggests a further form of presence that emerges in distance and virtual settings: that of ‘design presence’. This is an extension of social, cognitive and possibly transactional presence (Armellini and De Stefani, 2016; Shin, 2003; Munro, 1991) but as expressed in a design context and as a design identity through design presence (**Publication M**). The notion of a design identity is one that will be familiar to design educators (Cheng, 1998), but performing this identity in a community of practice is what creates design presence.

This latter view of design presence relates to Davies and Elmer’s (2001) social construction of materiality: without the context of operation (the social studio), there can be no material articulation of ideas since their materiality depends on that very socius. This was a similar finding in **Publication D**, which evidences a social definition of creativity in design education, using the very large student cohorts studying *U101: Design Thinking* and, particularly, the paradigms and patterns of creative response that emerge in such a group. By this view, classically defined creativity through novelty or difference, was not necessarily a predictor of a ‘successful’ design outcome. Rather, it was a blend of competence, familiarity and connection: factors that can only arise within a social setting and as part of a process of design, leading to a ‘grammar’ of creativity (Figure 2).
The work in Publication D also identifies far broader social or even cultural overlaps operating in studio. The t-shirts, for example, are created in multiple social and cultural contexts with both informing the outcomes directly and indirectly, as identified by others. The idea that a studio is a culturally isolated place where only completely new ideas emerge is one fostered with the myth of creativity (Coyne, 1997), particularly noticeable with increasing use and ubiquity of new technologies embraced in practice studios (Budge, 2013; Castro, 2019). Beyond even cultural extensions of studio, issues of representation, inclusion and social sustainability are worth highlighting in terms of the potential of studio to adapt readily to different forms of inclusion (Sclater and Bolander, 2004; Boys, 2010).

The studio, then, has to be seen as a site of broader social relations as well as immediate ones. Such types, or scales, of social connection have to be considered when exploring cultural articulation and propagation in studio, in whatever mode a studio operates. As a further practice-based and distance example, the adoption of Building Information Modelling (BIM) in the architecture and construction industries in the UK still offers the potential for team cooperation and collaboration in shared digital environments and radical change to design and construction practices (Stothart and Wood, 2011; Chevin and Crotty, 2012). In order to achieve this, however, the cultural and
social dimensions of practice in the BIM environment must be taken into account (Chevin and Crotty, 2012; Linderoth, 2010) and, without a change to these cultures, no radical transformation is possible (Publication C). This is because any studio is necessarily a series of overlapping groupings (social, professional, ideological, etc.), their cultures all expressed by the artefacts, behaviours and interactions that one might see in any traditional setting. Indeed, as Publication C identified, in the online setting such cultures can even be exacerbated and ossified.

Beyond representation and propagation of culture, the studio is also one of the production of culture (Farias and Wilkie, 2016). Richburg (2013) observes that, as the subject of design expands it becomes more socially complex. McDonald and Michela (2019) go further and theorise the studio as the place of the production of ‘moral goods’, arguing these artefacts emerge from both students and tutors as part of the socio-complex that is studio practice. This latter view aligns with recent shifts in the subject domain of design (section 2.1), where a critical approach to the contexts of design (socius, habitus, culture) is argued to be necessary for a sustainable design culture to emerge (Boenhert et al., 2018).

Social factors in studio, then, are critical to how such studios operate. The ‘local’ social learning mechanisms and immediate studio socius have a direct effect on student experiences and success. Beyond the studio, social connections bring contexts and cultures into studio, a necessary part of enculturation and the emergence of individual studio communities. The studio is a milieu of such intersections and, critically, such social complexity is in evidence in all modes of studio (online, distance, distributed, blended, augmented, etc.). Indeed, it is very often in the transition from one mode to another that evidence of such complexities emerges (Jones, 2021).
The VDS is not enough

As is hopefully obvious from preceding sections, the studio is more than simply its physical components or behavioural interactions. In educational technology and research, there is often a tendency to focus only on the operational or technical aspects: the software, interface, functions, service, etc. and this often fails when it comes to VDS research. Just as the traditional studio is far more than the room, so too is the VDS much more than the technology. Even in simple translation or comparative studies, if the complexity of human interaction is distilled to some function or a single aspect of a system that is intended to support that interaction, then it very often misses the point of the underlying connections and their value. At the same time, the functional and operational aspects of the tools and services used (either through choice or otherwise) have to be taken into account. Doing this with a deeper understanding of studio as a socio-complex is argued to be necessary to avoid such ‘translation’ problems, as already outlined in Sclater and Lally (2016).

At a practical level, almost all contemporary VDSs sit within some broader learning context and these tend also to be digital or online platforms, or VLEs. The importance of integrating any studio into a VLE as part of the overall learning design is now being recognised as critical to successful online design education (Fleischmann, 2019; Afacan, 2016), perhaps best summarised by Power and Kannara (2016):

“In considering a blended learning best-practice model, three factors should be considered: the conscious and active human intervention, good learning design and pedagogical input, and the sensitive handling of the process by trained professionals.”

(Power and Kannara, 2016)
This finding was repeated in Publications L and M, noting that the data demonstrated far more complex student interactions than expected when considered only operationally. The persistence and type of student behaviour in a VDS as part of the course U101: Design Thinking requires a more comprehensive explanation of student motivations and social behaviours than can be provided by behavioural or transactional education theories.

Perhaps this result is unsurprising when we consider the complexity and plurality of the ‘object’ of study: a more appropriate metaphor for studio might be that of a learning ecology (Crick et al., 2007), where the system of deep engagement is central to the pedagogy (Crick, 2012). To give a practical example of this consider a further condition that Broadfoot and Bennett propose is necessary in creating an effective design education studio: that One-to-one dialogue between teacher and student is an essential component (Broadfoot and Bennett, 2003). In a distance setting this can be challenging and the VDS has to be able to support multiple functions and modes of communication to facilitate this, as clearly outlined by Maher et al. (2000). The VDS used in U101: Design Thinking centres around asynchronous and ‘semi-synchronous’ contact and communication: synchronous contact between students and tutors is provided by other software solutions. Similarly, assessment and a large proportion of student-tutor interaction takes place using yet other software and systems, such as the software and online systems associated with OU assessment (Publication E).

Hence, the online studio software on its own cannot be said to be ‘where’ all interaction and communication take place and cannot, therefore, be considered the whole studio. Its role in this broader conception of studio is a particular one: it may be a necessary condition, but it is not a sufficient one. In fact it is a range of services that support dialogue as a learning process in the extended VLE (Laurillard, 2013), hence the ecology analogy above.
As a further example, the ‘desk crit’ is another common activity in most studios – some would argue a signature pedagogy in design education in itself (Goldschmidt, 2002; Goldschmidt et al., 2010; Brandt et al., 2013). One way this is translated to the course *U101: Design Thinking* is through project assessment using concept mapping software to elicit and represent students’ design processes and thinking, as opposed to the final design outputs. The concept mapping software, CompendiumDS, supports this process by allowing students to spatially arrange their work and communicate a story of their process to tutors. In return, tutors can easily read this story and respond to students through feedback, focusing on the process, structures and relations, not just the content itself. As such it could be considered more of a dialogue between tutor and student than the traditional process of focusing only on the final design output ([Publication E](#)).

When combined with other affective modes of engagement, such dialogic approaches offer the potential of far greater presence and engagement between student and tutor at a distance. For example, research shows that audio feedback in a distance education setting can reduce ‘distance’ by increasing/improving presence (Dixon, 2015; Ice et al., 2007) and this has been extended to a design education setting, aligning with findings in other VDS case studies (e.g. Bender and Vredevoogd, 2006) and [Publication P](#) (In Press).

In any distance education setting, the fact that student and tutor are not proximate is an obvious and key difference to traditional design education settings. For institutions set up to explicitly teach at a distance, this difference is an obvious and central one, meaning effort is deliberately put into addressing these issues from the start. Increasing student and teacher presence as a proxy for physical proximity has been shown to be an effective teaching approach in a distance setting ([Publications E](#) and [F](#)). Critical to this, however, is the focus on the
underlying value and purpose in both modes: the dialogic connection and relationship between tutor and student is critical in both design (Broadfoot and Bennett, 2003) and general distance education (Laurillard, 2002).

In a traditional setting, then, the complexity of such dialogue seems simple because it can be seen as a ‘desk crit’ that takes place at a single point in time. Its complexity is essentially hidden because we do not have to question or isolate the full detail of human dialogue and interchange. In a distance or online setting, all aspects of interaction(s) are explicit and mediated in some way, meaning the complexity of dialogue has to be preserved or replaced in other ways. It is very often this type of replacement that is missing when traditional courses move to distance and online settings.

Hence, the studio presented in these examples depends on a milieu of online spaces, services, interactions, opportunities, activities, conversations, etc. – an ecology of learning that, like its traditional counterpart, allows the ‘right sorts of opportunities’ for students to learn. It is perhaps interesting to note that through investigation of what makes a virtual studio work, critical and previously hidden, aspects of traditional studios are being highlighted (Jones, 2021). Research into alternative studio education should not be considered as only an adjunct of traditional studio research but a potential contributor to that domain.

**Conceptual model of ‘studio’**

Comparing virtual to physical studios as contrasts or even opposites is quite common in the literature. Even the word virtual in VDS, as already pointed out, suggests an attitude to studio that considers one ‘real’ and the other not (Publication A and B). The consequences of such a priori
attitudes can be seen in some of the emerging research from 2020 that seek to ‘compare’ learning and teaching before and after the transition to distance modes. For example, the National Design Survey (Wright and Grover, 2020) presents results from a large survey that claims to compare physical studio teaching with remote learning but is in fact comparing recollections of studio with the emergency alternatives created in response to the 2020 pandemic, a pivot to modes of learning and teaching in a crisis setting. These and many other prior assumptions and attitudes towards online and distance settings are often unhelpful to understanding how learning takes place across modes of teaching.

