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Aligning Design Studio Pedagogy to Industry Practice: Future Proofing Higher Design Education

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Abstract: Amid the COVID-19 pandemic, design education experienced a significant shift as traditional studio teaching went online. This transition coincided with industry demands for adaptable, technology-proficient graduates prepared to work and collaborate as part of a decentralized workforce. This study examines how design educators in seven countries adapted their post-pandemic studio pedagogy to align with these industry needs. An online survey was used to efficiently reach the wide, geographically dispersed participant pool of educators. Findings indicate a rising acceptance of online technologies in studio teaching. The majority of design educators are now incorporating online elements into their design teaching. Pre-recorded lectures, online feedback and critique sessions, self-paced learning activities, and the use of cloud-based collaboration tools are among the most frequently employed methods. Nearly a third of surveyed educators are even considering teaching fully online design courses. This shift reflects a forward-thinking approach aimed at better aligning design education and industry. However, the study also highlights the importance of remaining open to disruptive technologies like generative artificial intelligence which is currently reshaping the design industry and work practices.

Keywords: online teaching strategies, virtual collaboration, online design studio, decentralize workforce, employability, artificial intelligence, design industry practice

1. Introduction

Currently, design education in tertiary institutions is globally structured around design studio pedagogy. The design studio is based on the "atelier" method from the "Ecole Des Beaux Arts" model (1819–1914) which was later adapted by the influential Bauhaus School (1919–1932) [1]. 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 [2].

The design studio, rooted in practice, embodies key aspects such as dialogical learning, critique, and fostering social interaction within a learning environment [3, 4]. It is widely recognized as a distinctive teaching approach often referred to as a signature pedagogy [5] in higher design education. Pre-COVID-19 pandemic, there was a general belief that the hands-on practice of knowledge acquisition in the design studio could not be duplicated virtually [6, 7].

The COVID-19 pandemic, however, necessitated a shift from traditional studio-based learning to virtual environments, prompting design educators to reconsider traditional pedagogical approaches. Design educators in Australia, Germany, New Zealand (NZ), Scandinavia, the United Kingdom (UK), and the United States of America (USA) acknowledged the effectiveness of some online teaching strategies used during the pandemic [6, 8]. Other studies also identified a marked shift in acceptance of online teaching strategies during the pandemic [9].

Before the pandemic, the design industry had already embraced a technology-enhanced workstyle that continues to evolve with decentralized workforces. Today's designers are often part of multidisciplinary teams and engage beyond the usual client interactions in participatory design practices. That means they design "not for" but "with" people [10]. This can include a wide variety of stakeholders such as the community at large and government consultants or policymakers who are involved in the design process [11]. To facilitate such interactions, today's designers often connect through virtual means such as online communication and collaboration platforms that can scale according to needs driven by stakeholder involvement [12, 13].

The COVID-19 pandemic accelerated the decentralized collaborative approach via the Internet even further. Remote, online collaboration became a key component of the global reach of the design profession that is now the de facto standard and applied to disciplines as diverse as software development and aircraft design [14, 15].

Although the distributed online work environment is becoming a "new normal" in the design industry, there is still resistance among design educators to fully adopt online technology to enhance physical design studio education [6, 8, 9]. This resistance to teaching design online prompted some design researchers and educators to argue that design education is stuck in the past and does not always align with market realities. Sopher et al. [16] argue that the "studio has not changed over the past century,

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regardless of significant criticism and major technological developments." Matthews et al. [17] point in their research to designers and academics who warn that current design curricula are disconnected from the changing industry landscape and "that we are preparing graduates for economic conditions and cultural expectations that no longer exist."

Within the global context of the design industry's decentralization and technological evolution, it is important to gauge if today's design educators are preparing students for the new dynamic role designers are playing in a wide gamut of industries. This study therefore explores to what extent a cohort of international design educators has integrated online technology to enhance design studio teaching and adapt to industry practices two years after the pandemic. The study also examines the readiness of design educators to prepare students for the future of their professions in an often distributed workplace.

2. Literature Review

2.1. Design industry requirements

Labor markets have undergone major transformations in recent years, particularly in the use of virtual communication and collaboration platforms. In fact, the popular press is replete with stories of how employers are having to entice employees back to the office [18]. This shift has directly impacted how designers work with others, are employed, and the jobs they perform within organizations that can often hire designers on an as-needed basis [19]. This project-based employment has led to fewer full-time staff jobs and more freelance positions where flexibility, adaptability, and skill sets are more fluid [20].

Professional designers now collaborate across teams, countries, and time zones, a practice that was not new but was amplified by the pandemic and emerged as a "new normal" in many design domains. Designers are also part of a growing community of digital nomads who work remotely wherever they are as long as they have Internet connections [21]. This combination of work and travel has become increasingly popular for creatives driven through the pandemic with its lockdowns.

Working as a designer remotely and in collaborative virtual design studio environments requires a high degree of adaptability particularly in using new technologies, as Crosby et al. [22] assert, "Changes in technology have increased the diversity of tools available, and designers need to be able to adapt their skills." Respectively, Lee et al. [23] comment that "Ideally, university curricula respond to this industry demand and ensure learning is conducted in conditions, that, in some sense replicate or communicate the likely challenges of industry."

