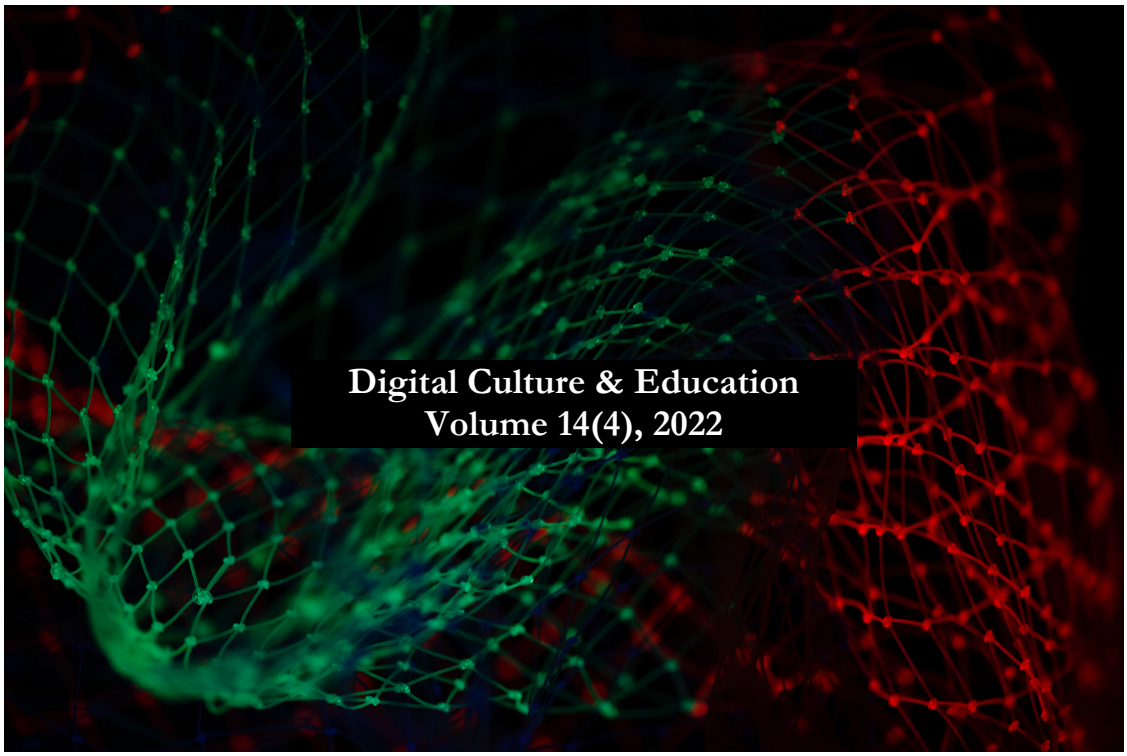

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Working with/in the tensions: educational technology as feminized craftwork

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WORKING WITH/IN THE TENSIONS: EDUCATIONAL TECHNOLOGY AS FEMINIZED CRAFTWORK

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Abstract: *This paper argues that the literature of feminized craftwork offers insights for understanding educational technology as a tension-negotiating practice through which we might learn to see and experience alternate possibilities for the field of educational technology. Post-human and socio-materialist education technology researchers have focused on learner usage of existing objects and environments, while educational technologists have emphasized the collaborative and affective labour involved in their work. These realities have sustained boundaries and silences between different theory-based and practice-based forms of educational technology knowledge. Practices from feminized craftwork, including enacting agency, engaging in collaboration, and reworking possibilities, offer an alternative approach that involves actively engaging with the tensions in between essentialist-instrumentalist, object-affect, and individual-collaborative binaries. Practice-based examples of 'Phonar,' 'Domains of One's Own' and 'FemEdTech quilt' are used to illustrate feminized practice in action, and the tensions of educational technology that require negotiation.*

Keywords*: educational technology; intra-activity; feminized craftwork; sociomaterialism*

Introduction

Educational technology scholars have advocated for research and practice that considers "the organizational, political, economic, and cultural factors that pattern the design, development, production, marketing, implementation, and 'end use' of a technological artifact" (Selwyn and Facer, 2013, p. 10). The field has, however, struggled to engage with these complexities and the uncomfortable tensions they generate. Post-human and socio-materialist education technology researchers have focused on learner usage of existing objects and environments (Bayne, 2015a; Gourlay, 2020; Knox, 2014). At the same time, educational technologists have often emphasized the collaborative and affective labour involved in their work (Gray, 2020; McGowan and Skallerup Bessette, 2020). The result has been two, distinct 'analytic cuts' (Barad, 2003) that have often sustained artificial boundaries and silences between different theory-based and practice-based forms of educational technology knowledge in ways that hold essentialist-instrumentalist, object-affect, and individual-collaborative binaries in place.

