

Computing in Fabric: Exploring Posthumanist Capturing of Learning

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Abstract: Posthumanist perspectives unsettle core assumptions of contemporary learning theories, including people as the only actants. Adapting these perspectives promises to inform the study of learning. This study investigates how posthuman perspectives inform the study of learning through a video analysis of youth computing with fiber crafts. Findings present computational learning as the process of physically expanding routine ways in which people and materials come together. This has methodological implications.

Introduction and background

Recently, posthumanist perspectives have been taken up in literacy studies (e.g., Kuby, 2017). Rather than looking at what comes after the human, these perspectives radically question assumption of people as only actants and the reduction of materials to mediators that serve people (Barad, 2003). These ideas present a dramatic departure from assumptions of canonical learning theories and, therefore, promise to uncover ongoing learning and developmental possibilities that would otherwise remain overlooked. However, it remains unclear to what extent these paradigmatic shifts do productive work to increase understanding of learning. Investigating how to study learning with posthumanist perspectives is particularly important for disciplinary contexts that face enduring challenges related to gender, class, race, and ethnic biases (Kuby, 2017), including computer science. Compelling contexts for investigating the utility of posthumanist perspectives for computer science learning are fiber crafts, like weaving and sewing, that are connected to the history of computing, for example through the Jacquard loom (Plant, 1995). Thus, this study asked: *What is the utility of posthumanist perspectives for studying computational learning in the context of fiber crafts?* This qualitative study analyzed video data of a craft course with middle school students to identify: 1) Patterns of how people and craft materials came together to produce computation and 2) variations in these patterns that tamed and advanced computation in weaving and fabric manipulation. The findings of this article present that computation that developed as people and materials came together in craft-specific ways. Learning lay in how computation, which youth were part of producing, physically changed in comparison to itself. The work makes space to cast a wider net for capturing learning possibilities that would otherwise be at risk to be dismissed as irrelevant to computing.

Methods

The setting of this research was a craft course with 16 middle school students (8 girls, 8 boys). The fiber crafts course included sessions on weaving and fabric manipulation, embroidery of graphic patterns into dimensional shapes. The poster focuses on fabric manipulation. The fabric manipulation unit included colorful fabric and thread, needles, scissors, grid paper, pencils, and a laser cut grid with holes along vertices. To produce a fabric manipulation projects, the grid was placed on top of fabric to trace a matrix before sewing designs into fabric that pulled dots on the matrix together to create 3D forms. Following Jackson and Mazzei's (2012) approach to think with theory, posthumanist perspectives guided the data collection and analysis. To advance the aim of the study to explore the posthumanist perspectives for the study of learning, the visual centrality of humans was disrupted by capturing a range of angles that showed multiple perspectives of how materials and people came together at the craft table: 1) Eye-level video (about 7 hours) centered on youth's material handling, 2) birds-eye-view video (about 7 hours) captured the crafting from above the table, and 3) youth project videos (each 20 seconds) focused on dimensionality and complexity. The videos were iteratively coded to identify patterns of child-material actions. The analysis focused on repetitions of youth and materials coming together that produced computation as well as variations in the patterns that changed the established computational repetitions and physically increased it.

Findings

As the component parts of fabric manipulation, which included the youths, came together, a pattern of youth-material togetherness emerged that produced computation. Computation was contingent on a repeating series of component part combinations that were paired with aspects of the craft (see Figure 1). First, youth-fabric-grid combinations transposed a matrix onto the fabric, producing the computational space. Second, youth-fabric-thread-needle combinations created sewing knots and running stitches that produced computational loops. Third,

youth-fabric-thread combinations pulled sewn units together and processed the input variables of the stitch pattern. Lastly, youth-fabric intra-actions unfolded the results of the fabric algorithm (i.e., the stitches) into user-readable output (i.e., the final project). Youth did nothing without materials and materials did nothing without the youths, Youths became one component part of the computation as they helped produce the computational space, performed loops, and processed variables, but not the only actant.



Figure 1. Intra-active pattern of youth-material togetherness that produced computation.

In fabric manipulations, variations were differences in how component parts came together compared to the repetition. Variations made it possible for computation to expand. A frequently observed variation included breaking out of the provided matrix grid to sew illustrative shapes, including geometric forms, into the fabric. This variation introduced a crucial difference to the youth-material togetherness: Youth-fabric-*grid* changed to youth-fabric-*paper*. When this became particularly salient was Savanna's fabric manipulation project. Savanna decided to sew a star pattern into her fabric that did not fit into the provided grid. To trace the star, Savanna placed a drawing of the star on top of the fabric and then frequently lifting the paper to mark the star's vertices on the fabric. This time-consuming production led other youths to raise their eyebrows and to dangle their progress before Savanna while she continued to trace star vertices. These comparative acts assumed that computation was materially stable and bound to the provided grid. In this view, variations from the script became mistakes and youth those who committed them. However, dwelling with such variations in the posthumanist space, showed the potential of the variation for emerging computation. For example, in Savanna's project, the variations in the matrix grid produced a new computational matrix with a whole new range of possible sewing patterns and computational loops. Savanna wondered about alternative possibilities: "If all the outer edges would have [sewing] knots, then you scrunch them up as you go along. These ones would be scrunched up and these ones would be scrunched up. If these ones were, this whole thing would be scrunched up." Savanna played with the placement of knots, which turned the star into its own computational grid. The personalized variation changed how component parts physically came together and led to a physical expansion of what computing was.

Discussion and implications

The analysis showed how posthumanist perspectives frame youth *and* materials as part of emergent computation. Computing physically grew through youth-material togetherness. Taking posthumanist perspectives on learning pointed to consider disciplinary learning as materially discrete and to focus on how the coming-together of people and materials produced what computing can be, how it is done, and how it changes. These perspectives called to ask how computing changes in order to see how the person changes, which made it possible to capture productive learning possibilities that could otherwise be at risk to be dismissed.

References

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