Current criticism of design curricula often revolves around its failure to reflect evolving industry practices due to relying on traditional studio-based methods [24]. Many programs prioritize traditional skills over emerging technologies and interdisciplinary collaboration [22, 25]. Adapting curricula to industry needs remains a challenge: "The pace of technological change in the design industry requires university curricula to continually adapt, with curricula planned for future employment possibilities" [22].

While traditional design education has its merits, it falls short of meeting contemporary demands [24]. Since the digital revolution, design curricula have struggled to keep pace with advancements like desktop computing, online platforms, and now generative artificial intelligence (AI). Each technological shift has led to the rapid creation of new design professions within the industry, such as user interface designers and user experience designers, fundamentally altering the landscape of how designers collaborate and operate, thereby leaving design educators to respond to these changes.

Driven by technological shifts, the evolution of work patterns has transitioned from centralized studio settings to "decentralized collectives," where design teams are globally dispersed, often working for the same organization or hired temporarily for specific projects [24]. Consequently, Vita [26] contends that "designers strive for distributed knowledge, diverse and systemic thinking, adopting various collaborative practices, and more inclusive and holistic approaches to their work" [26].

Given the changing ways designers work, today's graduates need versatile skills to thrive in the decentralized design profession. These skills include:

1) Independent learners with an attitude of pursuing lifelong learning

   Staying abreast of emerging techniques and technologies, students need to continuously enhance their skills and remain relevant throughout their careers. Independent learners are adept at adapting to diverse projects and challenges, quickly acquiring new knowledge and skills as needed. Design professionals who actively pursue lifelong learning can stay competitive in the evolving job market [27, 28].

2) Adaptable to new technologies

   As technology advances, adaptability to new technologies is crucial for design students. Staying current ensures competitiveness in the job market and facilitates the integration of new technologies into design processes. Additionally, embracing new technologies fosters creativity and innovative problem-solving, leading to enhanced design outcomes. Adaptable students can also collaborate effectively using the latest digital platforms and tools, maximizing their potential in the evolving design landscape [17, 22, 29].

3) Good communicators over collaborative online platforms

   The rise of remote work trends, accelerated by globalization and technological advancements, underscores the importance of adept communication over online platforms. Design students must be good communicators on collaborative online platforms to succeed in the digital age. This entails utilizing various communication tools and channels, such as email, instant messaging, video conferencing, and project management software. As a designer, effective communication is crucial for articulating design concepts, conveying feedback, and discussing project requirements with clients, colleagues, and stakeholders. Learning how to communicate clearly and concisely over online platforms allows students to leverage these tools to exchange information efficiently and coordinate project tasks effectively demonstrating their ability to thrive in virtual work environments [27].

4) Business acumen including project management know-how and entrepreneurship

   Students need business acumen, project management skills, and entrepreneurship know-how to thrive in the design field. Understanding business principles enables them to effectively manage projects, budgets, and client expectations. Moreover, entrepreneurship skills empower students to seize opportunities, innovate, and turn their design ideas into successful ventures. By mastering these aspects, students enhance their employability, contribute to project success, are adaptive

to change, and lay the foundation for entrepreneurial endeavors in the design industry [22, 27–29].

2.2. Teaching and learning in the design studio environment

Despite the variations in design domains (e.g., Graphic/Communication Design, Product/Industrial Design, Interaction/Interactive Design, Fashion Design), teaching and learning design adhere globally to the principles of design studio pedagogy [2–4]. The design studio, grounded in the principles of "learning by doing" [30] and drawing from Kolb's [31] experiential learning model, is primarily characterized by its physical nature in design education. Despite advancements in technology and larger class sizes, the physical studio remains an integral and semi-structured physical workspace, where students assume apprenticeship roles and educators act as mentors in a dynamic creative process [3, 4, 32]. This practice-based approach emphasizes hands-on engagement and is still widely endorsed by design educators [6, 33].

In the design studio, students engage in project-based learning which often involves open-ended problems without a single definitive solution [3]. This intentionally creates ambiguity and uncertainty, mirroring the real-world practice of design [2, 4]. Within the studio environment, experiential learning takes place through a dynamic dialogue between design educators and students, as well as among the students themselves [2, 4]. Studio teaching emphasizes face-to-face interactions, facilitating individual student learning through meaningful interactions and dialogue [2, 3, 32].

Studio-based teaching has been recognized for its ability to facilitate active learning and social engagement [3, 4, 32, 34]. The studio's dialogical learning process involves continuous informal and formal feedback throughout students' creative development as part of formative assessment. This way of learning is setting design apart from many other academic domains where feedback is typically summative, such as exams following a course of study.

2.3. The online design studio: Virtual collaboration in design classes

Given the specific characteristics of the design studio, the effectiveness of the online design studio varies, depending on the specific design domain being taught [6]. In a survey of international design educators, it was observed that domains involving hands-on skills, like product design and fashion design, displayed limited enthusiasm for the online studio due to the necessity of teaching tactile skills that require specialized equipment, focus on materiality, and 3D objects. Other design domains such as Graphic/Communication Design and Interaction/Interactive Design are naturally more aligned with working online [6].