Selwyn *et al.* (2020, p. 5) argued that critical educational technology researchers ought to pay attention to emerging hybrid areas of inquiry "forming in-between the computational and social sciences." Feminized craftwork represents such an area of hybrid inquiry. From 'traditional' craftwork, including sewing and weaving, to 'modern' socio-materialist digital design, feminized craftwork is a long-standing, applied study of material-making (Rosner, 2018). It therefore centers 'intra-active' *practice,* emphasizing *how* we simultaneously make and are made (Barad, 2003). In the process, it challenges conventional notions of agency, time, and our relationships with the material "things" (Braidotti, 2002). Moreover, the scholars of feminized craftwork seek to draw in diverse people and practices that have previously been excluded (Rosner, 2018).

Throughout this theoretical paper, I argue that the literature of feminized craftwork offers insights for instead understanding educational technology as a tension-negotiating *practice* through which we might learn to *see* and *experience* alternate possibilities in our field. Braidotti (2019, p. 49) advocated for the re-territorializing and re-composing knowledge by "creating multiple missing links, opening generative cracks and inhabiting liminal spaces." By exploring the tension-negotiating practices of feminized craftwork, I seek to open generative cracks that provoke new ways of thinking about educational technology as a practice of "working with/in the tensions."

Feminist scholars have long-argued, research is neither objective nor neutral (Lather, 1991). My experiences as a white distance education student, educational technologist and researcher shape my work (Elias, 2021). I am also shaped by my experiences learning to sew with my Inuit mother-in-law. Over a period of approximately 10 years, she not only taught me to sew both with a machine and by hand, but she also challenged me to think differently about everything, including educational technology (Elias, 2022). I write, therefore, from in-between spaces, in ways intended to trouble the practitioner-researcher, teacher-learner, indigenous-settler and digital-analog binaries. In doing so, my goals are both to foreground the important work of educational technologists in the critical educational technology literature (Eynon, 2018), and to stimulate educational technologists to engage in their own day-to-day practice as a tension-negotiating craft.

Moreover, in connecting the practices of feminized craftwork to those of educational technologists, I seek to "reconstitute not only the missing links in academic practices, but also and especially the missing people" (Braidotti, 2019, p. 51). To this end, I draw into this paper the experiences of globally dispersed women engaged in 'traditional' craftwork, including sewing and weaving, whose expertise as skilled technologists has historically been overlooked. I am keenly aware of the situated nature and nuances that surround diverse examples of feminized craftwork and take care to neither flatten nor displace their situated histories (Rosner, 2018). With these risks in mind, I nevertheless proceed knowing that it is at such intersections "where struggles over

meaning, cultural practices and economic processes take place and globalization plays out in the everyday" (Gajjala and Zabibha, 2013, p. 82).

From this position, I begin this paper by comparing educational technology as described by posthumanist and sociomaterialist educational researchers and educational technologists themselves. I then argue that these approaches represent specific 'analytic cuts' (Barad, 2003) that often sustain silences and further entrench three binaries: instrumentalism-essentialism, individual-collaborative and object-affect. I further argue practices from feminized craftwork, including enacting agency, engaging in collaboration, and reworking possibilities, offer alternatives. Finally, I introduce three of examples educational technology that illustrate these tension-negotiating practices in action: Phonar, Domains of One's Own and the Fem EdTech quilt. Throughout this process, I challenge educational technology researchers and practitioners to think differently about our field so that we might meet "the challenges of contemporary transformations with creativity and courage" (Braidotti, 2007, p. 72).

Beyond tools and towards posthumanist and sociomaterialist theory

Over the past 30 years, much has been written about the both the transformational potential and threat of new digital technologies within education (Sancho-Gil, Rivera-Vargas and Miño-Puigcercós, 2020). During that time, instrumentalists have argued that these educational technologies "act as enablers to achieving the universal right to education" (Caswell *et al.*, 2008, p. 2), something that can be completely mastered. Conversely, essentialists describe these same technologies as something over which we have little to no control (Clegg, Hudson and Steel, 2003). In both cases, however, educational technology has typically been depicted as a set of technical 'things,' something Latour (1987) called 'ready-made' technology in which digital products are treated like black boxes.

Bayne (2015a, p. 10), however, argued that these over-simplified definitions of educational technology served to isolate technological tools from their social contexts in a way that "robs the field of its complexity and richness, reducing our capacity to understand it as a domain of genuine social significance." She further argued:

> It is time to re-think our task as practitioners and researchers in digital education, not viewing ourselves as the brokers of 'transformation', or 'harnessers' of technological power, but rather as critical protagonists in wider debates on the new forms of education, subjectivity, society and culture worked-through by contemporary technological change.

Building on these ideas, she used a 'teacherbot', a machine that was explicitly designed to explore the generative possibilities of a 'teacher-student-code' assemblage, rather than to solve the problem of teacher automation, a topic that she said was described in the literature as "almost as a nexus between the positions of technological-promise and technological-threat" (Bayne, 2015b, p. 457). Her work serves as an example of posthumanism within educational technology research, an approach that she later defined in more detail.

