TAKING STUDIOS VIRTUAL AND ELEVATING CRAFT

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Abstract

In early 2020, faculty were asked move our fashion materials studios online. In a program where the pedagogy emphasizes practice using state-of-the-art technology and equipment, students lost studio spaces and an environment that encouraged collaboration with experts and peers, and they lost access to the most important design, development, and prototyping techniques in their toolbox. Faculty sought new pedagogies and innovative ways of teaching and practicing, developing novel approaches by finding innovative ways to meld centuries-old techniques with digital tools in a virtual environment. Unexpected benefits were gleaned as students embraced handcrafting processes as a means of enriching their design process and outcomes and expanding their breadth of knowledge. Over time, students were able to integrate both approaches in their practices, advancing their design processes and furthering their thoughtful exploration of fashion materials. Holistic integration of craft and technology engaged students in understanding through haptic perception and material intelligence. This paper focuses on the role going virtual with studio courses played in enhancing students' integration of craft and technology in creating the materials of fashion. Through case studies of three technology-based courses, we discuss how a deeper exploration of craft and increasing the role of the designer's hand in making unexpectedly enhanced creativity and breadth of design outcomes. We analyze the impact of integrating craft techniques on student work and on their approach to design through a critical analysis of student projects and learnings. We also discuss the novel ways in which students interlaced craft materials and processes with digital tools. Our aim is to contribute to the larger discussion related to design, technology, and craft and to explore how this intersection can expand the development of design methods and new aesthetics.

Introduction

In early 2020, faculty were asked to do what was previously considered unthinkable; move our fashion materials studios online. The pedagogy in the Fashion and Textile Design program in our university emphasizes practice using state-of-the-art technology and equipment. Our students rely heavily on industrial CAD systems and tools, and production scale prototyping equipment, becoming highly skilled in digital design and the use of industry-standard software programs and practices. In addition to losing studio space and an environment that encouraged collaboration with experts and peers, students lost access to the most important design, development, and prototyping techniques in their toolboxes. With many of these industrial technologies inaccessible, faculty sought new pedagogies and innovative ways of teaching and practicing in our curriculum. Instructors developed novel approaches to teaching by introducing handcrafting practices and finding innovative ways to meld centuries-old techniques with digital tools in a virtual environment.

Though many of the consequences of this pedagogical shift were anticipated and challenging, unexpected benefits were gleaned from the experience. Students embraced the handcrafting processes, not as a replacement for technology but as a means of enriching their design process and outcomes and expanding their breadth of knowledge. Over time, as we developed electronic methods to ease back into working with the extensive industrialtechnologies, we found that many students did not abandon the crafting processes or forego leveraging the technology. Rather, they were able to integrate both approaches in their practices, advancing their design processes and furthering their thoughtful exploration of fashion materials. This is consistent with Cyr's (2014, p. 2) conclusion in her study of craftsmanship and technology that "craftsmanship brings new modes of thinking and engaging" to design and the materiality of fashion. Holistic integration of craft and technology engaged students in understanding through haptic perception and material intelligence.

This paper focuses on the role going virtual with studio courses played in enhancing students' integration of craft and technology in creating the materials of fashion. Through case studies of three technology-based courses, we discuss how deeper exploration of craft and increasing the role of the designer's hand in making unexpectedly enhanced creativity and breadth of design outcomes. We analyze the impact of integrating craft techniques on student work and on their approach to design through a critical analysis of student projects and learnings. We also discuss the novel ways in which students interlaced craft materials and processes with digital tools. Our aim is to contribute to the larger discussion related to design, technology, and craft and to explore how this intersection can expand the development of design methods and new aesthetics.

Background

When working with textile handicraft techniques, such as handweaving, knitting, or needlepoint, one develops an embodied understanding of material properties and behavior. Balanced tension, for instance, is difficult to grasp until one feels the material pulled taut or slacking. Identifying the textural variance between different yarns is possible through visual assessment, but handling the fibers themselves leads to a deeper, instantaneous understanding. This haptic knowledge is something design researchers have attempted to theorize for the past several decades. Anni Albers discussed the inability to articulate the knowledge gained from working with materials, but felt that it was a type of internal awareness that can be described as tacit knowledge (Albers, 1959). In 1983 Schön (as cited in Bye, 2010) developed the concept of the reflexive practitioner which is based on the idea that understanding is something that develops during the process of design. Johnson (2007) went on to build on this theory by advancing the concept that knowing involves action and practice, meaning that the design process serves as the basis of understanding when it is practiced with reflection, critique and creativity.