Conversely, some design educators supported the efficacy of online studios pre-pandemic where "social interaction and peer learning … is something that is actively constructed and sought out by students" [35]. Wragg [34] and Thompson et al. [36] argue that instead of aiming to replicate the on-campus educational experience, the focus when creating online design education should be on the social aspect of the studio which can create a sense of belonging.

Indeed, various studies highlight that online design studios do not fully capture the intricacies of dialogical learning [37, 38] and fail to establish a studio culture that can replicate the informal learning and social interaction opportunities available in a physical space [6, 8, 37–40].

Nevertheless, design researchers also found that online collaboration and communication tools had numerous positive applications. Nubani and Lee [39] identify advantages of online learning that included one-on-one virtual meetings with faculty and screen sharing that allowed digital markups – a finding also made by Hepburn and Borthwick [41] as well as Tessier and Aubry-Boyer [38]. Fleischmann [37] as well as Tessier and Aubry-Boyer [38] note that online technology when teaching design can effectively facilitate student work critiques through digital platforms. Leveraging cloud-based technologies for critiques is seen as proficient in enabling peer and teacher feedback, while also proving successful in documenting students' creative advancement in the virtual realm [23]. This kind of virtual peer and team interaction using cloud-based technology mirrors current industry practice [23]. Some students flourish in this online environment [37] and learn the skills they need to collaborate in a decentralized online workspace that prizes adaptability, commitment, self-motivation, and good time management – all skills demanded in today's design industry.

Cloud-based collaboration tools like Slack, Miro, Mural, and Collaborate Ultra have also proven successful in enriching and extending the on-campus learning experience [40]. These file-sharing and communication platforms are used extensively in the remote workplace, resulting in a reported increased productivity [42]. This way of working together gave rise to a new word, "netiquette," which means acting in a civil and respectful manner when collaborating online. Many universities now see netiquette as part of digital literacy which considers digital needs, demands, and capacities in everyday tools such as email and social networks. Researchers such as Soler-Costa et al. [43] clearly see "new patterns of behavior in a society where digital skills are becoming essential" including in the workplace.

3. Methodology

3.1. Research design and methods

This study examines whether design educators in seven countries (Australia, New Zealand, Scandinavia (Denmark, Norway, Sweden), the UK, and the USA) have adapted post-pandemic virtual studio pedagogy to prepare design students to enter a decentralized, remote design industry workforce. It explores the question: Do design educators align more closely with industry practice by incorporating more online teaching and learning now that the pandemic is essentially over? The seven countries were chosen due to their robust higher education systems and established track records in offering comprehensive design programs.

This research is underpinned by the epistemology of pragmatism (based on Charles Sanders Peirce and John Dewey); hence, there is an emphasis on the role of experience in shaping knowledge [44]. Often seen as a problem-solving approach [45], the application of a pragmatic research paradigm allows the researcher to choose methods that are well-suited to the practical, real-world nature of the situation being studied [44, 46].

3.2. Online survey and question design

An online survey was deemed the most suitable research method due to its ability to efficiently reach a wide, geographically dispersed participant pool within a short time frame [47]. The online survey explored the acceptance of online technologies in design education to reveal if design educators are

meeting industry demands enumerated before. The online survey, conducted through the SurveyMonkey platform, was designed to collect both quantitative and qualitative data through six closed-ended and open-ended questions. The researcher carefully designed questions to receive first a general overview/trend on a topic through closed-ended questions and generate deeper insights on the topic (What is going on here?) through open-ended follow-up questions. Consequently, the survey did return data on measurable indicators (e.g., Are you prepared to continue to adopt more online elements in your design courses in the next five years? Yes/No) and also provided deeper insight into the researched phenomena through collecting qualitative feedback through open-ended questions (e.g., Why or why not? Please explain your answer). The questions asked in the survey are quoted directly in the Findings section. Answers to the two demographic questions (country of origin and design domain) are reported in the Participants section below. The survey was open for three months (August–October 2022).

3.3. Data analysis and presentation

The overarching data analysis followed an inductive path, primarily focusing on exploration and the pursuit of discoveries [48]. For the quantitative data, collected through closed-ended questions, the author relied for analysis on the online survey platform to provide fundamental statistical information such as response totals, percentages, and response counts, which are detailed in the Findings section. The decision not to employ further statistical analysis was primarily influenced by the limited sample size and the predominantly qualitative nature of the research approach.

Qualitative data derived from open-ended survey questions underwent a thematic analysis process. This involved interpreting the data, generating and selecting codes, and shaping themes [49]. This method proved valuable for delving into diverse viewpoints among research participants, uncovering commonalities, distinctions, and possibly unforeseen insights [50]. The number of mentions of a theme is shown in brackets (number). Representative quotations from participants are presented to illustrate themes [51] with the design educator's participant number shown in brackets (DE number).