> Posthumanism involves us in making an ontological shift from understanding 'the human' as an individuated entity separate from and observant of the world and its (human and non-human) inhabitants, to one which is inextricably connected to the world and only conceivable as emergent with and through it (Bayne, 2018, p. 1).

Other educational technology researchers have also explored posthumanism and sociomaterialism as a means of moving beyond educational technology as a digital toolset. Within the context of lifelong learning, Edwards (2010, p. 8) explored the subject-object binary in which "objects remain the other to the subject, separate." Knox (2014) considered the subject-object divide, noting the

unpredictable ways in which the objects associated with MOOCs, including algorithms, software and internet infrastructure might impact learning experiences of student subjects. Knox (2016) further interrogated the subject-object binary within the context of MOOCs run by elite post-secondary institutions. Gourlay's (2020, p. 164) posthumanist analysis centered on the ways in which analog and digital text objects emerge, move around and act on the world, including both other objects and human subjects. At the end of her analysis, she concluded "that learning and analytics, and the algocracy, have committed an act of ontological violence, by rendering students into documents, in a sector dominated by multiple forms of surveillance, normativity and discipline."

In addition to addressing the subject-object divide, Knox (2016, p. 312) explored physical place-digital space binary, noting that "the two sides remain distinct, and the leafy campuses of the Ivy League appear untainted by worldwide participation." Using a slightly different lens, Rousell (2016) explored additional physical place-digital space divides, including dwelling-construction, regional-local and emplacement-displacement, within university learning environments. These posthuman approaches describe the inner workings of educational artefacts, environments, code, and algorithms, offering insights into the ways learning experiences are impacted by non-human elements. By emphasizing the ways in which these digital tools are influencing the experiences of learners, they begin to dissolve subject-object and physical place-digital space binaries; by highlighting the ways in which educational technology is constraining human learning choices, they challenge the concepts of human exceptionalism.

At the same time, the above efforts represent what Barad (2003) might call a particular 'analytic cut.' By applying sociomaterial theory to subject-object and physical place-digital space divides, they tend to center individual learners' usage of specific pre-existing objects and environments as described by researchers 'observing from nowhere.' Moreover, in the process of equalizing the effects of human and non-human actors, human emotions and agency tend to be overlooked. Questions of *how* to enable change the nature of these interactions have been asked but not answered (Bayne, 2015b; Gourlay, 2020). Moreover, the educational technologists and other people responsible for the sourcing, development and ongoing support of both humans and machines are largely absent from these accounts. As a result, the acts of making, collaborative efforts, and affective investments of the people 'behind the scenes' of educational technology, and their political entanglements, have remained hidden and the generative possibilities of the tension-filled space in between technological-promise and technological-threat has remained largely unexplored (Bayne, 2015b).

Foregrounding educational technologists, collaboration and affect

Meanwhile, educational technologists[1], the people "actively involved in managing, researching, supporting or enabling learning with the use of learning technology" (Browne and Beetham, 2010, p. 6) dwell in this tension-filled space. McNutt (2010, p. 145) found that practitioners often sit "at the juncture of a busy intersection with many opinions, views and stances creating a dynamic mix of debate and at times disquiet" and expressed feelings of tension, frustration, hope and expectation" (McNutt, 2010, p. 221). Educational technologists have, however, been largely absent from the critical educational technology research literature. For example, Kenny *et al.* (2005) found that "we know precious little" about the socio-cultural aspects of the field. Noting this absence, Browne and Beetham (2010, p. 13) asked: "Might it be the case that 'technology' is seen as central but 'technologists' are not?"

[1] Based on this definition, I have included instructional designers and instructional design research within this section.

As if in response, educational technologists have increasingly made their voices heard in practice-based journals and blogs. Richardson *et al.* (2019), for example, found that "collaborations between faculty and instructional designers are key to developing positive learning experiences for students." Mueller, Richardson, Watson and Watson (2022) further noted an increased interest in the important often tension-filled relationships between educational technologists and faculty over the past seven years (Bawa and Watson, 2017; Halupa, 2019; Rubley, 2016). The Association for Learning Technologists (ALT) blogs document a similar interest in the importance of collaboration among educational technologists. Compton (2021), for example, explained:

> If one thing is clear to me, it is that the vast majority of academic colleagues have gone way above and beyond and have adapted with students' best interests at heart. Much of this has been built on the often understated work of learning technology, instructional design and academic development teams.

This emphasis on transformation through collaboration was echoed in a recent a member-survey conducted by ALT (Scott, 2020).

With this focus on collaboration, has also come an increased focus on affective labour among educational technologists. Gray (2020, pp. 52-53) described her experiences working as a new educational technologist during the pandemic. The following excerpts are from April and June 2020.