The benefits of integrating hand techniques into the design process have been documented in previous research. Philpott (2012) found that innovation in textile production was generated through the designer’s physical response to the behaviors of the material, something that was not possible when designing in a digital interface. This was echoed in Pinski, Evans and Kane’s (2019) study that examined the integration of handwoven textile processes in commercial footwear design. They found that introducing handweaving techniques early in the design process fueled innovation, generated in-depth knowledge, and enhanced control in decision-making. Further considerations related to material properties and product design were approached simultaneously, leading to improved design outcomes.

Today, textile and fashion designers are increasingly using digital design tools to conceptualize and develop commercial applications. 3D software, for instance, is being used as a hybrid design and prototyping tool and is even being expanded for merchandising and marketing visualizations (McQuillan, 2020). Petreca (2017) argues that digital design tools should augment, not replace, a designer’s embodied experience and that it is critical to maintain bodily engagement in the design process. While digital tools provide undeniable value in improving efficiency and reducing material waste, relying heavily on digital design methods can also limit discoveries and the innovation that is generated from hands-on making. Contributions of materials designers who embrace hand crafting techniques evidence the value this brings to materials of fashion. For example, most of Rebecca Atwood’s designs begin as sketches in watercolor, gouache, or simple pen and ink (https://rebeccaatwood.com/pages/process) and end up in beautiful home fashions like those for Pottery Barn (Holdefehr, 2020). Iconic designer Dame Zhandra Rhodes also begins her textile design process by sketching or painting on paper (Bowers, 2011).

The improved problem solving skills that designers gain from grappling with materials is reduced when working digitally from ideation through design finalization, then engaging with materials only when ready to prototype. The haptic knowledge gained from engaging with materials off the screen can play a critical role in expanding the design process. One only has to imagine detangling a string visually to acknowledge the significance of touch asa means of figuring something out. In the context of higher education, textile design programs are challenged to prepare students for an industry that is centered around digital design methods, while ensuring that students acquire a foundational understanding of material properties and textile construction techniques. Industrial CAD programs can be highly complex and require tremendous amounts of time and practice to develop competency.Balancing this with slow and laborious hand processes in a four year program is difficult, not only because of the time, but also the cost of materials, tools, programs, and skilled faculty required to teach each skill set.

This is further complicated when taking into account the historical underpinnings that have positioned craft and industry in opposition to one another. In his seminal book, “The Craft Reader”, craft theorist Glenn Adamson examines the Arts and Crafts movement as well as contemporary “DIY” revivals, arguing that craft holds a vital presence in industrial production (Adamson, 2018). Still, the marginalization of craft in fine art and design can be found in the pedagogical priorities of higher education and design aesthetics. Even with the revival of handicraft techniques, negative connotations of craft are commonplace.

In an institution that is known for innovation and technologically advanced collaborations with industry partners, it can be difficult to imagine a place for handcraft. Our curriculum focuses on CAD design processes and utilization of our state of the art industrial facilities.

Students graduate with advanced skills in digital and technical design, in large part due to this emphasis on industry standard CAD programs. The irony that moving courses online to a virtual space ushered in an emphasis on handcraft processes is the focus of our paper. In the following three case studies, we examine novel ways faculty integrated hand techniques to replace access to technology and equipment. We critically analyze student work to locate the ways in which students expanded their design practices with new hand processes and modest materials. The case studies presented are in sequential order within the four year, cohort based undergraduate curriculum.

Case Study 1

Yarn Design Studio is a second year course that introduces students to the yarn design process. In a typical semester, students complete a series of exercises that range from classifying yarn to creating and dyeing their own yarns, and then applying yarns to a fabric through knitting, braiding and weaving techniques. Throughout the course, students develop an understanding of yarn so they can effectively choose appropriate fibers for textile applications. Outcomes of the course include a physical binder with samples and a final project focused on combinations of techniques learned in the semester. The use of industrialequipment is heavily emphasized and several exercises rely entirely on industrial technologies. For instance, some exercises include yarn analysis using ASTM standardized physical testing equipment, and yarns and fibers are dyed with industrial lab equipment.