3.4. Participants

The contact information for potential participants in the study was randomly selected from well-established tertiary design programs. This selection was made from the publicly available staff profile pages of design departments and design schools on websites in selected countries.

A total of 629 design educators from the seven countries were contacted via email with an invitation to participate. Thirty contacts were invalid due to educators being on sabbatical or having left the university; 58 design educators responded to the survey (response rate 9%).

Participants were from the following countries: Australia (30), the UK (8), the USA (7), NZ (5), Denmark (3), Norway (3), and Sweden (2). Table 1 shows the distribution of participants across design domains.

Table 1
Number of survey participants across design domains

Design domain	Number of participants across design domains*	Percentage*
Graphic/Communication Design	29	50%
Design Thinking/Social Design	18	31%
Design Research/Theory	15	26%
Interaction/Interactive Design	14	24%
Product/Industrial Design	11	19%
Game Design/Animation	6	10%
Fashion Design	3	5%
Interior/Spatial Design	2	3%

Note: *Some design educators teach in more than one domain

3.5. Limitations of study

For the validity of this study, participants were randomly selected. However, given the low response rate, the researcher acknowledges potential distortion in the results of the survey not representing the total population. Data insights (provided by the survey platform) show that 45% of participants completed the survey in late August and 55% in early/mid-October. When comparing early and late responses, there are no significant differences contributing to the validity of the results [52]. Findings from this survey can be considered based on their merit to accurately reflect attitudes of the population [53].

4. Findings and Discussion

Design educators' experiences are discussed in the context of the earlier presented industry demands and how their experiences align with current industry practice. The themes that emerged during data analysis are used as headlines organizing the discussion around key findings/insights from the data analysis.

4.1. Growing acceptance of the digital design studio

Design industry practitioners will note positive developments in the findings. Survey responses confirmed a growing trend in design education to incorporate more online elements in the post-COVID-19 design classroom (see Table 2). The reasons vary, such as convenience, remote collaboration, and critiquing opportunities and allowing educators more flexibility in engaging with individuals in tutorials.

The responses below (presented from high to low) detail how the 46 design educators use online technology to support the physical studio:

1) pre-recorded lectures (18)
2) feedback/critique session online (7); of these, four are using online tools for critiquing while being in the physical room
3) pre-recorded self-paced learning activities (6)
4) cloud-based collaboration tools (e.g., Miro, Slack) (6)
5) small group meetings, Q&A sessions, and consultations (4)
6) building online libraries/repositories (2)
7) live online lectures for large cohorts (2)
8) using online polls to get instant feedback (1)

4.2. Demand for independent and self-directed learners

Although the online elements varied, recording video lectures that students could access online largely through learning

Table 2
Post-COVID-19 incorporation of online elements to support physical teaching and learning strategies

Survey question: Two years after the pandemic, do you incorporate online elements into your design teaching and learning strategies?		
Answer choice	Percentage (no of educators)	Design domain counts*
Yes	79% (46)	Graphic/Communication Design (26) Design Thinking/Social Design (17) Design Research/Theory (13) Interaction/Interactive Design (12) Product/Industrial Design (8) Game Design/Animation (6) Interior/Spatial Design (1) Fashion Design (3)
Not yet, but I am currently working on it	5% (3)	Graphic/Communication Design (1) Interaction/Interactive Design (1) Product/Industrial Design (1)
No	16% (9)	Graphic/Communication Design (2) Design Thinking/Social Design (1) Design Research/Theory (2) Interaction/Interactive Design (1) Product/Industrial Design (2) Interior/Spatial Design (1)
Total	100% (58)	

Note: *Some design educators teach in more than one domain

management systems was the most popular strategy among educators, while recording self-paced learning activities was the third most applied activity. This flipped classroom model where students assume responsibility for their learning of specific concepts and skills through viewing pre-recorded video lectures and technical demonstrations before attending class was implemented with varying success. One educator commented: "If your teaching is resting on delivering face-to-face elements with the expectation that students have done some online work beforehand, it becomes a lot harder" (DE18).

Other design educators have naturally adjusted their strategy to what works best in a flipped classroom, as this design educator states: "I incorporate pre-recorded video content as a strategy. This includes shorter (<20min) videos rather than long lectures (40–60 min). I found this strategy to improve engagement" (DE27). One survey respondent summarized the advantages of pre-recorded lectures: "I am recording lectures so students can pause and reply when necessary" (DE06) providing greater control over the pace, time, and place of their learning. This is a widely seen benefit and is also confirmed in recent studies [54, 55].

In the context of design professional practice, pre-recorded lectures and self-paced video demonstrations prepare students to become independent and self-directed learners, an attribute favored by industry.

