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

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

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

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

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

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

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

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

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

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

Design Studio Pedagogy and Culture

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

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

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

The Studio's Incorporation of Technology

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

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

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

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

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

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

Methods

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

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

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

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

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

Findings

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The Changing Shape of the Physical Studio

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

Table 3. The pandemic online opinion shift across design domains

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

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

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

Table 4. Post-pandemic teaching mode preferences

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

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

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

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

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

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

Graphic/Communication Design (27 comments)

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

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

Product/Industrial Design (17 comments)

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

Interaction/Interactive Design (11 comments)

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

Game Design/Animation (9 comments)

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

Design Thinking/Social Design (7 comments)

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

Interior/Spatial Design (5 comments)

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

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

Fashion Design (5 comments)

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

Design Research/Theory (5 comments)

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

Discussion: The Post-Pandemic Design Studio across Design Domains

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

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

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

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

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

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

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

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

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

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

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

Conclusion

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

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

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

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

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

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