> The work is intense and everyone is anxious and I absorb it all. My colleagues want desperately to do right in a system that is failing, flailing, and I live at the intersection of their desires and our capacities...
>
> On good days, I'm a cheering squad; on bad days, I'm a still a cheering squad, but on the bad days I can admit that I'm torn up, exhausted, undone. We don't have enough people, we don't have enough time, the task is too big, the resources too scant. We do phenomenal work, some days, but not enough of it. There is too much to do and it can't be done.

McGowan and Skallerup Bessette (2020, p. 138) further described their stress and frustrations in affective terms.

> We have in stances become the avatars for the administration, the face of policies being implemented, the voice of the decisions in our daily educational development work…[managing] tensions in order to ensure the desired "buy in" from faculty, of enacting policies that one might not agree with (proctoring software, for example).

These examples align with Muller *et al.*'s (2022) findings that educational technologists "seem to be shouldering or, at least, feel primarily responsible for the conflict management within collaboration with faculty." As a result, these descriptions represent an analytic cut distinctly different from the one presented in the previous section. This analytic cut foregrounds collaboration and affect; and making the human bodies EdTech visible. At the same time, however, this cut is often silent with respect to the material objects of educational technology (i.e., platforms, curricula, and devices) or the impact of these activities on students per se. Moreover, these practiced-based accounts are often silent about *how* educational technologists might more effectively negotiate the tensions the political tensions within which they dwell.

As a result, where posthuman and sociomaterialist education technology researchers have focused on how learners use existing objects and environments, educational technologists have emphasized the collaborative and affective labour involved in their work. While both are valuable, these analytic cuts create artificial boundaries and silences between different theory-based and practice-based forms of educational technology knowledge in ways that risk entrenching essentialist-

instrumentalist, object-affect, and individual-collaborative binaries, and thereby inhibiting generative re-patterning within our field.

Educational technology as craftwork

Proposing a different analytic cut, Sancho-Gil, Rivera-Vargas and Miño-Puigcercós (2020) traced the definition of 'technology' back to its Greek roots 'technē' (art, craft) and 'logos' (words, reflection), emphasizing that technology represents neither a toolset nor the usage of a toolset, but instead an active practice of making (art, craft) through which knowledge (words, reflection) is generated. Defining 'technology' as an active practice is not uncommon (Latour, 1984; Feenberg, 1991) and perceiving educational technology as a joint material-knowledge-making practice expands its definition. Hamilton and Friesen (2013, p. 12) further explained:

> Once we understand technology as a socially situated process of making things we must also revise our normal understanding of the history of technology. Technology is thus not just invented once, applied to a practice and then refined. Rather it and the practice to which it is addressed are constructed in tandem over time.

This cut suggests that by engaging analytically with educational technology as in applied practice, we might learn to actively work with/in (simultaneously with and in) the real tensions in the spaces between these binaries. In the next section, I consider how the literature of feminized craftwork and the concept of intra-activity might assist in this endeavour.

Feminized craftwork and intra-activity

Unlike sociomaterialism as described within the context of educational technology in the previous section that tended to represent a single analytic cut, the sociomaterialism of feminized craftwork seeks to cut and recut the material, relational and political worlds using different analytic patterns. In the process, it troubles the boundaries, binaries and silences and actively engages with the tensions by enacting agency, engaging in collaboration and continuously reworking possibilities (Suchman, 1987; Haraway, 1991). It seeks to enact a practice of 'more than human relationality' that combines individual experience with collaborative expression, and the making of material objects *with* human feelings.

Feminized craftwork involves a variety of 'traditional' material-making practices including sewing, weaving, and knitting, activities deeply entangled with 'modern' digital and computational technologies (Plant, 1997; Wajcman, 2004; Minahan and Cox, 2007; Bratich and Brush, 2011;). Rosner (2018, loc 2705) explained the connections between an active practice of feminized craftwork and socio-materialist theory:

> Embodied in my early examination of information technology around knitting, I looked at the objectives, methods and tactics underlying my project. By following emergent questions and tensions—"staying with the trouble"… —I began to challenge my theoretical tool kit, contesting the idea of the user as a stable frame or the idea of the designer as a universal subject.

Barad and Kleinman (2012, p. 16) further emphasized the importance of interconnections across material, time, and space.

> It's important to have some kind of way of thinking about change that doesn't presume there's either more of the same or a radical break… [an approach] that doesn't deny creativity and innovation but understands its indebtedness and entanglements to the past and the future.

According to Rosner and Barad, sociomaterial theory emerges from practice in ways that celebrates complexities and entanglements. Within the context of feminized craftwork, once the entanglements between traditional-modern, analog-digital, manual-mental forms of feminized craftwork are acknowledged, interesting connections begin to emerge (Gajjala, 2013) and notions of 'handmade' and 'machine-made' become increasingly intertwined (Cortés-Rico and Pérez-Bustos, 2021). Lindström and Ståhl (2014) invited members of the public to explore the everyday entanglements of technologies by embroidering text messages received via SMS; Cortés-Rico, Patarroyo, Pérez Bustos and Sánchez Aldana (2020) explored the use of digital-textile making as a means of opening up new possibilities for reconciliation in Colombia; Cortés-Rico and Pérez-Bustos (2021) considered how artisan textile work and its master embroiderers might inform the digital design processes.