When exercises involve the use of hand techniques to aid understanding, they are often paired with technology-based practices. Examples include hand braiding later executed on industrial braiding equipment, hand spinning that is then translated to industrial spinning machinery, or hand knitting later executed on knitting equipment. The exercises result in hand-produced samples and larger industrial samples that students can compare to investigate the differences. Often, students are so enamored with the efficiency of the industrial machinery that they lose focus of the importance of hand techniques to their learning.

When the course moved online, both the structure and the content changed. While biweeklymeetings continued online, the length of the synchronous class time was reduced allowing students to work on exercises at their own pace off screen. With no access to industrial equipment, all of the class design exercises focused on hand development processes.

Handcraft techniques that were added include needle felting, rug hooking and macramé knotting. Students were provided with a supplies packet including items such as drop spindles, wool roving, needle felting materials, knitting needles, rug hooking supplies and aselection of yarns. Lectures related the hand techniques to industrial processes, and exercisesthat had previously relied on industrial lab equipment were adapted for execution by hand at home. Fiber and yarn dyeing techniques were recreated with at-home ingredients of food coloring and vinegar. Spinning was done on drop spindles, and yarn analysis was carried outby visual and physical observation. At the end of the semester a digital portfolio documentingall exercises was submitted in place of the physical binder usually required.

After the initial exercises, students were assigned to create a final collection of soft productsfor the home using the techniques they had learned. For this collection students could use acombination of handmade samples and digital simulations to convey their ideas on a larger scale. Adding the digital CAD component enabled students to see their material concepts through to a final large-scale application and evaluate how the materials translate into application.

The course changes came out of a necessity, yet several benefits led to students' deeper understanding of the materials and innovative ways of working with them. Allowingadditional time for material engagement deepened understanding. In actually feeling the fibers draw into the yarn during hand spinning and observing the fibers binding together during needle felting, students could engage more closely with the materials. Severaldeveloped a passion for the processes, continuing on with spinning, felting, macramé or rug

hooking, long after the class was completed. A couple of students independently investigateddyes after the home dyeing exercise, experimenting with coffee, tea and other natural dyeingmethods.

It was noted that this group of students was more open to experimenting and mixing materialsthan previous students who had taken this class. Some students experimented with weavingor knitting using unconventional materials such as plastic bags, rubber bands or plants. Others took to creating and weaving on alternative looms like an embroidery hoop, plastic bin and a loom created from found sticks. Experiments with unique combinations ofmaterials, such as wool roving needle felted to velvet or knotted macramé that was then painted, were seen. It is possible this openness to experimentation came out of a deep engagement and curiosity about the materials and process.

The time spent with hands-on making and craft became a critical outlet for the students in atime when all of their education was also virtual. The focused energy on craft provided a respite from the virtual time on the computer, as students highlighted in their class evaluations.

Case Study 2

In Woven Textile Design Studio I, students in their third year are introduced to handweavingthrough the use of 16-shaft computer assisted dobby looms. The dobby looms use electronicdevices to lift the shafts during weaving, driven by weave drafts created in the woven designsoftware program, WeavePoint. Students learn how to create weave drafts of woven structures and patterns in WeavePoint. The design process requires both digital and physicalprocesses as pixelated patterns are translated into physical woven material. To students whohave never woven on a floor loom, this introduction to weaving is somewhat abstract, as thedigital pattern comes first. It is only once the student begins weaving that they are able to see firsthand how yarns impact a pattern, how colors interact, or how the woven fabric behaves. WeavePoint software allows students to explore complex structures and engage inrapid experimentation.

When the course moved online, content had to be completely redesigned as students lost access to the dobby looms, WeavePoint software, and essential tools and materials. 18-inchwide tapestry looms replaced the computer controlled 16-shaft looms, and students were taught how to set up their looms with four leashing bars, or heddle rods that allowed four- shaft structures to be woven without having to manually thread the weft over and under warpends. The aim was to continue exploration of basic woven structures and complex patterningto create fabric for design applications.