There are perhaps more constructive ways to approach such dualities, not least those suggested and outlined towards the end of section 4.1. Theoretical conceptualisations of studio have almost all been based on describing existing practices, settings and situations and then extending this very slightly to some idea or theory. Hence, as can be seen from the preceding sections, frameworks and descriptive cases are more frequently found as opposed to any deeper theorisations of studio. This has had a limiting effect on what the literature has had say about the boundaries and extents of studio, with few authors going beyond the pragmatic or empirical.

Recently, however, this has started to change with work that attempts to consider studio using alternative conceptual frames and approaches. The works in Farías and Wilkie (2016), referred to throughout this covering paper, are examples of this shift, albeit still retaining a pragmatic approach to the object of study. Such approaches recognise the limitations in purely (theoretically) objective understandings of the pragmatic evidence and provide alternative interpretations, theorisations or even narratives. As a further example, the edited collection by Boddington and Boys (2012) reconsiders learning in terms
of space, a reframing that allows a broader range of ideas and approaches to be applied, expanding understanding conceptually as well as pragmatically or operationally. Moreover, framings in both examples are from a range of practitioners, educators and stakeholders, broadening intradisciplinary opportunities for enquiry.

I would argue that there is also value in a reconsideration of the studio along pragmatic lines that acknowledge and use theory in a more constructed (or even creative) way, and certainly in ways that relate more to the discipline on its own terms. An example of this is demonstrated in the work of Sclater, Lally, and Marshalsey applying Cultural Historical Activity Theory (CHAT) to design, studio, and other online and physical settings (Sclater and Lally, 2016; Sclater, 2016; Marshalsey and Sclater, 2018). This approach or framing is particularly relevant to design and studio research in terms of focusing on two specific matters, 1) human *enaction* and agency, and 2) artefacts and tools, providing some tangible ‘unit of analysis’ to study. This allows a more appropriate bridge between theory and research practice in a design education setting, such as studio. Critically, it allows such exploration regardless of mode of operation (physical, proximate, online, distributed, etc.).

Another example is work in the area of embodied cognition and conceptual metaphor is providing one ‘way in’ to such explorations in the work of researchers such as Plowright (2014, 2019), Malafouris (2012, 2013), and Jornet and Jahereie (2011). Using such approaches, *Publications A and B* identify that the success (or failure) of virtual studios is due to whether (or not) they successfully translate conceptual metaphors of traditional studios to their online equivalents, rather than simply copying superficial or behavioural characteristics. Conceptual metaphors represent an embodied (hence *experiential*) reality for users regardless of mode of experience. By using conceptual metaphors as
the translating 'language', a more experientially relevant comparison between traditional and virtual studios can be made.

Even in early VDS research work the utility of metaphor was recognised, such as that used by (Maher and Simoff, 1999) to articulate assumptions and properties of a range of VDS types. Publications A and B outline several examples of the use of conceptual metaphors as translations between physical and virtual spaces. As a simple example, the online studio used at the OU has a ‘Pinboard Area’ which is (obviously) not a real pinboard but which, as a conceptual metaphor, immediately declares its purpose and invites and frames certain actions on the part of students (Publications G, K, L).

Such direct use of metaphor has been understood in design education for some time (McGlone, 2007; Coyne et al., 1994) but its use to inform learning designs is more recent. Conceptual metaphors are valuable as ‘boundary objects’: “shared syntax or language for individuals to represent their knowledge across boundaries.” (Carlile, 2002, p. 451), which are known to be important in design collaboration (Di Marco et al., 2012) as well as in VDS settings (Abdellatif, 2012). Publication F takes this further and explores how narrative is informed by (and informs) the conceptions we create and put to use in an educational setting, this time using spatial forms of storytelling rather than metaphor. Common to both, however, is the communication of something richer than simply ideas: conceptions.

As noted, such works still begin with the studio as the object of study: a physical, historical and cultural entity that exists in a particular way and is the starting point for any enquiry. More recent reconceptualisations of studio have been realised by taking different starting points and then using these to explain or explore studio. For example, Ash (2016) makes use of the work of Sloterdijk (2011) to re-present the studio as
atmospheres, using the theory to tell stories around the empirical happenings. Such an approach is used in Publication H, which provides a theorisation and explanation for the conceptual metaphors used by people, particularly embodied cognitive metaphors so common in design and studio settings. By attempting to understand how we construct conceptions, particularly embodied cognitive conceptions, we gain insight into materiality and artefacts in design, their relation to human values (morals and ethics), as well as their operation in studio.

Even at a practical level, taking a conceptual approach to designing a VDS provides a way forward that avoids issues such as simplistic forms of ‘physical vs virtual’ comparison: for example, by focusing on object types that are common to both (values, ideas, concepts, etc.). Importantly, this is an approach that requires only the ability to conceptualise and articulate, something that domain experts in design have been doing for centuries and is evidenced in contemporary distance studios, whether this is the tacit transfer of detailed embodied tacit knowledge (Treadaway, 2009), using a ‘real virtual photography studio’ (Brown and Cruickshank, 2003) or the development of personal design competencies and agency (Duell et al., 2014).

The shift to exploring studios of any mode in terms of such richer conceptual metaphors potentially signals a change in direction for studio education research more generally. The core theories of studio have allowed us to make some progress but continually repeating them without updating them is no longer appropriate. The emerging approaches to studio indicate an exciting and emergent area of enquiry that will hopefully lead to new ideas around a very old practice.

The three themes of contemporary VDS research just outlined are examples only, chosen because of their relationship to the publications presented in this thesis. The scope of contemporary research is, of
course, much broader than this and is increasing rapidly as design educators explore the potential and boundaries of distance and online methods. What has hopefully been communicated is the attempt to contribute rigour as well as utility to such exploration, all with the overriding hope that the potential for learning is never missed.
05 SUMMARY OF PUBLICATIONS

This section provides summaries of each publication included in the portfolio of work (in PART 2: PUBLICATIONS). Citations were determined in February 2021 and numbers given do not include self-citations. Download figures are taken from publisher’s websites and/or Open Research Online (ORO), the OU’s online academic repository. The summaries are presented in order of publication date (oldest to newest) which also represents a sequence of work connected by my own research interests and academic development.

Conference papers are included in some of the publication summaries to demonstrate development between papers, usually as part of an arc of research. Dissemination through conferences remains common in design education, not least for the reasons outlined in section 3.3. All publications have been double blind reviewed.

5.1 Overarching themes

The publications have already been placed in their research contexts throughout chapters 03 and 04 and, in particular, in the context of VDS research in section 4.2) and this remains the most coherent ‘narrative’ that draws the publications together. There are, however, further common themes between the publications that are worth drawing out to demonstrate particular areas of interest.

Some of the publications have very clear themes or common objects of study. For example, there are two distinct subject themes around education and design cognition: Publications B, D, E, F, G, K, L, M and P all explore design education in one way or another; Publications A, B, C, H, and J, all explore how people think and conceive of design and the implications of this for theory and practice. Even further, some of these publications share specific, blended subject and
methodological approaches (Publications G, K, L, and M represent such an arc of work and demonstrate longitudinal research of a very focused set of research questions).

An alternative organisation divides the work into theoretical and empirical sets: the former represented by publications A, B, F, H. and the latter in publications D, E, G, K, L, M, and P. This arrangement is partially reflected in the thematic grouping in section 4.2, above, and is interesting from a methodological point of view.

But there is a broader theme, or possibly narrative, that brings the publications together, introduced at the start of this covering paper and a question that has not changed since my first publication (Publication A): How do people make sense of the world and how does that, in turn, change the world?

This is a question that is particularly suited to being explored by both design practice and research since it investigates the ‘messy space between people and things’ (Koskinen et al., 2011), an area of enquiry that remains difficult to study using single epistemologies or methodologies. Design as a process, or as objects, operates in this messy space and its ability to utilise forms of knowledge construction can be usefully applied in making sense of complexity (the emphasis here is critical in terms of the conscious selection of that which may have utility for a given enquiry).

Publications A, B, E, F, and H, all respond to this question directly. They do so mainly theoretically, using critical theory and the development of theoretical positions to develop thinking in this area. There is, however, a very pragmatic motivation: it has never been more important to understand how people come to understand, or even know, things as we confront multiple realities and truths across many domains in society.
The ‘messy spaces’ just referred to are the subject of study of the remaining publications: the online design studio. In this ‘odd lacuna’ (Farias and Wilkie, 2016), we see the full complexity of people interacting with, making sense of, and ultimately changing, the world around them. It is very far from an objective and straightforward process and Publications C, F, G, E, K, L, and M all represent studies of this complexity.

Which leads to a further thread that draws the work together: how online studio education has developed over the last 10 years to respond to research into such complexity. The publications demonstrate a wide range of individual research methods and (in some cases) methodologies (see Appendix A for the full list). Education, as a phenomenon, is a complex activity subject to many variables, conditions, properties, etc. (Cohen et al., 2011). Studio education is not only subject to such complexity, it makes direct use of it as part of its pedagogy, as has been outlined.

Hence the approach to the study of studio is critical in itself, and it is this that has developed most obviously throughout the publications as my experience and knowledge has changed. The breadth of methods demonstrated has allowed a more flexible approach to enquiry whilst still retaining the rigour specific to each. The value of this is perhaps best demonstrated in Publication M, which outlines the reasons as well as the supporting theory for the process of enquiry undertaken. In hindsight, it is particularly close to the approach of Lave and Wenger, who aimed to avoid the extremes of the particulars or generalities of educational case studies. Instead (referencing a Marxist approach) they advocate an exploration from a concrete ‘point of departure’ (Lave and Wenger, 1991, p. 33), an approach that finds resonances in other work and methods (e.g. Sclater and Lally, 2016; Marshalsey and Sclater, 2018)
This approach, arguably based on process rather than method, is one that has emerged in my own work as a whole: a pragmatic approach that recognises the necessary limits of education research for the reasons outlined, hence, its purpose shifts from finding purely objective ‘truth’ towards finding ‘best explanations’, particularly where these have utility and value, whether this is in ‘useful answers’ (Denscombe, 2008) or ‘useful frameworks’ (Kear, 2011). Hence, it becomes necessary to have a general knowledge of methods as well as the ability to assess the utility and suitability of these in a context of enquiry. Such abductive or embodied approaches are hardly new but there are increasing calls in contemporary literature for their broader use, such as the call for an ecology of evaluation from Fawns et al. (2020) or the more explicit methodological investigation of using a ‘both and’ approach to quantitative and qualitative data in Borrego et al. (2009).