Citing Barad, Cortés-Rico and Pérez-Bustos (2021) further considered how the feminized craftwork of embroidery represented a form of 'intra-activity.' Where *inter*activity typically assumes that entities exist prior to meeting one another, intra-activity describes a process through which all entities, both beings and things, are constantly influencing and shaping one another. Barad (2003, p. 817) explained:

> It is through specific intra-actions that a differential sense of being is enacted in the ongoing ebb and flow of agency. That is, it is through specific intra-actions that phenomena come to matter — in both senses of the word.

Intra-activity, therefore, represents ongoing technological processes of both making and being made. It de-emphasizes the importance of scientific and technological 'things,' and instead emphasizes the importance of *practices* and centers questions of *how* we make and are made. In the process of working with technological tools, we *become* technology.

Despite the recency of these projects, it needs to be emphasized that such linkages between technology and craftwork are not new, but instead represent "a history that has yet to be written, but is everpresent" (Rosner, 2018). In fact, an ancient Incan artefact consisting of knotted threads offers an early example of feminized craftwork that served as a digital technology. Cortés-Rico and Pérez-Bustos (2021) explained that "in computational terms, the Quipu meant having material storage of information," where each knot, knot location and colour had meaning. In another Victorian era example, Ada Lovelace noted that a computer "*weaves algebraical patterns* just as the Jacquard-loom weaves flowers and leaves" (Essinger, 2004, p. 97). In another example, Rosner (2018, loc 397) described how women weavers supported the Apollo 8 spacecraft mission. She explained:

> By immersing ourselves in the story of the Little Old Ladies—the untouchable women who sent Americans to the moon and back—our team began to make visible otherwise hidden knowledge in technology production. We imagined how design might live and be alongside these different inheritances, the invisible legacies of dextrous bodies and commodified labor—complete with their ongoing knots, troubles and possibilities.

In these accounts of socio-materialist practice, feminized craftwork involves active participation through which craftworkers co-constructed both material and meaning in ways that changed their social, cultural, economic, *and* material worlds.

The phenomena that come to matter through specific intra-actions are not restricted to the material and social worlds but extend into the political in nuanced but powerful ways (Lindström and Ståhl, 2014). The history of the Jacquard loom, for example, was not only associated with craftwork and digital technology, but also with early industrialization (Cortés-Rico *et al.*, 2020). In the case of the Little Old Ladies, Rosner (2018, loc 541-570) highlighted the political implications

of foregrounding "both the embodied nature of technology development and how design processes invite inspection of entrenched systems of oppression." She further argued that these approaches are political in their rejection of the neutral, autonomous nature of technology, in "seeking methods to live with and between contradictions and breakdowns," and by de-mystifying "the political-economic separation of cognitive labour from craft labour" (Rosner, 2018, loc 3789).

Sánchez-Aldana, Pérez-Bustos and Chocontá-Piraquive (2019, p. 1) further explored the connections between textile-knowledge-making practices and associated political action "in ways that are not always explicit and that take place in public, private, physical and virtual spaces." While taking care to highlight the highly contextual and situated nature of textile activism, they further explained:

> With this, we want to emphasize that the collective/community in these cases is more than human relationality: groups are made with the materials with which they express themselves and, therefore, their political action becomes in that relationship human–material–communal; it is defined by it and it is possible within it (Sánchez-Aldana, Pérez-Bustos and Chocontá-Piraquive, 2019, p. 20).

Viewed through a socio-materialist lens, feminized craftwork might therefore be considered the practice of 'more than human relationality,' weaving together individual experience and collaborative expression, stitching together material objects and human feelings.

Feminized craftwork as tension-negotiation practice

Having introduced the history of feminized craftwork and some of its political entanglements in the previous section, this section considers tactics that can be drawn from this research and expertise with respect to working with/in the tensions of instrumentalist-essentialist, individual-collective, object-affect. To that end, I first explain the material importance of tension and tension negotiation within feminized craftwork and explore how feminized crafters work with/in those tensions to enact agency, activate collaboration, and rework possibilities.

Within the realm of feminized craftwork, including sewing and weaving, "tension is everything." (Langlands, 2018, p. 145). When sewing with hides, stitches "can be neither too tight, lest the skin tear, nor too loose, lest the seams work and split" (Issenman, 1997, p. 10). Achieving the correct tension is equally important when machine sewing. According to the sewguide.com website:

> Tension refers to the balance with which the thread is threaded through the machine—it may be tight or loose or balanced and balanced is what we aim for. You need a perfect lock stitch on your stitching line that would not be pulled out just a tug but that will join the fabric layers beautifully without any wrinkles or distortions.