In many cases students developed refined designs that concealed the use of the tapestry loom. Especially when mapped onto products, these handwoven samples almost appear as durable,

Industrially woven fabrics. As students gained confidence in weaving and in understandingwoven structure development, experimentation was pushed further. The flexibility of the tapestry loom and the ability to manipulate patterns was leveraged.

Much of this experimentation was self-directed as students made discoveries at the loom. The ability to develop patterns *while* weaving, rather than ahead of time on a screen, allowedstudents to make real time connections between interlocking threads and visual or textural effects. There was not a digital weave draft leading the development of the fabric; it was thestudents themselves, who could change course and try new techniques at any point. The slower pace of working fostered ref6lection and observation, which led to a productive curiosity. For example, one student discovered his pattern was manipulated by an area of warp yarns that were slack on the loom. He decided to exaggerate the imbalance of the warptension to see how the optical effects of the pattern could be enhanced. Clearly this is not ideal for commercial textiles, but as “idea fabrics” these techniques served as a starting pointfor further development.

For the final project, students created collections for applied design applications, such as home furnishings or apparel, or they could develop experimental weavings focused on textural effects. In each case, the expectation was to further refine techniques learned previously or to research new techniques independently. For students who wove collections,a significant amount of time was spent rendering woven samples into “digital yardage” andmapping fabrics onto commercial applications. These projects did not carry the language ofcraft or show signs of tapestry weaving as traditional weaving techniques were not utilized. Students rather displayed their understanding of weave drafting through pattern variations that they developed on their own.

One of the fourteen students built a physical product, a headboard woven with 1” wide leather strips. This weaving was completed without the use of a loom, and required the student to develop her own method of securing strips of material together. As students werenot stationed at a floor loom throughout the semester, they were accustomed to setting up tapestry looms, carrying them around, and taking their weavings off again and again. In contrast to setting up a dobby loom, which can take up to a week to complete, the warping of the tapestry loom can be achieved in less than a few hours. This flexibility, and the simplicity of the loom, deemphasized the equipment itself, and enabled students to think ofweaving in ways that are not dependent on a loom. While it is difficult to imaginetransitioning from a 16-harness pattern on a dobby loom to loom-free weaving, it is less of aleap to go from a handheld loom to a table top.

For the students who explored tapestry techniques, a range of effects were achieved. One student focused on discontinuous wefts to create asymmetrical compositions with varying density. Open areas with leno lace patterns were contrasted with dense sections of plain weave. While complexity in structure was not the emphasis in this case, experimentation with material and the weaving process itself is visible. There is a sense of spontaneity that comes across as decisions were made throughout the process to leave areas unwoven. Tapestry weaving lends itself to this way of working, compared to a computer controlled loom. For example, one can decide to work on the entire left side of a weaving on a tapestryloom before moving on to the right. On a floor loom, one is confined to building the weavingline by line, from the bottom up. Any change in pattern requires stopping the weave functionand loading a new weave draft. The interactive nature of tapestry weaving gives the weaver,again, a sense of control and freedom from the loom set up. From a teaching standpoint, onecan see how this may lead to greater confidence in the process.

In reviewing what students gained from working with the tapestry looms, one of the greatestbenefits was perhaps the opportunity to experiment with a wide range of handweaving techniques. Because it was not feasible to focus exploration on complex weave structures inthe same way one can on a dobby loom, students were challenged to improvise and push thepotential of tapestry weaving. The areas of exploration include irregular warp spacing, warppainting, discontinuous wefts, alternative materials, off-loom weaving, leno weaving, imbalanced warp tension, and pictorial w[7]eaving techniques. Students also made discoverieson how to integrate handweaving techniques with digital tools. For example, students translated pixelated images to weavings through printed grids that were then used as guides.The creation of “digital yardage” from handwoven samples also required a new skill set to digitally resolve irregularities in the fabric.