4.3. Good communicators over collaborative platform for distributed work practice

The survey revealed the use of multiple file-sharing and communication online platforms such as Zoom, which was used for tutorials, while Collaborate Ultra was employed to give feedback during tutorials. Some design educators used online platforms to deliver critiques, to support student collaboration, and to provide feedback sessions online (7). There was an interesting trend in that four design educators use online tools to critique while being in the physical classroom. Additionally, cloud-based tools such as Miro or Slack are used to facilitate online collaborations (6). These tools are used extensively by industry practitioners in distributed work teams and have also been confirmed as a valid form of peer learning in the digital design studios [23, 40]. Their use also develops in design students the core idea that design is a participatory process that often involves multimodal and multidisciplinary teams. In a practical sense, students can promote themselves to prospective employers through the digitization of the studio and its attendant opportunities. The flow-on effect from this online collaborative process boosts the focus on employability and industry readiness which includes also career self-management through online image-sharing platforms and digital portfolios [19].

Despite its emerging alignment with industry, the language of some comments suggests that there is still a deeply ingrained dislike of using online technologies to enhance the physical studio environment among some educators, for example: "We use online tools like Miro. We are *forced* to under our blended learning model" (DE36). However, others focused on the added benefits of online collaborative platforms: "In terms of positives, we now run all our classes through an online environment (Collaborate) even with the students physically in the room. This allows staff to easily sketch feedback directly onto the students work" (DE14).

4.4. Physical objects and lack of social interaction

Design educators may be starting to future-proof their courses through utilizing online teaching tools; however, they still express an ambivalence. One educator remarked that online platforms "enriched" their teaching but observed that online lacks the "social depth" of a physical studio. Another design educator of communication design commented that "online teaching can replace face-to-face studios unless a studio is presenting a physical artifact or some kind of experience-based piece." Yet another educator, while praising online technology, commented that students miss the "social interaction" of physical studios. The deep divisions among design educators about the efficacy of online studios largely centered on the lack of social contact and the difficulties of teaching hands-on skills, a finding the author made [6, 8, 37].

4.5. The future of online integration

The survey also investigated whether design educators are willing to further integrate online elements into their design courses over the next five years (see Table 3).

The results are evenly split between those design educators who will continue to adopt more online elements and those who will continue with the online elements they are currently using. A small percentage are outliers when it comes to ignoring online studio practices altogether. Those respondents who reject online elements are spread across various domains: Design Thinking/Social Design (1), Design Research/Theory (1), Graphic/Communication Design (1), Interior/Spatial Design (1), and Product/Industrial Design (2).

This hesitancy about adopting online technology into studio teaching is more sharply evident in the responses to the question about the future of the fully online design classroom where survey respondents were asked to speculate on whether they could see themselves teaching fully online courses in the next 5–10 years (see Table 4). This question revealed a deep division in those design educators who want the latitude to choose online elements that work in a blended classroom and those who see online as the future of design education.

However, there is an upward trend in accepting fully online design classrooms. Twenty-eight percent of design educators in this study see teaching a fully online design course/program as possible in the near future, a finding which aligns with a German study [8] where 35% of design educators see the fully online design classroom becoming a reality.

Comments from design educators in this study resonate with the rapid transition to online design classrooms, mirroring industry trends:

> It increasingly doesn't make sense to have to do everything in person. So much computer based technical training can be easily done as virtual only workshops/lessons. A lot of one-on-one discussion is just as helpful as screen sharing over Zoom or similar. (DE45)

Although there were entrenched comments that face-to-face teaching is the only effective way to teach design, forward-looking design educators commented that their classroom technology could be translated to the design profession and hence better align design education to industry practices as is noted by various critics of current design education curricula [17, 27].

One design educator noted how they now purposefully strive for convergence of design education and industry practice:

> In Service Design, Design Thinking and related subjects, I have incorporated at least 1–2 tutorials online. This is to introduce students to virtual collaborative platforms such as Mural and Miro. The reason being that Low Contact Co-Design methods are now commonly used in the design industry and have proven to be effective in reaching broader participants, especially in exploratory and longer-term projects. I personally think that learning to design in and through [a] virtual environment would broaden student's understanding about co-design. (DE3)

A product design educator from the UK envisions the opportunity for education/industry alignment through more incorporation of online elements: "…there's real opportunity to take a close look at the theoretical spine of our programs and take the best of what we got from the whole online pandemic experience and craft a better student experience using that experience" (DE12).

4.6. Generative AI: The new frontier

The role of generative AI in design industry practice has also become an important dimension in discussing the changing shape of design studio pedagogy. Some design educators are embracing its role as a digital tool, while others see it as a job threat in certain domains [56, 57]. One design educator commented:

> AI is moving very quickly in terms of generating content, images and concepts and that's going to affect how creative people generate content. And that means that it will widen the types of people that are going to be capable of generating successful imagery and content. It's not going to be necessarily around people's ability of craft, but more so around the ability of verbalizing, internally and verbalizing ideas which will then be generated by the AI. So that's going to probably have a major impact on how you teach creativity. (DE31)

In a separate study focusing on German design educators, Fleischmann [8] found an existing concern among educators that generative AI will destroy the creative core of design by instantaneously creating design ideas without any human creative input. While the Internet is a powerful tool that can be searched quickly, generative AI has crossed a new technological threshold that raises a set of new, sticky problems for design educators. There is also concern in the design industry that generative AI will render some professions obsolete. Matthews et al. [17] questioned the future of graphic design. However, they highlight that this time, it is not only design educators but also design industry practitioners who are "poorly prepared for the impact of automation, AI and ML on them."