Similarly, weaving "has to be done under tension because the warp and weft must be forced together and bonded on the frame" (Langlands, 2018, p. 145). As a result, the (mostly) women who undertake these activities *know* tension because their crafts are an intra-active study of its nature; they see it and feel it. They manipulate tension and are constrained by tension.

Their attunement to tension then often extends beyond the materiality of the item and out to the political, social, and economic tensions, that surround feminized craftwork (Editors, 2017). Sánchez-Aldana, Pérez-Bustos and Chocontá-Piraquive (2019, p. 21) explained:

> Textile practices become spaces that can be progressively politicized in different ways; ways that not only imply a geopolitical dimension, but also a dimension in which materialities (their strengths and fragilities), beyond human relationships, allow the emergence of other senses of activism.

In the next three sections, I explore how feminized craftworkers enable agency, engage in collaboration, and rework possibilities by working with/in the tensions.

Enabling agency

As noted above, feminized craftwork shapes and forms material items by enacting agency over material tensions. Such agency, therefore, is not "as an attribute but the ongoing reconfigurings of the world" (Barad, 2003, pp. 817-818). Oakes and Riewe (1996, p. 22), for example, explored sewing technology within the context of Inuit *kamiik* (boots). They explained, "Inuit ingenuity is unlimited, and in meeting their needs from warm footwear using available resources, they have created a marvel of technology." They went on to explain in detail how Inuit women enact agency over their materials. Through this process, they not only reconfigure footwear, but quite literally *how* their family members can move in and through their worlds. At the same time, they recognized:

> These decisions are influenced by a variety of factors including: available resources, time, interaction with neighbouring groups, contact with outsiders, economics, spirituality, culturally distinct symbolism, self-esteem of wearer or producer, lifestyle, age and gender, activity, season, terrain and snow conditions, traditional knowledge, desire for affiliation with a specific group and technology. (Oakes and Riewe, 1996, p. 192)

Within this context, agency represents neither unrestricted freedoms nor fully determining forces over which feminized craftworkers have no control, but rather an intra-active dynamism in which they take into consideration an extensive list of considerations outside of their control. They rely on their skills and expertise to negotiate constraints and embrace new opportunities *and* their knowledge and expertise continues to change and grow through each act of making. Both human and non-human are changed in the process of making as theorized by Barad.

The practices of feminized craftwork, therefore, do not involve an essentialist decision to accept or reject technology or an instrumentalist pattern to follow. Instead, their feminized craftwork involves enacting agency through a continual process of decision-making within a complex and changing world.

Engaging in collaboration

Drawing from Barad, I suggest that the intra-actions associated with the agentic dynamism extend beyond the individual crafter and into the wider community in which they live. Within the context of Indian weaving villages, Gajjala, Seemanthini and Syamasundar (2013, pp. 96-101) examined "the loom as technology, embedded in everyday life where the interplay between economics and culture is inseparable." They explained:

> The two (loom and weaver) must function together, within a whole community that supports the individual weaver and handloom in production through various necessary functions such as the production and dyeing of yarn and so on. This is the only way to produce handloom material— or there is no "handloom" cloth in existence at all.

Handloom technology is, therefore, not the act of a single designer or developer making for others (Rosner, 2018). Instead, it is an intra-active practice that involves communities making together. Gajjala, Seemanthini and Syamasundar (2013, p. 114) further emphasized that "leaving out the functions that people in the family or outsiders have to perform and identifying weaving only with 'sitting on the loom' denotes a total denial of the way handloom technology operates and the activity is organized."

I suggest that this recognition that multiple human and non-human actors constitute feminized

craftwork ought to challenge educational researchers and practitioners to widen our analytic cuts to include not only tools and some humans, but instead and collective assemblages of practice in ways that embrace our complex interconnectedness. Every action of each assemblage member represents an opportunity to intervene in our collective "world's becoming." Moreover, these decisions points become a multitude of opportunities through which we can continuously "contest and rework what matters" (Barad, 2003, p. 827).

Reworking possibilities

According to Barad and Kleinman (2012, p. 80), responsibility emerges from intra-active opportunities to contest and rework the constructions that surround us. She further explained:

> Responsibility is not a calculation to be performed. It is a relation always already integral to the world's ongoing intra-active becoming and not-becoming. That is, responsibility is an iterative (re)opening up to, an enabling of responsiveness. Not through the realization of some existing possibility, but through the iterative reworking of im/possibility.

New possibilities do not, therefore, emerge from nowhere. They are instead created through practices of reworking and decision-making. As described earlier, political action is defined and made possible through human-material-community relationships (Sánchez-Aldana, Pérez-Bustos and Chocontá-Piraquive, 2019). Boldt and White (2011, p. 36), for example, described the Chilean arpilleras, tapestries made of recycled cloth which depicted scenes of activism, protests, and everyday life, in clandestine workshops initiated to generate income among, poor women also found a way to channel their anger. They further explained that "through this collective learning and dialogue, women were empowered and mobilized politically to protest and reveal the atrocities they encountered." Despite the severe constraints place on these women by the Pinochet regime, their material-making practices opened new political and economic possibilities for themselves and their country.