In my own research, such approaches continue to evolve and develop. The position just outlined was generally developed throughout the publication listed but it was in Publication M that it came together as a methodology. As my knowledge has developed, my own ‘ways of knowing’ have also changed. Just as in the practice of design itself, it is this awareness of the conditions and competency of the process that is just as important as individual activity, something that is true at all levels of design education (Kimbell et al., 1996).
5.2 Publications A (and B): An alternative (to) reality


Publication A is a book chapter contribution introducing the edited volume *Understanding Learning in Virtual Worlds*, part of the Springer *Human Computer Interaction* series. The chapter is based on a single authored conference publication presented at the conference *ReLive 2011: Research Learning in Immersive Virtual Environments* (Jones, 2011). The chapter proposes that the *conceptions* (the emergent ideas users create) of either virtual or physical realities are at least as important as the *perceptions*. In particular, it argues that the reason we can use virtual worlds in particular ways is through the translation of conceptions of the physical world, applying them to the virtual.

The chapter compares and contrasts cases from virtual to physical spaces to show that common experiences and phenomena in both can be explained as shared conceptions: that the cognition and thinking involved in one is sufficiently similar to practically relate one to the other in a meaningful way.

The significant contribution of the chapter is the observation that, when designing or creating virtual learning environments, a superficial translation of properties is insufficient to explain peoples’ reactions and thereby their behaviours, including any successful learning outcomes. For example, recreating virtual university campuses alone is unlikely to generate behaviours observed in the physical campus. A better approach is to consider the translation of conceptions of environment...
and make direct and explicit use of these. This theoretical position is developed further in later work (Publications B, H, and M).

The chapter describes three case study examples of physical and virtual space designs that explicitly utilise conceptions in order to work. Two of these examples are educational: The OU course *U101: Design Thinking*, which uses the virtual design studio, OpenDesignStudio, as an alternative to a physical design studio; and the redesign of the Norwegian Museum of Science and Technology, which blended physical, virtual and conceptual elements to communicate certain core concepts in physics. The final case study example is based in the design practice outlined in Publication C around Building Information Modelling, where a shared digital model is shown to also represent a shared set of ideas. The publication concludes by providing some considerations for educators creating translations of learning environments of any kind.

This work was the basis for a follow-up conference paper, Publication B, presented at the 2013 LearnXdesign conference in Oslo, a DRS PedSIG conference (full submission, double blind peer review and track review). It is included here to demonstrate the development of the work and dissemination of the book chapter and ideas to a wider education audience.

Publication B develops one of the case studies in Publication A in greater detail, looking specifically at the conceptual metaphors used in the OU course *U101 Design Thinking*. For this Publication, the focus is more on communicating the central idea to other design educators, particularly recognising that conceptual transfer is regularly used by teachers of design, albeit rarely explicitly recognised or articulated. For example, in online environments we use conceptual transfers of ‘home’ page, spatial navigation to go ‘back’ and ‘forward’, or even the idea of online ‘rooms’, ‘forums’, or other spaces. The paper argues that these properties are rarely explicitly used beyond their initial application but
that by extending their use a more effective translation of the conception can take place. As the case study in Publication B demonstrated, this assists with orientation to the course conceptually and practically, both of which are necessary to support student engagement and persistence. Longer term, the paper hypothesises that this contributes to, or is a condition of, a shared vision within a community of learners, something necessary in the formation of a community of practice (Lave and Wenger, 1991).

Reception

I am the sole author of Publication A, which has a total of 15 citations in peer-reviewed journals, has been downloaded 1600 times from the publisher’s website, and 445 times from ORO. Publication B is co-authored (I am the first author, 60%) and has a total of 9 citations.

These citations mostly refer to the central concept of relating physical and virtual learning spaces using conceptions. For example, this citation in the Journal of Educational Technology:

While Pokemon GO aptly demonstrates that the distinction between ‘real’ and virtual spaces is disappearing, studies such as Jones’ reinforce that ‘virtual environments are [...] just as valid phenomenal conceptions as their physical counterparts’ (Jones et al., 2013a). (Pearson, 2019)

The majority of the other citations refer to the core concept as it relates to education in a range of learning design contexts, for example:

“As Jones (2011) suggests, learners have the ability to actively affect, alter and enhance the content of the virtual world in a manner that will enable them to construct their cognitive schemes and engage with the subject they study.” (Christopoulos et al., 2018)
The citations indicate that the central idea and its relevance to education technology research has had some contribution to this body of literature.
5.3 Publication C: Building Information Modelling Design Ecologies - A new model?


This Publication was written around the same time as Publication A and considers the use of Building Information Model(ling) (BIM) in the Architecture, Engineering, Construction and Operations (AECO) building industries in the UK. A BIM is a shared, digital model (data file) used by stakeholders in a construction project, allowing a single ‘place’ where the design, specification, construction management, and operation of a building can take place. More recently the concept has been rebranded as Digital Twin in the UK (NBS, 2018), but the concept remains the same: when a single point of information is created, accessed and used by multiple stakeholders, there is better access to data, hence a reduction in errors arising from distributed information sources as well as many other benefits (Stothart and Wood, 2011; Grilo and Jardim-Goncalves, 2010).

In order to achieve this, Publication C argues that social and cultural system changes are required in construction professions and institutions, not simply the adoption of new technology to apply existing processes, a view also iterated by the initial UK Government BIM Taskforce (Morrell, 2011). It goes on to introduce the idea of a design ecology, an embodiment of both the subject and process of design, applied across a series of scales of operation. The paper outlines four key affordances of a design ecology and how these positively align with the (then) emerging BIM process proposals.

Publication C uses case study examples to support each affordance by demonstrating how the cultural changes required in the AECO industries (raised by a series of critical reports over the past 4 decades)
could be initiated by adopting certain methods and processes uniquely supported in BIM approaches. The linking of these specific ideas across two very different domains was the major contribution of this publication.

The design ecology outlined in Publication C aligns with aspects of studio pedagogy and theory. Indeed, any BIM could be considered a studio in itself in terms of the interrelations between stakeholders (Grilo and Jardim-Goncalves, 2010) and the networks required (Linderoth, 2010). Whilst authors have considered the role and potential influence of BIM in education (Morton, 2012), few have yet written about adapting a BIM to educate directly.

Reception

I was the principal author of Publication C (80%) and it is published in the International Journal of 3D Information Modelling (now the International Journal of Digital Innovation in the Built Environment). It has no recorded citations in peer-reviewed journals but has nearly 600 downloads from ORO, the OU publications repository.
5.4 Publication D: Everyday creativity in design process


Creativity in education has its own body of work and sub-domain of knowledge, both theoretically and as applied in teaching practice. There is no agreed or formal definition of creativity and a number of different approaches and theoretical frameworks of creativity are available in different educational contexts. Coyne’s (1997) ‘definition’ of creativity as a ‘conceptual gestalt’ came from dissatisfaction with such variations in approach, arguing that creativity is more valuable as an applied (messy, human) concept rather than a well-defined and constrained set of properties. This more constructivist approach to creativity was the starting point for the research in Publication D.

The context of the study is the OU course U101: Design Thinking and particularly OpenDesignStudio (ODS), the online studio used by students. The course is based on the idea that anyone can ‘learn’ to be a creative thinker and designer, a position taken towards design education in the inception of the University and still firmly applied today (see chapter 02). In wider creativity research the idea of being able to develop creativity in students, as opposed to some innate personal property, is a recognised position, albeit a relatively recent one in the literature (Craft, 2001).

A particular distinction outlined in Publication D is that, instead of emphasising individual or ‘natural’ creativity, the social and developmental properties of creativity in people should not be ignored. This is particularly important in education where it is teacher belief that very often informs approaches to learning and teaching around creativity (Bereczki and Kárpáti, 2018), and especially creativity as applied in art and design education (Cheung and Leung, 2013).
Similarly, something a student produces may not be universally novel (sometimes referred to Big C Creativity) but can still be novel to the individual (referred to as small-c creativity). This latter novelty is particularly useful in (personal) learning when applied appropriately. One way to promote and foster this, as outlined in chapter 03, is through design methods: how the outcomes from these methods are used both personally and in an external (social) context, such as a VDS, relies on a blend of personal and social ideas of creativity.

The Publication tests these assumptions by analysing student output from the first design project in the entry level design course *U101: Design Thinking*. This project requires students to design and make a t-shirt, using a step-by-step design process whilst also engaging with others in the virtual studio, ODS. This is an early example of work exploring a theoretical position by empirically analysing student work in ODS. The method used is a form of Consensual Assessment Technique (CAT) (Baer and McKool, 2009) using two reviewers (myself and the co-author), both familiar with the course and student work. Over 1,000 t-shirts were rated independently and tested statistically for inter-rater reliability and consistency.

The results show that, whilst there is a strong dependence on existing t-shirt forms and visual language, this does not fully explain either the grammar used or the rating results. A t-shirt judged creative was just as likely to use ‘average’ grammar as it was a divergent one. Similarly, a creative t-shirt could arise equally from common content themes emerging from the student cohort, as well as divergent themes.

These results support the theoretical position outlined above. Firstly, that there emerges, in a cohort of students, a shared idea of what is and is not creative. This is informed by existing creative grammars around the product being designed and also created by (or within) the student cohort itself – a socially constructed ‘grammar of creative output’. Secondly, that the design method and process students employ also
contributes to the creativity of the outputs by providing a common ‘grammar of creation’ (of process, not product).