Table 3
Future role of online strategies in design courses

Survey question: Are you prepared to continue to adopt more online elements in your design courses in the next five years?	
Answer choice	Percentage (no of educators)
Yes, I will adopt more.	45% (26)
I will probably continue with what I currently use.	45% (26)
No, I have nothing adopted yet and won't in the near future.	10% (6)
Total	100% (58)

Table 4
The future of totally online courses

Survey question: Can you see yourself managing or teaching a totally online design course/program in the next 5–10 years?	
Answer choice	Percentage (no of educators)
Yes	28% (16)
Maybe	15% (9)
Probably not	52% (30)
I am already doing it	5% (3)
Total	100% (58)

5. Conclusion

The COVID-19 pandemic had the unintended consequence of bringing design education and industry practice closer together through the online transformation of studio pedagogy when the suite of skills desired by industry practitioners became part of the learning process. The results of this research suggest that the partition between the profession and design educators is narrowing, prompted by an increasing use and a higher acceptance of online technology.

After the pandemic, the majority of design educators are continuing to use online technology including cloud-based technology to enhance the physical design studio. Forward-thinking educators are seeing future opportunities to align with professional practice while still maintaining the key elements of studio pedagogy.

The adaptability of studio pedagogy remains robust, even in an online environment, where discussions, presentations of work, and collaboration can take place virtually and remotely. That creates conditions to reflect work practices and prepare students for careers in a wide variety of industries that employ decentralized, remote workforces connected and collaborating on the Internet.

Presumably, design educators have an eye on changes in their industry but need to continue to reflect those changes in their studio pedagogy. The requirements of the design industry are a moving target, framed by dynamic economic and social changes now accelerated through generative AI.

Generative AI, rapidly adopted by the design industry and public [17], presents challenges for integrating into higher education, including impacts on learner autonomy, cognitive development, biases, and copyright [58]. Despite these challenges, its industry relevance mandates its inclusion in design curricula, necessitating teaching strategies that foster critical thinking and creativity. Ethical concerns like bias, privacy, and intellectual property rights must be addressed alongside staying abreast of industry trends.

This task is challenging in practice. Design educators often find themselves stretched thin in their own lifelong learning when they strive to remain relevant to industry demands. It is imperative for institutions to take an active role in supporting this ongoing curriculum evolution. Regular professional development opportunities should be provided for design educators. Curriculum adjustment strategies should be flexible, institution-led, and based on collaboration between design educators and industry professionals to craft curricula that align with both academic standards and industry needs.

Ethical Statement

This study does not contain any studies with human or animal subjects performed by the author.

Conflicts of Interest

The author declares that she has no conflicts of interest to this work.

Data Availability Statement

The data that support this work are available upon reasonable request to the corresponding author.

Author Contribution Statement

Katja Fleischmann: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Writing – review & editing, Visualization, Supervision, Project administration.

References

[1] White-Hancock, L. (2023). Insights from Bauhaus innovation for education and workplaces in a post-pandemic world. *International Journal of Technology and Design Education*, *33*(1), 261–279. https://doi.org/10.1007/s10798-022-09729-2

[2] McLain, M. (2022). Towards a signature pedagogy for design and technology education: A literature review. *International Journal of Technology and Design Education*, *32*(3), 1629–1648. https://doi.org/10.1007/s10798-021-09667-5

[3] Crowther, P. (2013). Understanding the signature pedagogy of the design studio and the opportunities for its technological enhancement. *Journal of Learning Design*, *6*(3), 18–28.

[4] Shreeve, A. (2011). The way we were? Signature pedagogies under threat. In *The Researching Design Education: 1st International Symposium for Design Education Researchers*.

[5] Shulman, L. S. (2005). Signature pedagogies in the professions. *Daedalus*, *134*(3), 52–59.

[6] Fleischmann, K. (2021). Is the design studio dead? An international perspective on the changing shape of the physical studio across design domains. *Design and Technology Education: An International Journal*, *26*(4), 112–129.

[7] Park, J. Y. (2011). Design education online: Learning delivery and evaluation. *International Journal of Art & Design Education*, *30*(2), 176–187. https://doi.org/10.1111/j.1476-8070.2011.01689.x

[8] Fleischmann, K. (2023). German design educators' post-Covid challenges: Online, artificial intelligence (AI) and government data restrictions. *Design and Technology Education: An International Journal*, *28*(1), 135–153.

[9] Jones, D., & Lotz, N. (2021). Design education: Teaching in crisis. *Design and Technology Education: An International Journal*, *26*(4), 4–9.