Drawing on these ideas, I suggest that educational technologists have similar opportunities to use their work with/in the tensions to thread together their material and non-material worlds, their objects and affects, in ways that might enable new possibilities to emerge.

Three examples of educational technology as feminized craftwork

In the previous section, I described how feminized craftwork enacts agency, activates community, and reworks possibilities by working with/in the tension-filled spaces. In this section, I introduce three small-scale projects that demonstrate these tension-negotiating practices of feminized craftwork in action within the context of educational technology. These projects are not intended to serve as perfect or utopian examples. Instead, they are presented as imperfect examples of projects that did not emerge out of the sudden appearance of a "innovative new technology," but instead were made, shaped and reshaped, by educational technologists, instructors and/or students working within complex landscapes to enact intra-active agency, engage in collaboration and rework im/possibility.

Phonar

Worth (2017) used an open online course entitled Phonar (Photography and Narrative) to explore the tensions associated with being a twenty-first century photographer at a time when the Internet was defining the field's business model between 2010-2015. Although he initially resisted the change outright, after a digital encounter with a teenage fan 'stealing' his work he decided instead to instead engage with the tensions affecting his livelihood despite not knowing

how to teach these shifting concepts.

Rejecting both instrumentalism and essentialism, Worth instead enacted intra-active agency in which he both negotiated the constraints of post-secondary instruction and new opportunities afforded by the Internet to craft something new. Further explaining, what he called "holistic open pedagogy," he noted:

> The iterative thinking through doing speaks to the maker philosophy of hands-on independent crafting and tinkering and of failing fast and often, both in the products that the students are making (photographs, for instance) and their learning experience. (Worth, 2017, p. 91)

Drawing these ideas into the Phonar course, students in engaged in collaboration by drawing in people from outside the class and built on previous iterations, thereby encouraging creative remixing and active engagement with the Creative Commons licenses in ways that reconfigured not only learning within the cohorts, but also between them.

In the process Phonar activated complex student-teacher-machine-community interconnections and assemblages of people and tools to contest and rework the im/possibility of what it means to teach and learn. Phonar14, for example, themed as 'Photography for Your Ears,' ended with a flash mob cello concert performed by the entire class, led by concert cellist, and introduced from Hawaii (Worth, 2017). In this example, a complex assemblage of students, instructors, community members and machines, both digital and musical, shaped, and reshaped their learning spaces in ways that troubled essentialist-instrumentalist, individual-collaborative and object-affect binaries. Like the Inuit seamstresses whose small stitches in boots affect the ability of their families to move within their world, in small and often nuanced ways, the choices made as part of the Phonar course affected the ways in which students and teachers move in and through one course within their larger educational worlds.

Worth (2017) went on to ask:

> Have I enabled my class to give their informed consent to learn with the digital? Is there an equitable share of the power within and without the class, and if not, is that dynamic transparent? Do any of my teaching decisions constitute barriers to entry/engagement, such as geographical, cultural, technological, linguistic or academic? Who owns our data? (p. 101)

This example and these powerful questions emphasize the intra-active nature of agency in which pedagogical choices made reflect small, deliberate refusals of both the material and political status quo, while taking into consideration extensive educational and technological considerations beyond his control.

Domains of one's own

Like Phonar, the Domain of One's Own (DoOO) enacts intra-active agency by giving students the opportunity to become their own system administrators (Figure 1).

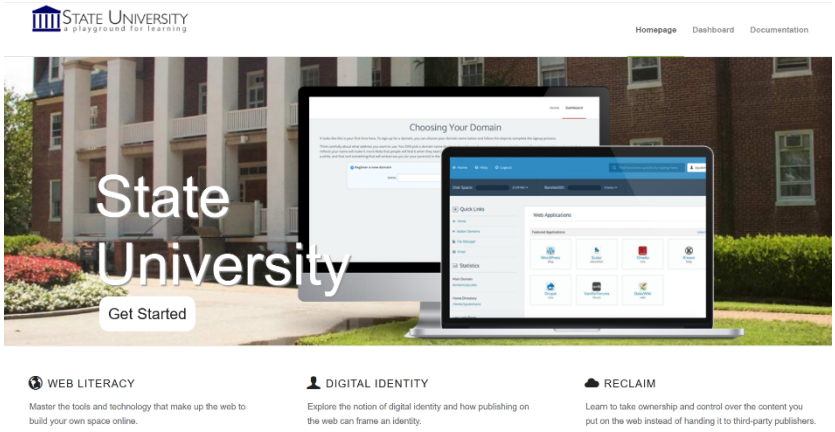

Figure 1: Image of Sample Domain of One's Own Site. Source: https://stateu.org/

Watters (2015, paras. 7-8) explained why these practices are important for students:

> It is important to have one's own space in order to develop one's ideas and one's craft. It's important that learners have control over their work—their content and their data… This means they have some say—although not complete—over their personal data, and in turn they begin to have an understanding of the technologies that underpin the Web, including how their work and their data circulate there.