These findings demonstrate that a design method approach, applied in conjunction with an explicitly socially constructivist model of creativity, can contribute to the development of creative design thinking in a cohort of novice design students at a distance. In effect, we see evidence of the “…process of distributed creation…” referred to in Farias and Wilkie (2016), albeit in a virtual rather than physical space. This result contributes to the understanding of how distance design education can work and is the significant contribution of this work. It provides an empirical and replicable method for follow up studies to efficiently assess large volumes of student work and apply analysis within a particular theoretical framework to test social creativity in a community of design learning.

Reception

Publication D was an invited contribution to the journal Art, Design & Communication in Higher Education, a key journal for design education, with a self-reported impact factor of 0.85 (2018) and Google Scholar h5 of 12.0 (2018). I was the second author of Publication D (40%) and it has 4 citations in peer-reviewed journals all referring to it as a contribution to the overall body of work on creativity in education, for example around the construction of creativity as a concept:

“…the dispute and arguments around the construct of creativity and its models (Lloyd and Jones, 2013; Welch and Loy, 2013; Wong and Siu, 2012; Wagner, 2009; Dineen and Collins, 2005).” (Sharman, 2018)

Publication D has been downloaded over 800 times from ORO and the conference item over 500 times.
5.5 Publication E: Reading students’ minds


Publication E continues the exploration sharing design ideas and conceptions at a distance. It also considers how this sharing addresses a key challenge in design education around distance and presence, that simply not being physically proximate precludes certain teaching and learning (see section 3.3 and 3.6). Exploring this topic also responds to the problem of how, in design education, we objectively assess what is usually considered to be a subjective knowledge domain (as outlined in section 2.1). The paper presents two contradictions in design research and design education, arguing, using case study examples, that each could be explored meaningfully using distance design education contexts.

The first contradiction emerges around teaching a subject that requires students to engage in uncertainty and ambiguity, rather than the (apparent) certainty of other subject domains. In education these tensions often reflect wider differences in belief around the social (or political) purpose of education as a system and, particularly, how this should influence approaches to learning and teaching itself (Gleeson and Ó Donnabháin, 2009 p. 27). I argue that distance design education at the OU is almost unique in its ability to transcend such tensions and that it can “achieve a balance between process and product, between responsive and contractual accountability and between individual and system outcomes” (Publication E).

The paper demonstrated this by describing how the administration and organisation of design education at scale at The Open University (thousands of students) is linked systemically to individual, meaningful student learning experiences. In other words, that it was entirely
possible to retain a student-centred, experiential learning approach whilst still achieving objective rigour and at scale.

The second contradiction concerned the difficulties in trying to research any design process by observing what designers do because it’s hard to tell what is actually going on through observation alone. In Lawson’s words: “there is not a lot of action to be seen and what is there cannot be readily understood” (Lawson, 2005 p.216). Many methods have been developed in design research to get over this problem, but **Publication E** is the first publication to report the use of a concept mapping tool to observe the process of design students as well as their outputs at the same time. In most research studios the processes and outputs are captured separately (e.g. through diaries or design journals with separate design presentation outputs) and this often reflects difficulties in representing the subtler interplay between process and output.

In response to this challenge, **Publication E** presented case study analyses of student submitted assessments using CompendiumDS, concept mapping software developed at The Open University for the module **U101: Design Thinking**. The current version of this software was developed at the OU by a team led by me ([http://www.open.ac.uk/blogs/design/learning-teaching/compendiumds/](http://www.open.ac.uk/blogs/design/learning-teaching/compendiumds/)). CompendiumDS allows students to represent a wide range of digital artefacts (images, text, web links) spatially on a blank ‘canvas’, in a similar way to a mind map but with greater freedom to construct map shapes. Students can create entities that represent thoughts, research, sketches, ideas, design activities which then are related to demonstrate design thinking and processes, such as collations, decision-making, idea creation, evaluation, etc.
The paper argued that the maps produced by students in CompendiumDS represent and reveal interrelations between design artefacts and process and that this, in turn, raises students’ awareness of both ‘scales’ of design activity, as well as providing key insights to tutors for assessment and feedback. In some way, CompendiumDS allows tutors to ‘see’ students’ thinking and design process: not just what they did, but why and how this contributed to their design process. In design education such points of contact between student and tutor are important in establishing and developing relationships; in distance design education they are absolutely critical to support the tutor-student dialogue necessary for effective studio education (Broadfoot and Bennett, 2003), as outlined in chapter 03.

As noted, Publication E presented cases that demonstrate the scalable and student-centred nature of assessment at the OU (UK) using CompendiumDS as the vehicle for assessment. Furthermore, it argued that some of the mechanisms established at the OU to address distance learning challenges could be unique solutions to the general difficulty of not being able to ‘see’ the design process in other domains of design education.

Aspects of the work have been presented internationally and at national levels in Chile and India to both the Chilean Department for Education and the Indian Design Council (IDC) and National Institute of Design in India.

Reception

The Publication was an invited contribution to the International Journal of Learning Designs (JLD), an Open Access journal run by the University of Queensland, Australia. The journal is no longer in publication and this Publication has no record of citations as a result of this. Publication E has been downloaded from ORO nearly 500 times.
CompendiumDS and the scholarship in Publication E won the eAssessment Scotland Conference 2016 Digital Innovation award.
5.6 Publication F: Reflection-in-Action and Motivated Reasoning


**Publication F** is a conference paper included because of its relationship to **Publication E** and the fact that it shows the progression of my work into how ideas (conceptions) are shared between student and tutor in distance education. The study focuses on the self-reflective text students produce as part of their project assessments for the course *U101: Design Thinking*, a critical part of the overall learning design and central to tuition in distance design at the OU.

The starting point is premised on the work of Hastorf and Catril (1954) on the subjectivity and unreliability of human experience as an impartially accurate report of events. The Publication supposes that the subjectivity involved in reporting any design process, and especially student reflection, should not be treated as an objective or accurate record of events since it is significantly affected by two biases: students’ own perceptions of their realities (the stories they tell themselves) and their expectations of tutor expectation (the stories students think tutors want to hear). These biases are argued to form a shared conception constructed by both students and tutors.

**Publication F** attempts an empirical test of alternative explanatory models of reflection to sketch a proof by contradiction. The methodology uses a coding of student submitted work on the basis of forms and structures of writing around topics, not explicit content. The themes levels of complexity in the forms or structures of reflective writing, ranging from simple (single statements), justified (a statement with explanation/justification), and fully reflective (a statement with
explanation/justification applied to a situation or context). This then allows a simplified coding and counting of reflection statement structures which can be compared to outcomes and development over time.

The results show that there is a strong, positive correlation between the level of structure in student statements and student success. Moreover, a further test looking at the change of these over time demonstrates a further, positive correlation between changes (complexity) in structure and improvements in student attainment.

The theoretical background in the paper identifies two critical problems with self-reflection in both theory and practice: firstly, the assumption that some objective truth is available to reflect on, and, secondly, that our thinking is itself a ‘thing’ that can be made use of directly. This is particularly relevant and important since one of the core theoretical ideas in design education is Donald Schön’s work in reflective practice (Schön, 1987, 1991; Waks, 2001). This early work is still regularly cited and referenced but is rarely challenged critically (Jordan and Laureline, 2018), despite existing criticisms of the work and its use (Mewburn, 2011; Webster, 2004, 2008).

**Publication F** contributes to these criticisms by demonstrating that alternative models of reflection can produce the positive results demonstrated in other work. It argues that what may be more important is not the objective truth of reflection but the process of reflection itself and how the shared ‘story’ constructed between student and tutor is analogous to the shared design conception created between designer and audience. This conception sharing is proposed to be a more useful mechanism in design education, particularly at a distance.

The results presented are partially complete because a larger sample size is needed to validate the initial results. The theoretical background and argument remain academically sound, however, and the criticisms
of reflection are valid and remain unanswered. The centrality of these theories to design pedagogy mean that this is important work to complete or build on in the future.

Reception

Publication F has no formal citations (DRS Proceedings have not been listed in academic databases until very recently), however, it is one of the most downloaded Publications on ORO, with nearly 3,000 downloads.
5.7 Publication H: Embodied Cognitive Ecosophies


Publication H is the most academically and technically challenging paper in this collection, dealing with a topic normally considered in the disciplines of social geography and philosophy. It does, however, use a pragmatic approach to ‘redesign’ the theoretical concepts it addresses and has been included because it has contributed significantly to my work in distance design education and from there to the overall theme of how people make sense of the world.

The paper updates the theory of ecosophy (ecological philosophy), by applying ideas from the field of embodied cognition and, in particular, forms of extended cognition (Wilson, 2002; Malafouris, 2013). As a simple example, the value of extended cognition in physical studio settings is well recognised in design (Williams, 2013) but its importance in education is often overlooked in institutions where spatial requirements are considered only operationally or functionally and modes of teaching that require less space are often preferred (Radzikowska et al., 2019).

In addition to extended cognition, embodied cognition is a theory and body of work that can be used to explain the means by which people share concepts. For example, it can be used to explain how we translate concepts from physical to virtual environments (Velmans, 1998), and in particular in virtual design studios as outlined in my own work in Publications A and B (and, to a lesser degree, the work in Publications E, F and P).

Publication H considers the history of ecosophy, a theory developed (or more accurately a theoretical position taken) independently by Arno
Næss and Felix Guattari in the 1970s. Ecosophy originally aimed to present an alternative form of approaching the general science of ecology, one that questions the anthropocentricity assumed in all ecological models and, more relevantly, requires that any model acknowledges ethical or moral matters.

The publication uses a critical reading and comparison of both Næss’ and Guattari’s formulations of ecosophy and reviews contemporary criticisms to construct an updated version that 1) removes the need for *a priori* values and 2) uses empirical aspects of embodied cognition to explain how such values emerge ‘naturally’ in an ecosophy. This first point has been the classical criticism of ecosophy, one that is difficult to defend if the theory is constructed without recognising and then addressing these values. *Publication H* presents a way of achieving this by using embodied cognition to show how values necessarily emerge in any constructed idea. Hence, rather than values (ethics, morality, or any other preferential position) being a contribution to an ecosophy, they are actually part of the structure itself.