[10] Sanders, E. B. N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *CoDesign*, *4*(1), 5–18. https://doi.org/10.1080/15710880701875068

[11] Voorberg, W. H., Bekkers, V. J., & Tummers, L. G. (2015). A systematic review of co-creation and co-production: Embarking on the social innovation journey. *Public Management Review*, *17*(9), 1333–1357. https://doi.org/10.1080/14719037.2014.930505

[12] Iriarte, I., Hoveskog, M., Ngoc, H. N., Legarda, I., Uranga, M., Nazabal, M., & Atxa, A. (2023). Service design for digital servitization: Facilitating manufacturers' advanced services value proposition design in the context of Industry 4.0. *Industrial Marketing Management*, *110*, 96–116. https://doi.org/10.1016/j.indmarman.2023.02.015

[13] Zallio, M., Grey, T., Boland, P., Kelly, H., White, P. J., & O'Ferrall, E. (2022). Online-based participatory design: A case study of developing international standards during a pandemic. *Strategic Design Research Journal*, *15*(1), 39–51. https://doi.org/10.4013/sdrj.2021.151.05

[14] Jackson, V., van der Hoek, A., Prikladnicki, R., & Ebert, C. (2022). Collaboration tools for developers. *IEEE Software*, *39*(2), 7–15. https://doi.org/10.1109/MS.2021.3132137

[15] Xu, J., Su, H., & Zhang, H. (2021). Research on design collaboration of aircraft digital mock up for suppliers. *Journal of Physics: Conference Series*, *2006*(1), 012066. https://doi.org/10.1088/1742-6596/2006/1/012066

[16] Sopher, H., Gewirtzman, D. F., & Kalay, Y. E. (2019). Going immersive in a community of learners? Assessment of design processes in a multi-setting architecture studio. *British Journal of Educational Technology*, *50*(5), 2109–2128. https://doi.org/10.1111/bjet.12857

[17] Matthews, B., Shannon, B., & Roxburgh, M. (2023). Destroy all humans: The dematerialisation of the designer in an age of

automation and its impact on graphic design—A literature review. *International Journal of Art & Design Education*, *42*(3), 367–383. https://doi.org/10.1111/jade.12460

[18] Christian, A. (2023). Why workers are still winning the return-to-office fight. *BBC Worklife*. Retrieved from: https://www.bbc.com/worklife/article/20230622-why-workers-are-still-winning-the-return-to-office-fight

[19] Barnes, C., Wragg, N., Fisher, E., Tyagi, S., & de Kruiff, A. (2022). Portfolio literacy and the transition to work for graphic design graduates. *International Journal of Art & Design Education*, *41*(2), 300–319. https://doi.org/10.1111/jade.12407

[20] Bridgstock, R., Tytler, R., & White, P. (2020). Do creative skills future-proof your job? Creativity and the future of work in an age of exponential technological advancement. In G. Hearn (Ed.), *The future of creative work* (pp. 245–258). Edward Elgar Publishing. https://doi.org/10.4337/9781839101106.00025

[21] Larsson, K. (2015). *The graphic designer as (a) digital Nomad*. Bachelor's Thesis, Dalarna University.

[22] Crosby, A., Pham, K., Peterson, J. F., & Lee, T. (2020). Digital work practices: Affordances in design education. *International Journal of Art & Design Education*, *39*(1), 22–37. https://doi.org/10.1111/jade.12231

[23] Lee, T., Pham, K., Crosby, A., & Peterson, J. F. (2021). Digital collaboration in design education: How online collaborative software changes the practices and places of learning. *Pedagogy, Culture & Society*, *29*(2), 231–245. https://doi.org/10.1080/14681366.2020.1714700

[24] Meyer, M. W., & Norman, D. (2020). Changing design education for the 21st century. *She Ji: The Journal of Design, Economics, and Innovation*, *6*(1), 13–49. https://doi.org/10.1016/j.sheji.2019.12.002

[25] van Laar, E., van Deursen, A. J. A. M., & van Dijk, J. A. G. M. (2022). Developing policy aimed at 21st-century digital skills for the creative industries: An interview study with founders and managing directors. *Journal of Education and Work*, *35*(2), 195–209. https://doi.org/10.1080/13639080.2022.2036710

[26] Vita, J. (2023). A dialogue about experiences of collaboration in design practice. *The Design Journal*, *26*(1), 173–183. https://doi.org/10.1080/14606925.2022.2144551

[27] Brosens, L., Raes, A., Octavia, J. R., & Emmanouil, M. (2023). How future proof is design education? A systematic review. *International Journal of Technology and Design Education*, *33*, 663–683. https://doi.org/10.1007/s10798-022-09743-4

[28] Nielsen, E. J. L. (2019). *Employability strategies used by creative industries graduates*. PhD Thesis, Queensland University of Technology.

[29] Design Council. (2018). *Designing a future economy: Developing design skills for productivity and innovation*. Retrieved from: https://www.designcouncil.org.uk/fileadmin/uploads/dc/Documents/Designing_a_future_economy18.pdf

[30] Schön, D. A. (1987). *Educating the reflective practitioner: Toward a new design for teaching and learning in the professions*. USA: Wiley.

[31] Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. USA: Prentice-Hall.

[32] Hart, J., Zamenopoulos, T., & Garner, S. (2011). The learningscape of a virtual design atelier. *Compass: Journal of Learning and Teaching in Higher Education*, *2*(3), 1–15. https://doi.org/10.21100/compass.v2i3.45

[33] Jones, D. (2021). Making little things visible. *Design and Technology Education: An International Journal*, *26*(1), 8–11.