As Watters noted DoOO does not provide students with unrestricted freedoms, but instead engages them in the tensions of data and content ownership by enabling agency through a practice of making their own digital worlds.

Moreover, tracing the history of DoOO "through the people who helped make it happen," Groom (2015, para. 2) emphasized how a small but dedicated group of educational technologists engaged in collaboration to create code, to advocate for alternative approaches to educational technology and to offer financial support in ways that reworked what was possible in terms of online learning spaces. In another example, a small group of faculty and staff at Lansing Community College used Domains of One's Own to build a space called Live Together, Learn Together through which members of their school community engaged in collaboration and shared their pandemic experiences (livetogether.openlcc.net/). They noted: "We hope these posts will help to remind us, that despite this upheaval, we are not alone, and our situations and thoughts are shared a hundred-fold throughout our community."

Within educational technology, the collaborative human-machine-community assemblages described in the above examples stand in contrast to individualized and personalized learning and the "autonomous learner," in which individual, self-sufficient learners are imagined to be interacting one-on-one with a machine. These DoOO stories, therefore, highlight how more-than-human relationships can come to matter, in the form of alternative approaches to online and digital learning.

FemEdTech quilt

Bell (2019) led the creation of a FemEdTech Quilt of Care and Justice in Open Education, a project intended to engage in the political tensions that surround educational technology through material creation. In the Call for Participation, they explained:

> Ours is a quilt of activism…. A celebration of our collective work, and as a focus for activism in the future. Care and Justice in Open Education are not a given, they need our thoughts, actions and work. (Bell, 2019)

As noted in the Call, Bell was keenly aware that building educational technology as a centered on care and justice is not a theoretical undertaking, but instead an active practice of reworking possibilities within the field. Over the next six months, over 50 contributors from around the world responded to the call. The FemEdTech quilt, therefore, worked across the boundaries of "traditional" and "modern" technologies in ways aligned with socio-materialist approaches to feminized craftwork (Figure 2).

The FemEdTech website (quilt.femedtech.net) provided standards, instructions, and deadlines as well as progress updates in ways intended to engage the community in the practice of making. The material output of this textile activism included four hand-stitched material quilts and a digital quilt with text-based stories woven into the interface. At the level of the individual, the creation of the FemEdTech quilt depended on individual contributors enacting intra-active agency with physical materials.

Figure 2: Image of the FemEdTech Quilt. Source: femedtech.net/published/stories/femedtech-quilt-at-altc-2022/

The digital version of the quilt further drew in the stories of the people behind the quilt, emphasizing the collaborative engagement that stitched together material and knowledge making practices. One quiltmaker wrote:

> Interwoven, connected. We are all part of the fabric of life... I had no concrete idea when I started what would emerge. I immersed myself into the process with positive thoughts, hopeful ones too… Care for each other as only then will we be able to understand each other better, much better. (Naranzti, 2020)

The quilt does not represent a pre-existing object to be used but is instead a material im/possibility that emerged while individuals enacted agency and engaged in collaboration. As noted earlier, new possibilities do not emerge from nowhere. They are instead made possible through human-material-community relationships (Sánchez-Aldana, Pérez-Bustos, and Chocontá-Piraquive, 2019). In this case, this project quilted together material individual objects, both cloth and digital, with human emotions across a dispersed and often loosely connected open educators. Through individual and collaborative acts of making materials, a community of open educators interested in matters of care and social justice was materialized. It, therefore, serves as a material—and digital—reminder of our ability to enact agency in small ways that can materially rework the possibilities by working with/in the tensions of the spaces in between essentialism-instrumentalism, individualism-collaboration, and object-affect.

Conclusion

As seen in the examples of Phonar, Domains of One's Own and the FemEdTech quilt, tension-negotiating practices of feminized craftwork have been, and can be, applied within the context of educational technology. These practices can be used to enact intra-active agency, to support enhanced collaboration and to rework possibilities. This does not, however, suggest that such enacting such practices is easy. On the contrary, these practices involve slow, detailed and often unpaid work; they have often been dismissed as inefficient or utopian. At the same time, as discussed in this paper feminized craftworkers have continued to work with/in the tensions address apparently insurmountable constraints despite being told that their work was irrelevant or even 'primitive.' Lives have been changed and world reconfigured through their persistence.

Educational technology *will* continue to change and its temporal and spatial entanglements with culture, politics and economics will continue. Up until now, the research and practice of educational technology has largely been defined by essentialist-instrumentalist, individual-collaborative and object-affect divides. Feminized craftwork and its practices offer creative ways to engage with/in the tensions of education technology to address the contemporary transformations of what it means to teach and learn with persistence and courage.

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