What becomes more relevant by this argument is how people respond to such values; how we select, apply, work with, or ignore values and these become the elements that ‘make’ the ecosophy. This is where the practical aspects of the theory apply pragmatically to both design and design education: that learning to work with implicit (or ‘invisible’) values in any design context is a valuable professional and educational design ability. This argument builds on and aligns with other recent work in design philosophy, such as Latour’s matters of concern (Latour, 2007, 2008); Sloterdijk’s theory of volumes of interaction (Sloterdijk, 2011).

**Reception**

*Publication H* was an invited contribution to a special issue on Ecosophy in *Geografiska Annaler: Series B, Human Geography*, the
Swedish Geographic Society’s journal on human geography. This is an internationally recognised journal in the area of human geographies with a self-reported impact factor of 0.5 (in 2018).

The Publication has been cited 9 times in peer-reviewed journals or books. These citations generally situate the work in the wider body of work on embodied cognition and/or spatial geographies, suggesting it has made some reasonably accepted contribution to this area overall. So far, all citations have accepted the arguments presented and referred to the paper supporting the general literature and growing body of work exploring embodied cognition, for example:

*However, more recent research showed that there is more behind human actions than this simple one-way relationship between thoughts and the body, which was traditionally reduced to a sole executional tool of our mind (D. Jones, 2017). (Schnack, 2020)*

And one paper refers to the theory itself and suggests an extension to it:

*Expanded listening could be considered as a form of embodied cognitive ecosophy (Jones 2017), meaning that the affective–cognitive perception of sound is a product of ongoing flows between mind, body, and environment. (Paiva et al., 2018)*

This paper remains a unique contribution to the philosophy of embodied cognition and ecosophy. Despite being purely theoretical, it is based on pragmatic approaches and methods which are themselves directly applicable to design and design research. The next steps for work in this area is to produce testable hypotheses and experimental setups to consider the value of the theory in applied contexts. For example, similar research in marketing design research (Dahl, 2011), architecture (Perez-Gomez, 1987; Evans, 1992; Downing et al., 2008) and especially its relation to virtual learning environments such as VDS.
5.8 Publications G, K, and L


Publications G, K, and L are related conference papers included because they represent the outputs from a longitudinal piece of work, the Are We Making Progress? (AWMP) project. This was an OU eSTEeM funded project looking at student activity in OpenStudio across all courses in the Design and Innovation qualification and at all study levels. The project was a team collaboration with colleagues in the OU Design Group, Nicole Lotz and Georgy Holden, both experienced design educators and researchers. The publications present results from the AWMP project at different stages and presented at design education conferences to allow feedback on the work as well as a wider dissemination to the international design education community.

Publication G focuses on a single student cohort of the module U101: Design Thinking and sets up the methodological and analytical protocols used throughout the AWMP Project. It presents early statistical results testing correlations of student online behaviours (activity in the online studio ODS) to success (module and qualification results), as well as identifying testable conjectures for future work in the project. Publication G uses descriptive and inferential statistics (Pearson Product Moment of Correlation) to identify positive correlations between ODS activity measures and student success.
A critical finding is the strong correlation between students viewing work in ODS and then actively commenting on that work. This link established a direct, measurable benefit to using ODS by linking learning design to student behaviour and this, in turn, to student success. **Publication G**, alongside K, L, M, remain the only study of its kind (at the time of writing) to outline a replicable protocol and test that demonstrates a measurable correlation between learning design and student outcome in an online studio.

The publication also outlines difficulties in using purely statistical methods to make claims of large data sets. For example, **Publication G** hypothesised a possible S-curve correlation by dividing the student population into quartiles which would have confirmed an early theory of interaction. This was subsequently demonstrated not to hold true when repeated in **publications K** and **L** with a larger and wider student sample, an important negative result added to the literature.

**Publication K** extends and develops the work in **Publication G** to five course presentations (sample size of 1,171 students) and the full results of the quantitative analyses repeated and extended: descriptive and inferential statistics (Pearson Product Moment of Correlation and Spearman Rank Correlation). These demonstrate the lack of statistically significant links between many behaviour measures and student success, a disappointing but still important result to report. The surprise finding in this paper is that a ‘passive’ student behaviour (viewing other students’ work) is the single strongest behavioural correlation to student success. As with **publication G**, a list of teacher-focused recommendations is provided in conclusion to the work.

**Publication L** considers the qualitative aspects of student engagement by analysing student content. In particular it asks what sort of work students paid attention to and whether this differed from the type of work design ‘experts’ (tutors) would pay attention to. To respond to this question a Consensual Assessment Technique (CAT) compares
student and expert responses to selected work. As with Publication K, the surprise finding is that this did differ and that a far more complex explanation of student behaviour is required to explain the results.

This series of publications contribute directly to the general body of research into distance design education and virtual design studio pedagogy by providing findings and results supported by empirical evidence. The findings respond directly to questions around student activity in distance and online learning settings, outlining several factors that can be correlated to student success. These factors were finally applied to develop a theoretical framework in Publication M and respond to the general question ‘How do students learn design at a distance?’

These publications also support a contribution that applies a rigorous research paradigm, influenced directly by mainstream education research and the culture of distance education research at the OU (UK). By clearly setting out and articulating the approach and methodologies, the work assists replicability, critical interrogation, and even reinterpretation of results, a vital contribution to respond to the criticisms of design education research outlined in chapter 03. Without this rigour, the iteration of testing and analysis between papers would not have been possible.

Reception

Publications G, K, and L are published in the conference proceedings of either the Design Research Society or Learn X Design conference series. Publication G (40% contribution) has been cited 7 times, Publications K (60% contribution) three times and Publication L (40% contribution) twice. Most citations refer to the general contribution the publications make to distance education, for example findings around communities of practice, social learning at a distance, or as a study of
VDS use at a distance. Other citations relate to specific findings or observations, for example:

“Students become more self-reliant when it comes to developing their own expertise if an expert is not available in the studio for immediate feedback (Lotz, Jones, & Holden, 2015).” (Fleischmann, 2019)

The work in these publications continue to have a further practical impact on learning design at the OU. As part of work to develop OpenDesignStudio version 2, the findings have been disseminated across the University as part of training the teaching applications of ODS.
5.9 Publication M: A longitudinal study of Virtual Design Studio (VDS) use in STEM distance design education.


Publication M presents final and complete results from the Are We Making Progress (AWMP) project and uses these to develop a theoretical basis to explain the findings. This was a large piece of work containing a number of individual and important findings that has an impact on research in this area in several ways.

Firstly, it confirms the previous finding that social comparison (and possibly legitimate peripheral learning) is correlated to student success. That is, students looking at other students’ work in ODS is the single strongest single factor correlation to success measures. This is closely followed by commenting on other students’ work and then their own work (most often in response to other student comments). Evidencing this simple action and benefit of viewing and then ‘progressing’ to interacting with other students remains a critical finding in distance design education.

Secondly, it confirmed empirically higher than expected levels of social comparison activity and behaviour. Students compare in order to check their existing progress and ability as well as a means to confirm their creative work, a finding that supports some of the results in Publication D. This could be considered a necessary first step towards, or as a contribution to, a community of practice.

Thirdly, that if this initial social comparison is not aligned to students’ own motivations for learning (personal or by subject), then engagement can drop sharply and not recover, as identified in higher stages of study in the project. However, if the connection between engagement and
personal values can be made, then social engagement habits emerge and these can lead to sustained personal and social behaviours, associated with positive design outcomes.

Fourthly, the Publication argues that central to achieving the above is the development of online, social and cognitive presence. The Publication demonstrates that social presence best fits the results presented, aligning with other work around higher order learning (e.g. Schnabel and Ham, 2012; Sidawi, 2012), but that this alone does not fully explain the full range of behaviours observed. It also hypothesises the existence of ‘design presence’ as a further form of general presence theory; whereby the expression and articulation of a student’s identity as a designer that creates this type of presence. Such presence, in turn, links to the development of a ‘design personality’, another core competency in the development of design students (Lanig, 2019).

**Publication M** is almost unique in distance design education research in that it presents a longitudinal, large-scale, triangulated study of student behaviour in a VDS based on both quantitative and qualitative empirical evidence. There have been calls for this type of research in other Publications (Broadfoot and Bennett, 2003; Saghafi et al., 2012; Karabulut-Ilgu et al., 2018) and the study’s large sample size, time period and methodology are unique and significant contributions.

The results provide practical lessons for design educators around supporting communities in design education contexts (both distance and traditional) in terms of activity design, functions that support (or inhibit) student engagement, and how the results align with theories in distance and design pedagogy, such as confirming that ‘listening in’ can take place.

The Publication ends by presenting a rigorous and comprehensive theoretical model to explain the empirical findings. The theoretical work itself took almost a year to complete and, with the quantitative work and
analysis, is a significant contribution of the paper. It explains the findings using a series of socially constructivist theories of learning that fit together to form a developmental model of socially-oriented design learning.

In summary, the model works as follows. Students engage in simple social comparison (Gilbert et al., 1995; Festinger, 1954) during the initial stages of VDS use by seeing others’ work and comparing their own to it. Small lessons are learned and deemed valuable enough to continue this behaviour, hence the exceptionally high sustained rates of use, a behaviour observed in other VDS uses (Thomas et al., 2016). This sustained behaviour is analogous to listening-in (Cennamo and Brandt, 2012), the design education equivalent of early stages of legitimate peripheral participation (Lave and Wenger, 1991). Continued interaction leads to (and/or depends on) the development of social and cognitive presence (Gunawardena and Zittle, 1997; Munro, 1991; Short et al., 1976), again, as has been observed in other distance education research (Kear, 2011). Over longer periods of time, this can lead to emergence of Communities of Practice. Such communities necessarily depend on the social setting and emerge around stable core networks, supporting a number of Lave and Wenger’s contentions (Lave and Wenger, 1991).