[34] Wragg, N. (2020). Online communication design education: The importance of the social environment. *Studies in Higher Education*, *45*(11), 2287–2297. https://doi.org/10.1080/03075079.2019.1605501

[35] Lotz, N., Jones, D., & Holden, G. (2015). Social engagement in online design pedagogies. In *Proceedings of the 3rd International Conference for Design Education Researchers,* 1645–1668.

[36] Thompson, J., Tregloan, K., Soccio, P., & Song, H. S. (2021). Dual delivery design studios: Exploring design learning for hybrid cohorts. *Design and Technology Education: An International Journal*, *26*(4), 221–238.

[37] Fleischmann, K. (2022). A paradigm shift in studio pedagogy during pandemic times: An international perspective on challenges and opportunities teaching design online. *Journal of Design, Business & Society*, *8*(2), 247–272. https://doi.org/10.1386/dbs_00042_1

[38] Tessier, V., & Aubry-Boyer, M. P. (2021). Turbulence in crit assessment: From the design workshop to online learning. *Design and Technology Education: An International Journal*, *26*(4), 86–95.

[39] Nubani, L., & Lee, E. (2022). Sense of classroom community in interior design studios: In-person learning versus online learning approaches. *Journal of Interior Design*, *47*(2), 51–70. https://doi.org/10.1111/joid.12217

[40] Spruce, J., Thomas, P., & Moriarty, S. (2021). From sharing screens to sharing spaces. *Design and Technology Education: An International Journal*, *26*(4), 96–111.

[41] Hepburn, L. A., & Borthwick, M. (2021). Synchronicity in the online design studio: A study of two cases. *Design and Technology Education*, *26*(4), 71–85.

[42] Golightly, L., Chang, V., Xu, Q. A., Gao, X., & Liu, B. S. (2022). Adoption of cloud computing as innovation in the organization. *International Journal of Engineering Business Management*, *14,* 18479790221093992. https://doi.org/10.1177/18479790221093992

[43] Soler-Costa, R., Lafarga-Ostáriz, P., Mauri-Medrano, M., & Moreno-Guerrero, A. J. (2021). Netiquette: Ethic, education, and behavior on internet—A systematic literature review. *International Journal of Environmental Research and Public Health*, *18*(3), 1212. https://doi.org/10.3390/ijerph18031212

[44] Kaushik, V., & Walsh, C. A. (2019). Pragmatism as a research paradigm and its implications for social work research. *Social Sciences*, *8*(9), 255. https://doi.org/10.3390/socsci8090255

[45] Prasad, M. (2021). Pragmatism as problem solving. *Socius*, *7*, 2378023121993991. https://doi.org/10.1177/2378023121993991

[46] Punch, K. (2009). *Introduction to research methods in education*. USA: SAGE Publications.

[47] Wright, K. B. (2005). Researching internet-based populations: Advantages and disadvantages of online survey research, online questionnaire authoring software packages, and web survey services. *Journal of Computer-Mediated Communication*, *10*(3), JCMC1034.

[48] Morse, J. M., & Niehaus, L. (2009). *Mixed method design: Principles and procedures*. USA: Left Coast Press.

[49] Kiger, M. E., & Varpio, L. (2020). Thematic analysis of qualitative data: AMEE guide no. 131. *Medical Teacher*, *42*(8), 846–854. https://doi.org/10.1080/0142159X.2020.1755030

[50] Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

[51] Thody, A. (2006). *Writing and presenting research*. UK: SAGE Publications.

[52] Radhakrishna, R., & Doamekpor, P. (2008). Strategies for generalizing findings in survey research. *Journal of Extension*, *46*(2), 22.

[53] Meterko, M., Restuccia, J. D., Stolzmann, K., Mohr, D., Brennan, C., Glasgow, J., & Kaboli, P. (2015). Response rates, nonresponse bias, and data quality. *Public Opinion Quarterly*, *79*(1), 130–144. https://doi.org/10.1093/poq/nfu052

[54] Koçak, Ö. (2024). Adapting the flipped classroom model to a design course in online learning environments: A case study. *International Journal of Art & Design Education*, *43*(1), 51–66. https://doi.org/10.1111/jade.12481

[55] Peng, F., Kueh, C., & Cetinkaya Sendas, M. (2023). Design pedagogy in a time of change: Applying virtual flipped classroom in design higher education. *Journal of Design, Business & Society*, *9*(1), 41–56. https://doi.org/10.1386/dbs_00045_1

[56] Huang, Y. C. J., Wensveen, S., & Funk, M. (2023). Experiential speculation in vision-based AI design education: Designing conventional and progressive AI futures. *International Journal of Design*, *17*(2), 1–17. https://doi.org/10.57698/v17i2.01

[57] Meron, Y. (2022). Graphic design and artificial intelligence: Interdisciplinary challenges for designers in the search for research collaboration. In *DRS2022: Bilbao*, *1–16*.

[58] UNESCO. (2023). *Guidance for generative AI in education and research*. Retrieved from: https://unesdoc.unesco.org/ark:/48223/pf0000386693

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