



Textile Technology: Learning With and From Materials

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Abstract: Understanding the roles of agency in learning can be expanded by taking up a posthumanist stance and examining material conversations in creative spaces—such as in this participant observation study set in a university textile technology art class. Using video/audio records, artifacts, and field notes, we categorize being, doing, and becoming agency of materials and the learning opportunities they offer in ecoprinting and computer/machine embroidery. Learning with becoming materials may depend more heavily on iteration.

Introduction and purpose

Materials hold energy from their pasts that speak to how we can—or should—use them to create artifacts and learn in the process. We consider the agency of materials as members of a university course on textile technology and examine traversals across materials, exploring artefact creation as joint projects involving shared agency, guided by a research question: How might we learn from and with materials through negotiations of agency?

Theoretical framework

Our work is guided by theory on agency and its role in learning. To this, we bring a posthumanist stance that positions materials as learning partners. Agency has long been treated unproblematically as making decisions, constrained by structures (Giddens, 1984). We take a situative approach to agency (Svhla et al., 2021) in which decisions unfold interactionally and vary in their consequentiality. We also take up a posthumanist view of material, extending classic descriptions of design as a conversation *with* materials (Schön, 1992). By treating materials as living and having the capacity to engage in joint projects, we center “withness” (Shotter, 2006) in which materials are worthy of respect. *Being* materials exert covert and potentially coercive influence or implicit background structure on the design landscape. *Doing* materials are ones that are selected specifically for a particular role and meet a specific need that is negotiated between designer and material. *Becoming* materials are those that are agentively repurposed by the designer as part of an interactional relationship between maker and material (Gravel & Svhla, 2020). We conjecture that becoming material conversations offer fertile grounds for both negotiating agency and learning.

Methodology

We used participant observation to investigate materials as partners in learning, alongside students as co-investigators (DeWalt & DeWalt, 2010). Students engaged in an ecoprinting process (Ratnayaka & Haar, 2022) and used Snap-based TurtleStitch to produce machine-embroidered designs (Wolz et al., 2019). The course, at a large southwestern US university, centers on textile art. The study team includes the course instructor, two learning scientists-as-observers, three graduate students, and two undergraduate students. We collected data through video/audio recording, artifacts, and field notes. We used discourse and interaction analysis to attend to ways members negotiated agency with materials.

Results and discussion

In ecoprinting, the dowel around which we wrapped the fabric and the steamer pot were being materials; their absence would be noticeable, but their presence was little remarked upon. The fabric and plastic were doing materials, selected for their dependable behaviors. We negotiated agency with the plants, as a becoming material, willing to contribute, yet surprising us. For instance, eucalyptus, a plant we sought for its ability to make distinct orange or brown prints, produced pale yellows. Plants withheld their capacities from us, requiring us to interact with them to discover what they could become. The water held more consequential agency than we anticipated. It seemed like a being material, present as damp, as steam, a backdrop. Yet through our material explorations, we were surprised by its roles in shaping the final print (Figure 1).

In TurtleStitch, the computer itself, browser window, and program were being materials. The individual code blocks, embroidery machine, and thread were doing materials. Created code blocks and the editable values

of existing blocks were becoming materials, producing unexpected results for us as inexperienced programmers. Although the preview on screen provided feedback, its translation to fabric was slow. Here, the embroidery machine held more consequential agency than expected, as a computer-drawn line running over itself hundreds of times is acceptable, but doing so even a few times with thread can break thread, needle, or tear fabric.

Across both, we experienced surprise in the transition between working with materials and the product that resulted. The time between code and rendered preview was shorter than the steambath of ecoprinting, but in both, the materials offered little ongoing feedback about how they would behave in final form. In lieu of ongoing feedback in ecoprinting, members gathered to review one another's designs both during designing and when unrolling final designs, sometimes making edits to their own yet-to-be-steamed design. In reflecting on their process, work, and material agency, members noted that they had plans or had implemented additional designs, at least partially in response to the unexpected ways certain materials behaved.

Figure 1

Examples of student work, left to right: preparation for ecoprinting; the completed ecoprint; TurtleStitch code and design preview



Implications

Our analysis foregrounds the negotiated nature of agency between designer and materials, providing insight into roles different materials play in designing and learning. Though the materials differed across ecoprinting and computer embroidery, both included *becoming* materials that had consequential agency, manifested as surprise. Our status as newcomers with the particular materials positioned some as becoming materials, but in the hands of an expert, the same materials might be being materials. Thus, as we learn, our relationship to the materials changes. Our ongoing research builds on this to consider ways we can support learner agency, such as anticipating deliberate, iterative work and reflecting on varied negotiations with different forms of material agency.

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