The work also demonstrates that rigour and empirical approaches alone are insufficient when exploring design education research without the qualitative stories to make sense of these results and explain the full experience of being (or becoming) a designer. Methodologically, an abductive process was necessary to adapt and re-apply existing learning theories to the evidence and as noted, this was a challenging and time-consuming process, necessary to ensure the rigour and competence of the results. The outcome is an updated social theory of learning in a distance design education setting. It also presents a
starting point for future research to confirm the results presented and build on (or adapt) them in similar VDS settings.

Reception

Publication M was published in the International Journal of Technology and Design Education, one of a few key design education research journals. IJTDE has a self-reported impact factor of 1.34. My contribution to the paper was lead author (70%), in particular the statistical work and developing the final adapted social learning theory. This paper has only recently been published and has been cited four times and downloaded 126 times from ORO.

These citations refer to Publication M as part of a literature review in education or virtual design studios and, as with the other papers in this arc of work, as part of a general contribution to this body of knowledge. or as a case study reference of an online studio. Many of the citations also specifically note the innovation or novelty of the VDS, for example:

“Innovative models for virtual studio learning have been developed by Pektas (2015) and Jones et al. (2020).” (Marshalsey and Sclater, 2020)

The subject of this paper, studio-based teaching at a distance in ODS, was included in The Open University’s Institute of Educational Technology Innovating Pedagogy series (Ferguson et al., 2019).

Beyond academic reception the other main use of this work is in informing future scholarship and learning design at the OU. In particular, the work on social learning and how technologies support this (or fail to) will have the greatest direct impact, especially when applied to designing learning across levels of study and how this can be developed over time.
5.10 Other publications and impact

The following outputs are not included as part of the formal list of accompanying Publications since they are either less immediately relevant to the core theme. They are included to demonstrate a more general range of dissemination and extended scholarly work.

BITE Books


The BITE books are part of a series of academic works created by Judy Robertson, Alison Williams, and myself. The idea behind the series was to provide academic content to as wide an audience as possible that also engages that audience in a challenging and active way, as set out by the BITE values:

- **Knowledgeable**: Academic integrity is central to our work; it underpins everything we do and present. We are open to alternative ideas and notions of integrity and welcome challenges and discussions to what is accepted (and acceptable) knowledge. BITE will only ever present work that has been nibbled on by a suitable editorial team.

- **Useful**: The outcome of a BITE project has to have utility, whether this is accessibility of ideas or guides on how ideas can be put into practice. To have utility an idea has to be easily transferred and owned by the person receiving it, such that it becomes their idea. BITE also has to be openly available as widely as possible and certainly to those who may benefit most from it.

- **BITEy**: BITE projects have an edge to them that seeks to go
beyond simply informing or presenting. BITE recognises that ideas only exist in people's' minds and working with ideas involves challenging thinking. This is difficult for many people and being BITEy means giving many opportunities to engage with challenging ideas at different comfort levels.

The BITE: series is as much a process of writing and editing as a series of outputs. Each book is its own project that the editorial team manages and develops through workshops, activities, soliciting work, writing, editing, and generally responding to the volume as if it were any other research project, albeit with a different output.

The recipe format came from a workshop I was invited to run to initiate the project and was initially based on the theory of pattern language (Alexander, 1996; Alexander et al., 1977) and the practice of pattern shepherding (Mor et al., 2012; Harrison, 1999). The recipe idea was based on my own work (at that time) on conception and the easy transfer of sticky concepts. Recipes work because everyone understands them in their own way, they can contain a number of types of knowledge, and they depend on an applied context to bring them to 'life' (Jones, 2014a).

The first book, BITE: Recipes for Remarkable Research, provided recipes for people working in (and with) research environments and contexts to engender greater creativity. These recipes ranged from the very practical (e.g. tips on organising workflow and space) to the personal (e.g. priming and developing creative thinking) to the administrative and entertaining (e.g. a recipe on how to completely destroy creativity in an organisation).

The second book, EqualBITE: Gender Equality in Higher Education, focused on issues, stories and projects at the University of Edinburgh around issues of gender in HE. As with the first book, recipes ranged from academic pieces on bias, gender, and workplace; to shared stories
with research-informed actions that anyone can take; to strategic and institutional recipes on how to ask for toilets and how to act as an academic beacon for issues around gender. The second BITE book has sold nearly 500 copies and is still given to new members of staff at the University of Edinburgh as part of their induction process.

Creating Distance Design Courses Guide


I started the #DistanceDesignEducation blog (https://distancedesigneducation.com/) in response to the Covid-19 crisis in 2020 and to support design educators transitioning their teaching to online and distance modes very quickly. It began using recipes, based on the BITE book series, and accessible articles to share OU Design Group experience and practice in teaching design at a distance and online, as well as organise and host Meetups to allow colleagues to discuss and share ideas and concerns. The positive response and uptake led to contributions from a range of practitioners and educators from around the world.

Since then, it has adapted to support colleagues beyond the initial urgency of pivoting online to supporting colleagues planning curricula and learning designs. The transition from ‘emergency’ to planned curriculum that took place led to the creation of The Guide for Creating Distance Design Courses. It was aimed at teachers needing some way to organise and plan curricula, not simply react to change. Writing it highlighted many of the tacit and implicit assumptions we all make about the practice of design education in any mode. The Guide has been downloaded over 2,000 times and is currently being translated into Spanish.
Report: India Report and impact


I have been involved in the development of design education capacity in India for a number of years, starting with an invited colloquium and workshop work at the Designing Design Education India Conference in Pune, India in 2013, organised by the Indian Design Council (IDC) and National Institute of Design (NID) in Pune. In 2018 I returned to work with the IDC and NID once again as part of a larger UK team chaired by Anne Boddington.

My contribution focused on design education institutes in Delhi as well as the design and facilitation of a three-day consultation event and workshop. This resulted in the publication of Article D, The Future of Design Education, (Boddington et al., 2018). On a more practical level, it also led to setting up a social media group for Design Educators India, which is now one of the largest social groups for design educators in the world. I remain in contact with many of the members and have continued to work with them in more recent networks and events. My research has informed all aspects of this work and in particular how design education can be scaled without losing its value and how this can be extended online (especially in Publications A, B, E, F, M, P and Q).

Impact B: Technology Enhanced Learning Software

I have been involved in the development of several key pieces of learning technology at the OU and, in particular in online design development with different colleagues and teams. Two of these have been referred to a number of times in the covering paper: CompendiumDS and OpenDesignStudio.
CompendiumDS (Figure 3) is concept mapping software first developed by the Knowledge Media Institute (KMI) at the OU and repurposed for design project assessment for the module *U101: Design Thinking* in 2010. My work in *Publications E* and *F* is based on use of this software and its use in assessment and student-tutor contact. This, in turn, informed my work in *Publications H* and *J*. The work outlined in *Publication E* and the scholarship from this won a Scottish eAssessment Digital Innovation Award in 2016.

*Figure 3 Screen capture of CompendiumDS, concept mapping software used in OU design modules*

OpenDesignStudio is the main virtual studio used at the OU and I was the lead academic for the development of version 2 (Figure 4). ODS is now used in over 60 modules across all subject areas at the OU and will be trialled in external UK universities in 2020. The unique knowledge we have of this tool arises from the OU’s approach to research, scholarship and teaching all interacting to support each activity – a ‘virtuous cycle’ of knowledge acquisition, enquiry, and application. This cycle was central to the in *Publications G, K, L*, and *M*, which studied the use of ODS and its relationship to student learning and outcomes. It also supported the work in *Publications A* and *D*. 
Figure 4 Screen capture of OpenStudio, the VDS used in OU design modules
6.1 Research questions

The general question introduced in this covering paper, *How does distance design education work?* like any design problem or broad academic question, has not been solved or answered completely. However, some progress has hopefully been identified throughout the covering paper and publications, particularly in response to the particular questions outlined in chapter 02.

1. *What research and knowledge supports understandings of studio, its application(s) in teaching, and its role in supporting effective distance design education and student learning?*

The covering paper has outlined generally how some of the core theories in design education have influenced contemporary design research and teaching practice, which, in turn, continues to influence distance design education and VDS use. It has shown that these signal a relatively young discipline that is, at the same time, very old in other ways: young in terms of articulating its knowledges in an academic form and context; old in the sense of holding and creating knowledge as an embodied, tacit, and specific form of knowing for some time. The contemporary challenge for design researchers is at least partly how to articulate this knowledge in ways that are academically rigorous but also do so in a disciplinary way; a designerly way.

1.1. *What theories and practices underpin studio use in distance design education and what evidence is there to support these?*

The core theories outlined in chapter 03 still remain highly cited and influential across the discipline, however, trends and shifts in these have also been highlighted, suggesting a move beyond these to further nuanced understandings of studio. Chapter 04 also highlighted how
these theories have been extended (or not) to VDS research and, again, how the trend in this specific area of research reflects a similar shift in nuance of understanding. Contemporary studio is being explored through multiple lenses and across many different dimensions, making it an interesting and vibrant area of study. Several examples of both theory working and building have been given throughout. **Publications D, E, F, G, K L, and M** demonstrate this change by building on existing theories in embodied cognition, creativity, and social learning, and either support or amend them where necessary. **Publications A, B, C, and H** take this building further and extend and advance theory in embodied cognition, design ecologies and ecosophy.

1.2. *In what ways do virtual studios relate to ‘traditional’ design education (or theories)?*  

Chapter 04 demonstrates the general lack of work that thoroughly explores relations between traditional and virtual studios, tracing the history and legacy of early work and bringing it up to date with contemporary work, including my own. The collection of work assembled in this thesis demonstrates the need for a more complex response to questions of relating traditional studio to online and distance settings and moving beyond simple dualities. **Publications A, B, D, G, K L, M** all clearly identify that student actions, behaviours and experiences in an online setting are, and should be, at least as complex as the traditional setting. But they also highlight the critical importance of making these visible, taking them seriously, and, in particular, recognising the *actual* learning taking place as well as the intended learning outcomes.