Throughout the semester, students made connections at the loom, rather than dividing the process between a digital design phase and physical making. This in large part led to confidence that enabled robust experimentation. There was little hesitation in trying something new, whereas students in previous semesters were tasked with learning how to operate complex equipment and a new CAD program, while also learning foundations aboutbasic weave structures. Independent problem solving is difficult in this scenario as the loommust be set up properly and settings in weave drafts must be correct in order for the loom tofunction. Working on a tapestry loom, however, is more forgiving. One can easily see how weave structures form and when errors are found, it is possible to explore solutions withouta significant penalty if one fails.

It was also empowering for students to see that tapestry weaving, a process they could do athome with simple equipment and minimal supplies, can be used as a sophisticated design and development tool for commercial fabrics. Emphasis was placed on contextualizing the woven samples as conceptual prototypes that could potentially be expanded for industrial use. Mid Centuryexamples were discussed in class, such as Dorothy Liebes’s handwoven works and her collaborations with industry partners. Students found inspiration in the potential of bringing the craft of handweaving to commercial applications.

Case Study 3

The third case focuses on a fourth year collection studio for materials designers. Asconceived, it is a capstone experience for students who have previously had two and a half years of courses learning specific technology-focused techniques. The prerequisite courses include computer aided textile design, yarn development, weaving with computer assisted looms, flat bed knitting with computer driven knitting machines, machine garment knitting and electronic jacquard weaving. In each of these studios, students learned in parallel complex software, machine and production variables and designing for a given output. Littletime is left for exploring slow processes associated with manual craft.

However, the first group of fourth year students to return to campus as pandemic restrictionsbegan to ease brought with them a very different prior learning experience. They had spent nearly a year engaged in virtual studio learning, without access to production equipment that provided the cornerstone of their learning. In non-pandemic times, working alongside skilled technicians to produce their designs on powerful production equipment brings the learning home for students. In those moments as their designs are actualized, ideas that seemed esoteric and unimportant begin to evolve into meaningful knowledge enabling the student designers to push the machines and materials. But without access to the equipment, understanding of how a digital concept might translate to a physical production sample suffered. These students' electronic jacquard weavi8ng and garment knitting studios took place remotely with students unable to experience translating their digital concepts to physical output. In electronic jacquard weaving, for example, these students never got to experiment with new materials and constructions on the electronic jacquard loom, a typicalexperience in the course. They struggled to grasp concepts of scale, repeating pattern and aesthetics of a physical output as they demonstrated less confidence in the jacquard process.At the same time, their appreciation of handcrafted design methods increased. They embraced small tapestry looms for creating rich woven textures and colors, actualizing designs in real time informed by the materials they touched. By the time they returned to campus for their capstone studio, they were deeply engaged in handcrafting with textile materials. With many of their courses online, they also continued to welcome the respite that handling textile materials provided from virtual experiences.

Not only did fourth year students bring novel handcrafting experiences into their capstone studio, they also returned to an environment different than the one they had experienced pre-pandemic. Despite being in-person again, production labs remained inaccessible due to COVID-19 protocols. Interactions with technicians and lab managers were electronic and asynchronous, as they had been the previous semester for remote courses. Even being back in the studio, they were distanced from the textiles being created as well as the yarns and fibrous components. Furthermore, they were distanced from the technicians producing the textiles and separated from the sensory experience of material being produced. The rhythmicsounds of the machines and visual sensation of watching their materials come to life on the production machines was absent. Conversations with knowledgeable technicians that often took place alongside a weaving or knitting machine, the conversations that empowered students to push the equipment and their own creativity, still did not happen. Instead, studentsremained isolated from the transformation of idea to physical industrial sample. This limited iterative development in prototyping and creativity in output. After having limited experience on key production technologies during their prerequisite virtual studios, and distanced from the translation of vision to tangible material, students struggled incorporatingindustrially produced materials into their collections.

As the semester progressed, collections began to evolve. Students found ways to integrate techniques and handcrafted methods they had practiced in the preceding year with technology-driven processes. Despite needing to develop digital files to have materials woven, knitted, or printed on industrial equipment, many began the design process by bringing their hand to the computer screen. Balancing hand techniques with the need for a digital result, they embraced the opportunity to move fluidly from drawing to digital designelement to designed textile. They also found ways to overcome their distance from the industrial material outputs by bringing their hand to the fabrics in post-production. Embroideries and beading accented digital textile prints and wovens. Tufted rugs and textural hand woven wall hangings lived side by side in diverse collections that showcased a wide range of both technology and craft intensive methods. Sculptural macramé pieces interplayed with digitally printed wallpapers and jacquard wovens. Handcrafted tassels and braids detailed larger pieces created from industrially produced materials. Where the materials demonstrated faltering confidence with designing for industrial outputs, the integration of handcrafted methods expanded the range of work, elevating the collections.