1.3. *What are the factors that enable effective and successful studio use in distance design education?*  

Almost all of the publications also identify specific factors in teaching that can contribute to successful student learning and experiences or are grounded in teaching practice in some other way. As noted
throughout the covering paper, the tradition of relating teaching, scholarship and research at the OU has offered a unique space to study virtual and distance studios. It also assumes particular intersections of education theory and practice through our shared mode of education which is necessarily transdisciplinary. For example, publications A, B, and C outline ways in which general approaches to designing distance learning environments can connect people using conceptions;

Publications E, F and L explore specific tuition practices around reflection and making conceptual connections between student and tutor; and Publications D, G, K, and M focus on learning mechanisms found in online studios. The overall lesson here, however, is that these findings can be readily applied to knowledge across modes of learning, again, moving away from the paucity of simplistic dualities.

1.4. What are the knowledge and research gaps in contemporary design and studio education, and what other trends are emerging to reflect concerns and issues?

The covering paper itself has brought together the literature in this area and identified a number of gaps in knowledge throughout, including around approaches to defining studio (section 3.4), the social, cultural and affective complexities around studio (sections 3.5 and 4.2), and methods and approaches to researching alternative studios (chapter 04). The identification of these gaps will hopefully be useful to other scholars as teaching practices continue to change. Section 4.2 considers and outlines the specific history and legacy of VDS use and is, in itself, one of only a few pieces of work to do this. By collecting and organising this work the trends of VDS use have been brought out and shown to possibly help explain some of the contemporary responses to the pandemic. The same relations with technology and the dissonance between what is needed as design educators or students, and what we have to work with, can be seen historically as well as during the course of events in 2020/21. This work also highlights emerging trends in VDS development and research and, as with the historical situation, the
practice is most definitely outpacing the research and knowledge. It remains important that we capture, discuss and disseminate the teaching experience and knowledge gained during 2020 in response to the pandemic. This is the motivation behind my work as the convenor of the Education SIG in the Design Research Society, the #DistanceDesignEducation blog (https://distancedesigneducation.com/), and the forthcoming special issue I am co-editing in Design and Technology Education: An international Journal, due out in 2021. As we might tell our students when confronted with any new situation, the last year offers an exceptional opportunity for learning.

1.5. Does studio use in distance design education have considerations and properties unique to its own domain of knowledge? How might these relate to other curricular areas and knowledge domains?

The work in Publication M clearly hints that this is at least partially true in the sense of adjusting or making existing theories work. In the case of Publication M it was a ‘putting together’ of a series of theories to explain aspects of social learning. In doing so it referred to other work that also attempts similar articulations, hence it could be that we are seeing this now emerge in design education more generally. But there is a tension here as well. By one view it is critical that we articulate design knowledge on its own terms in order to capture the contextualised richness of the experience and knowledge. By another view, it is preferable to avoid some of the historic barriers between education research domains, and instead engage more positively and proactively in trans- and intra-disciplinary discovery. This is a challenge in the contemporary UK setting for all the reasons outlined in chapter 03. One place to start may be to more actively and confidently articulate the value of the modes and forms of design education in response to functional approaches to learning. My ongoing work on a series of international projects is partly motivated by these challenges. The projects Studio Matters, Futures of design Education, and the
#DistanceDesignEducation projects all aim to bring the design education community together to explore our knowledge and become more confident in articulating this more widely. In doing so it repeatedly highlights our shared knowledge through divergent experience as well as many of the same frustrations and opportunities.

## 6.2 Future work

In bringing this work together, the covering paper has shown that design education is still an emerging area of research in terms of establishing its own *contemporary* body of work, core theories and ideas, as well as methods and approaches. There remain many gaps in our knowledge and the events of 2020 have made some of these visible as well as identifying others. My own work to date has certainly left me with a number of directions to take in future research, some of which are now presented.

### Teaching design at a distance

There remain many gaps in our understanding of how design can be taught at a distance and an open question as to how advanced (or specialised) such teaching can become. The results in this portfolio of work, for example, show that we are starting to become very successful at establishing social learning models in the early stages of learning and that our understanding of this is improving rapidly. What is less clear is how this early success can translate to later stages of study and how far such expertise can be taken at a distance for a *general* population of students.

My own work in this area will continue to develop the social learning model outlined in *Publication M*, testing it in other settings, and higher levels of study. Part of this work will continue exploring how individual students connect to form social learning ‘shapes’, such as core stable
networks or Communities of Practice. Importantly, the results from **Publication M** are suggestive of the possibility that these types of connection are more complex and varied than we currently recognise.

Taking a methodological approach that acknowledges it is exceptionally difficult to ‘see’ such connections, especially at a distance, is critical. Using learning data to create an understanding, not simply measuring something, will be a central feature in moving this work forward. An early example of such analysis is given in Figure 5 (currently unpublished).

![Figure 5](image)

*Figure 5 Examples of data visualisations used to identify student ‘stories’ in large datasets.*

In this example, the raw data is used to inform student ‘stories’ to assist with identification, discussion and analysis of behaviours and learning. The focus of the profiles of individual students is not the engagement metric in itself (i.e. no judgement or even correlation is made to specific metrics or outcomes). Rather, it is the pattern of engagement that informs a broader picture of what may be happening qualitatively. Each pattern represents an individual student learning journey, complete with the complexities that entails. For design educators, it may simply be
that making visible what is usually hidden may prove to be the most useful outcome (Jones, 2021).

**Next generation online design studios**

A particular benefit of working at the OU is the proximity of research, scholarship and teaching, specifically how each of these informs the other as part of a continuous practice. This is certainly true in my own work on online and virtual design studios, where the research we do informs the teaching directly and is then assessed through scholarship to, ultimately, inform research once again. The most recent findings made in **Publications G, K, L, and M**, in particular, are already having a direct impact on future learning and teaching, including future iterations of the virtual studio OpenDesignStudio.

Beyond such simple dualities of distance/online, considering studio as a mode or set of properties in learning and teaching opens up many other possibilities. For example, as outlined in the summary of **Publication C**, the potential of a Building Information Model (BIM) to be a host or site for studio-based education is one that has yet to ‘travel' back from practice to education. With colleagues at the OU, we have set up the Open Digital Prototyping Laboratory (ODPL) to examine the use of digital prototyping as a place of education as well as practice. This will make use of my research into both professional practice BIM settings and VDS for education. This opens the further opportunity of extending this to maker and manufacturing studio spaces, building on the work of other OU colleagues in this area (Jowers et al., 2017). Expanding studio to include (or be included in) maker spaces and FabLabs (fabrication laboratories) potentially opens up places of practice and education, allowing different opportunities to arise for both the subject itself and those who study it. In addition to maker spaces, community-based or co-created projects allow similar opportunities, where studio is constituted by the community itself or as a specific need arising from
that community (Alexiou and Zamenopoulos, 2019), or emerges from the constitution of the community in and of itself (Boys, 2010).

More importantly, beyond the obvious expansion of studio for practical purposes is the potential to expand representation, inclusion and participation. Both examples just given ask the questions ‘Where can/should design education take place?’ and ‘Who can/should study design?’ Answering these questions in more creative ways, and especially with potential contributors and students, may lead to radically different studios.

**Studio properties research**

A persistent gap that recurred throughout the writing of this covering paper is the lack of definition of studio or even articulacy around its properties or conditions. As discussed in chapter 03, defining or not defining are both problematic for different reasons, particularly in relation to how it is presented to non-designers. There remains something unresolved around how we collect, share and disseminate information about studio, particularly in terms of how design education researchers can approach their subject in a rigorous way, but also on their own, or subject-relevant, terms.

Making progress in this area is the motivation behind the Studio Matters project, a discussion and writing series with international colleagues, aiming to provide researchers and practitioners a resource on ‘properties’ of studio. A major motivation is recognising that simply gathering such properties would be a useful thing (currently no such work exists, except certain context-specific reports cited in this covering paper). Methodologically, the work will attempt to organise properties pragmatically (a purely theoretical or empirical framework will not, and cannot, dictate the work). Ultimately, this may permit comparisons between studios to be made, theoretical models to be tested, and, most
importantly, better-informed discussion between practitioners, which, in turn, will allow more rigorous research protocols to be established in order to build and contribute to a shared body of knowledge.

Contributing to general education

As I noted in Publication M:

*The question of what general design education might contribute to other curricular areas is still largely unexplored, with the exception of isolated cases and examples, which are often applied inappropriately to didactic and deterministic content.*

Design for education, or learning by design, has been around for many years and aims to make use of the general pedagogical values inherent in a design education. In the past such attempts have met with mixed success (as noted in chapter 02), but much of this failure has been as a result of applying incompatible learning modes and knowledge domains. A knowledge that is certain, measurable, and specific cannot be the enforced, causative outcome of a constructivist learning approach. Design problems, for example, are not the same as maths problems and require very different conditions of assessment of ‘outcome’ (Kimbell et al., 1996). To force one paradigm on the other is almost inevitably going to lead to failure (e.g. Krange and Ludvigsen, 2008).

However, such contrasting paradigms can be used in conjunction with one another, a fact recognised in problem based medical education research (Barrows, 1996). Extending this generally, there is significant potential in realising the value of design education as a process of developing general competence in learning: as a constructive mode of enquiry in itself (Kimbell and Stables, 2007), or as a more relevant and contemporary reframing of design thinking (Koh et al., 2015). Many of the cognitive properties and processes in contemporary cognitive
learning theory are very similar (or identical) to design cognitive processes (Dehaene, 2020). The value in treating design as a mode of improving cognition in a general education setting has been shown to be effective in other national curricula, particularly as part of developing the capacity of individuals as part of wider society (Nielsen and Digranes, 2007). Even without a national outcome or framework to support this similar outcomes can be achieved (Noel et al., 2019).

How we approach the design of higher education should at least be informed by how design is learned and (especially) developed at all stages of education. The work and research of early years design education practitioners has far more to contribute to later education than is perhaps currently acknowledged. Focusing on design as only a specialised and narrow activity studied mostly at higher levels reduces the potential of design graduates to work across and between specialisms. In truth, many graduates do this despite such constraints (Lloyd, 2011), but what else might be achieved if this were encouraged in early years education, developed in middle years, and only finally specialised when needed and in contextualised ways?

Part of my work as the Convenor of the Design Research Society Education Special Interest Group is to encourage and develop design education research across boundaries such as these. The discussion series Futures of Design Education has this particular aim in terms of broadening and pluralising current and future ideas of what design education is. The UK centric view presented in this covering paper is precisely that – a particular view – and many others exist and have far more to offer the future of design education.

6.3 Last words

There is indeed something very special about studio: what it offers to learning and its untapped potential. To understand this value, however,
is as Lyon (2011) says both important and frustrating. Frustrating because it is necessarily complex and difficult to study: it's human, messy, a milieu, incomplete, contradictory. Important precisely because of these same properties and affordances, reflecting the opportunities to safely explore the very difficulties of the contexts we are preparing our students for.

It is this idea of studio as incubator space that is perhaps the overarching hidden property of studio, that the studio itself acts as a ‘liminal servant’ in support of student learning. It is perhaps not what studio *is* that matters, then, but what it *enables*: its opportunities and potential as constructed by students’ learning. By this view, the mode of studio is far less relevant than the underlying value it offers in terms of enabling and nurturing. All studios, whether online, physical, distributed, or any of the many spaces that have emerged recently, can act as enablers in helping shape communities of design learning. Studio, at its essential core, is a place of preparation and readying in and of itself: not necessarily for *some* thing but for *any* thing.
07 REFERENCES

Publications presented in the portfolio of work are presented first for speed of reference and in chronological order of publication. For a full list of all publications and articles, see Appendix A.


Crowther, G. (1969) ‘Address by Lord Geoffrey Crowther, Foundation Chancellor, At the formal inauguration of The Open University’.


International Conference for Design Education Researchers, Oslo, ABM-media as c/o Oslo and Akershus University College of Applied Sciences, pp. 552–563.


Munro, P. J. (1991) ‘Presence At A Distance: The Educator-Learner Relationship In Distance Education And Dropout’, THE UNIVERSITY OF BRITISH COLUMBIA.


08 APPENDICES
APPENDIX A: List of Publications

NOTE: *Citation numbers and downloads collated in March 2021 and do not include self-citations. All downloads refer only to Open Research Online (ORO: [http://oro.open.ac.uk](http://oro.open.ac.uk)) figures unless otherwise stated.

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| Publication A | An alternative (to) reality (Jones, 2013)                           | Book chapter    | Single author     | 18                    | Case study review  
[445]  
[1600 from publisher]  
Critical argument (phenomenological) |
| Publication B | Which way is up? Space and Place in virtual learning environments for design (Jones and Lloyd, 2013) | Conference Publication | First author (60%) | 9  
[630] | Case study description |
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<td>First author (70%)</td>
<td>0 [587]</td>
<td>Literature review, Critical argument, Case study</td>
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<td>Publication D</td>
<td>Everyday creativity in design process (Lloyd and Jones, 2013)</td>
<td>Journal Publication</td>
<td>Second author (40%)</td>
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<td>Consensual Assessment Technique (partial), Descriptive statistics</td>
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<td>Publication E</td>
<td>Reading students’ minds: design assessment in distance education (Jones, 2014b)</td>
<td>Journal Publication</td>
<td>Single author</td>
<td>0 [472]</td>
<td>Thematic analysis (Grounded Constructivist), Descriptive statistics, Pearson Product Moment of Correlation (PPMC)</td>
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<td>Social engagement in online design pedagogies (Lotz et al., 2015)</td>
<td>Conference Publication</td>
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<td>Critical argument</td>
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<td>Lurking and learning: Making learning visible in a Virtual Design Studio (Jones et al., 2017)</td>
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| **Publication L** | Engaging qualities: factors affecting learner attention in online design studios (Lotz et al., 2018) | Conference Publication | Second author (40%) | 2 [177]               | Questionnaire design  
Descriptive statistical analysis  
Pearson Product Moment of Correlation (PPMC) |

**Publication M** | A longitudinal study of Virtual Design Studio (VDS) use in STEM distance design education (Jones et al., 2020) | Journal Publication | First author (70%) | 4 [126]               | Descriptive statistical analysis  
Correlation analysis  
Content analysis |
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<th>Contribution</th>
<th>Citations*/[downloads]</th>
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<td>OpenDesignStudio: Virtual Studio Development over a Decade (Lotz et al., 2019)</td>
<td>Conference Publication</td>
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<td>2 [157]</td>
<td>Case study report</td>
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<td>Guide A</td>
<td>Creating Distance Design Courses Guide</td>
<td>Online guide</td>
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<td>2,000+ downloads (#DDE website)</td>
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<td><strong>Article A</strong></td>
<td>Review of: Art and design pedagogy in higher education: knowledge, values and ambiguity in the creative curriculum</td>
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<td>Case study report of the project Developing Human Capital (Bravo et al., 2016)</td>
<td>Report</td>
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<td><strong>Article C</strong></td>
<td>The Future of Design Education in India, British Council: Knowledge Economy Partnership: Internationalising Higher Education. (Boddington et al., 2018)</td>
<td>Report</td>
<td>Contributor (&lt;10%)</td>
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<td><strong>Article D</strong></td>
<td>Innovating Pedagogy 2019: Open University Innovation Report 7 (Ferguson et al., 2019)</td>
<td>Report and review</td>
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<td><strong>Article E</strong></td>
<td>Editorial: Making little things visible (Jones, 2021)</td>
<td>Editorial</td>
<td>Single Author</td>
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APPENDIX B: Abbreviations and Glossary

AWMP Are We Making Progress. eSTeEM funded project undertaken by Nicole Lotz, Derek Jones, and Georgy Holden, investigating student use of ODS and its relationship to student success across all study levels.

BIM Building Information Modelling. The process of using advanced design software, shared data and design models across teams to design, build and operate buildings and the built environment.

CATS Credit Accumulation and Transfer Scheme. UK framework used to quantify learning between institutions and study levels. For example, an ordinary degree will typically be 360 CATS points.

CoP Communities of Practice. Developed by Lave and Wenger and an extension of social constructivist learning that attempts to explain how specific communities (such as designers) construct knowledge collectively.

Crit Design Critique. The critical appraisal of a design carried out using a range of formats, locations or participants depending on the need. For example, in education, a Wall Crit can involve the display of student work and its critique by tutors and peers. Other forms include: Desk Crit; Project Crit;

DRS Design Research Society. Founded in 1966, the Design Research Society is a learned society committed to promoting and developing design research and is the longest established, multi-disciplinary worldwide society for the design research community.

eSTeEM Research and funding group at the OU focusing on distance education in STEM subjects and set up to support staff scholarship and research: http://www.open.ac.uk/about/teaching-and-learning/esteem/

EMA End of Module Assessment. Summative assessment applied at the end of a module at the OU (UK), often used as an alternative to a traditional proximate exam.

HE Higher Education. In the UK this is ISCED Levels 6-8 (sometimes including Levels 4 and 5, depending on subject area)
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<td>HESA</td>
<td><strong>Higher Education Statistics Agency.</strong> UK agency with remit to collect and disseminate data on HE provision in the UK. Website: <a href="https://www.hesa.ac.uk/">https://www.hesa.ac.uk/</a></td>
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<tr>
<td>ISCED</td>
<td><strong>International Standard Classification of Education</strong> maintained by UNESCO (United Nations Educational, Scientific and Cultural Organisation)</td>
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<td>ODS</td>
<td><strong>OpenDesignStudio.</strong> Online tool and <strong>VDS</strong> used in a number of OU modules to support student production, presentation, and sharing of artefacts. ODS is available as part of the OU VLE</td>
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<td>ORO</td>
<td><strong>Open Research Online.</strong> The Open University's online repository for staff research publications, available at: <a href="http://oro.open.ac.uk">http://oro.open.ac.uk</a></td>
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<td>OSL</td>
<td><strong>Open Supported Learning.</strong> The learning and teaching model used by the OU, blending material, tuition, assessment, and support under an administrative and quality assurance framework.</td>
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<tr>
<td>OU</td>
<td><strong>The Open University (UK).</strong> Distance Education provider based in the UK established in 1969 and retaining a distinct educational and social mission, set out by UK Privy Council Charter.</td>
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<td>PedSIG</td>
<td><strong>Pedagogy Special Interest Group.</strong> A special interest group of the DRS dedicated to promoting and furthering design pedagogy research. Professor Michael Tovey was the founding Convenor, dedicating the SIG to the promotion of</td>
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<tr>
<td>PLM</td>
<td><strong>Product Lifecycle Modelling.</strong> The process of using advanced design software, shared data and design models across teams to design, manufacture and operate advanced products.</td>
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<td>STEM</td>
<td><strong>Science, Technology, Engineering, and Maths.</strong> Acronym used to refer to a particular cluster of subject areas around applied sciences and mathematics.</td>
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<tr>
<td>STEAM</td>
<td><strong>Science, Technology, Engineering, Arts, and Maths.</strong> As STEM but with the inclusion of Arts to acknowledge the importance of the creative arts and humanities in any applied domain.</td>
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<tr>
<td>TMA</td>
<td><strong>Tutor Marked Assignment.</strong> The commonest form of continuous assessment during an OU module. A TMA can take different forms and is assessed summatively and formatively by tutors.</td>
</tr>
<tr>
<td>VDS</td>
<td><strong>Virtual Design Studio.</strong> A distance and/or online design studio distinct from a normative (physical and traditional) studio. ODS is an example of a VDS used at the OU.</td>
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<tr>
<td><strong>VLE</strong></td>
<td><strong>Virtual Learning Environment.</strong> An online system, service and/or tool used to support learning and teaching. At the OU, the VLE is a heavily modified version of Moodle REF applied semi-consistently across all courses.</td>
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<tr>
<td><strong>ZPD</strong></td>
<td><strong>Zone of Proximal Development.</strong> Vygotsky’s social constructivist learning theory that categorises levels of ability according to how independent or dependent the learner is on some teaching source.</td>
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PART 2: PUBLICATIONS