Conclusion

In previous work, sensory input was found to be integral to the creative aspects of cognition (Treadaway, 2007). Through online delivery and the adaptation of three technology-based courses, we are able to see how the deeper exploration of craft and materials combined with digital technologies enhanced the creativity and breadth of design outcomes. The increase inengagement with materials contributed to a strong foundation in technical and conceptual understandings. This is consistent with work by Pinski, Kane and Evans (2018) who noted that digital methods provided breadth, while hands-on work provided great depth in understanding.

Treadaway (2006) reported that making by hand provides sensory input that informs practiceand encourage emotional expression that can be lacking in digital outputs. This wasevidenced in our study as students engaged more closely with the tools, techniques, and materials and took the time to discover and process the craft at their own pace when workingwith craft based approaches. Instead of moving quickly to more advanced technology, the slowing down and focus on process led students to develop labor intensive works that demonstrate their solid knowledge in foundational concepts. This emphasis on craft also fostered experimentation. Students took on rigorous investigations in traditional techniquesand developed inventive processes. Whereas the focus on exploration in these courses has typically been found in digital design methods, the shift to handcraft led to inquiries in constructing, manipulating, and expanding textile applications. Many ideas were generated from the materials themselves as students approached design in a new craft-based way of working.

There was also a new area of exploration in the language of craft. Design outcomes displayed exaggerated textures, experimental hand techniques, surface embellishments, and an emphasis in materiality. Displaying this textural work online was in many ways a poor replacement for in-person critiques; however, students were also able to share high resolutionclose-up images which captured details that may not be visible when reviewing work on a wall. The impact of viewing textiles via photographs was referenced in T'ai Smith's paper, *Limits of the Tactile and the Optical: Bauhaus Fabric in the Frame of Photography* (2006).Smith discusses how there was a shift in the early 1930s when photographs used inpublications for the Bauhaus transitioned from background wall hangings in architectural spaces to highly detailed, close-up photographs. Smith states, "...weavinghad the fortune of gaining a place in the spotlight, for the intimacy of a woven texture was particularly suited to the scrutiny of the lens. The slight swellings, recesses, and shadows producedby the crossing of weft and warp, the way the fabric folded or creased, or the subtlety of the tactilesensations generated by wool against cellophane seemed infinitely refined when framed by the sharpfocus of a precise optical apparatus." (Smith, 2006; page 7) While this was not articulated as eloquently by our students, a similar discovery is evidenced by their leveragingof photography to highlight detailed textures in digital format. This has been so impactful that as we have returned toin-person learning, critiques have been reformatted to continue emphasizing digital presentations, as well as physical projects.

The integration of craft and digital technologies also enabled students to see their material co1n0cepts through to large-scale applications. Small samples made by hand and then simulated through CAD software allowed students to imagine how their handcrafted materials could be applied to full scale, commercial products. Digitally produced materials were also enhanced with handcrafted details leading to new textural effects. This fluidity between hand and digital tools expanded student collections and led to new ways of workingthat pulled the hand into digital processes.

Treadaway (2007) noted that future research was needed to understand the role of making by hand in creative insight and how digital tools could complement this. In this work, providing an opportunity to engage with craft techniques and making by hand as a means ofgrasping foundational concepts and as a form of creative expression has proven to be highlyvaluable to our students. Going forward, it has become clear that integrating the hand with the digital not only enhances design outcomes, but also empowers students to expand their design processes. In our technology-led program, hand techniques have taken on greater importance. Craft is now more than merely inspiration for digital designs; it is a vibrant language, process, and approach that holds a critical space in contemporary design pedagogy.As noted by Treadaway (2007) understanding how to most effectively support creative cognition by integrating craft and digital approaches in teaching woven design is a rich areafor further study.

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