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Ethnotechnology: A Dialogue between Art and Cultural Anthropology

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In this paper we discuss the concept of ethnotechnology in a pedagogical context, as a dialogue between an artist and a cultural anthropologist teaching interdisciplinary courses. Ethnotechnology is an experiential study of technology and culture, an interdisciplinary practice that offers practitioners a method to explore the relationship between art and society. Ethnotechnology praxis encourages recognition of how the practices of making are co-constituent with theoretical perspectives on the socio-cultural worlds in which we live. In this paper we will explore some of the conceptual underpinnings of the term "ethnotechnology", and examples of pedagogical work that employs these perspectives. The classroom prompts, and some of the students' outcomes, demonstrate the generative potential of this dialogical approach. Creative ethnotechnology projects allow practitioners to engage with immense conceptual questions in a concrete manner, ethnographically overcome dichotomies between the particular/general, and develop a critical epistemology of technology, informing discussions on the relationship between socio-cultural issues and art.

Keywords: Anthropology, Art, Ethnotechnology, Critical Making, Ethnography, Making, Technology, Electronics.

1. Introduction

Ethnotechnology is a practical framework for connecting art, anthropology, and technology. This approach has a pedagogical etiology, as the co-operative product of our work together as an artist and a cultural anthropologist, teaching interdisciplinary courses. In the context of our co-teaching- engaged in dialogue and making projects — we developed ethnotechnology as an experiential study of technology and culture, an interdisciplinary practice that offers practitioners a method to explore the relationship between art and society. Ethnotechnology is therefore a praxis that encourages recognition of how the practices of making are co-constituent with theoretical perspectives on the socio-cultural worlds in which we live.

We first decided to engage in this collaboration — to combine anthropology with art and technology — because there seemed to be overlaps in the ways in which we spoke about our work. Cultural anthropologists study how humans shape cultures and how humans are in turn shaped by culture. Artists are cultural practitioners. Both may be interested in exploring and expressing the role of technology in human lives. Both of our approaches encourage recognition of the meanings, beliefs, and values that a culture ascribes to technologies. Yet there are also key differences in anthropology and art as disciplines, with separate modes of professional training that encourage us to view these topics in very different ways. Thus, within our interdisciplinary pedagogic framework we were prompted to ask, how can we leverage the disciplinary knowledge of art and anthropology to make this dialogue more fruitful, to facilitate growth in our perspectives, to create reflexive technologies— those that encourage reflection on social beliefs about what technology is and the role it plays in the lives of humans. We are offering our framework as a point of reference for people who produce technology-driven critical art. We also created this work for anthropologists who would like to use their cultural training to lead others in making art and technology projects, to create critical technology projects themselves, or reframe conceptual approaches to the topic. One of the overall goals of this effort is to foster mutual interdisciplinary appreciation and fruitful collaboration between artists, technologists, and anthropologists. In this particular paper we emphasize the anthropology side of the framework, as the paper is written for the xCoAx audience, who we expect to be more familiar with the art and technology side of the collaboration. Future papers written for other audiences will be geared towards other aspects of ethnotechnology as a framework, as complementary to the audience(s) disciplinary direction(s).

An xCoAx audience might ask how this approach is different from similar efforts, such as Critical Making and speculative design, that are often invoked in the context of xCoAx. Ethnotechnology speaks to similar concerns, as Ratto developed the concept of “critical mak-

ing" to connect critical thinking and working with physical materials in order emphasize the relationship between technology and social life in a manner that does not oversimplify either the complexity of human experience or the role of technology in human lives (Ratto 2011). Yet we also move in a different direction through a focus on anthropological perspectives. For example, in his work "Critical Making: Conceptual and Material Studies in Technology and Social Life", Ratto commented upon the difficulty of connecting critical theory about systemic and institutional issues to personal lived experiences, and his hope to bridge divisions between social sciences and humanities (Ratto 2011, 259). We propose a specific type of interdisciplinary connection that overcomes divides and emphasizes connections between specific, individually lived experiences and systems/structures/institutions; we do so, however, not as a bridge (a liminal betwixt and between space) between two perspectives, but rather as part of a dialogical process between practitioners.

Thus, to benefit from multiple existing perspectives on the topic, our framework is explicitly interdisciplinary; the practice of art informed by concepts from cultural anthropology. While building technologies we center the nuanced concept of culture employed by most cultural anthropologists, as well as their methodological approaches. In this paper we will explore some of the conceptual underpinnings of this projects through a discussion of the meaning of the term "ethnotechnology", and then share examples of pedagogical work that employs these perspectives. The classroom prompts, and some of the students' outcomes, demonstrate the generative potential of this dialogical approach as examples that we along with our students developed within this framework.

2. Ethnotechnology: Foundation and Meanings

While the "ethno-" in ethnotechnology could (correctly) be interpreted by readers through its etymological root — a prefix to signify "culture" or "people" (Greek, *éthnos*) — we also understand it in relation to two distinct uses as a prefix in related terms — "ethnography" and "ethnomathematics".

The word "ethnography" is used by anthropologists to refer to both an active research process and the product of that process. As simultaneously a research method and the communication of its results, ethnography in anthropology is fundamentally a form of praxis, in which practice and theory are co-constituents. The ethnographic methods traditionally used by anthropologists — participant-observation, interviewing, questionnaires, etc. — reflect a disciplinary recognition of the significance of primary perspectives on daily lived experiences for understanding culture and society. This is particularly true of participant-observation. Participant observation is not the observation of participants by an outside observer. Rather, it is

a method in which the anthropologist both observes and takes part in cultural activities motivated by multiple underlying assumptions, including that specific individual experiences give us valuable perspectives on more general human issues. This assumption — that there is a meaningful relationship between the particular and general, hence understanding the world view of even one small community can give us insight into the human experience at large — is foundational to anthropological inquiry. Consider, for example, anthropologist Clifford Geertz's comment about globalization, that, "...no one lives in the world in general. Everybody, even the exiled, the drifting, the diasporic, or the perpetually moving, lives in some confined and limited stretch of it — the world around here" (Geertz 1996). Our relationship to technology — while a part of larger level systems such as social institutions and cultural perspectives — does not occur on an abstract level of "everyone's experiences"; each interaction is a particular personal experience that both shapes, and is shaped by, our views on technology. Through participant-observation anthropologists can develop emic perspectives on human experiences, ways of knowing the world that require lived experiences because they are variously embodied, subjective, and/or a part of our habitus (in Bourdieu's sense of the term, e.g., Bourdieu 1977). Whether it is a need to experience the grueling physical labor associated with the artisan cheese industry to better understand the physical demands on those employed in that industry (MIT Anthropology Program 2008), or an opportunity to connect with others in virtual worlds to learn how online communities render the virtual "real" to participants (Boellstorff 2015), anthropologists understand more about the socio-cultural contexts that they study through taking part in them.

Similarly, in our ethnotechnology class students engaged in reflecting about the nature of technology in their own lives by not only reading theoretical works, but through experiencing first-hand the process. For example, while reading the article "CAD/CAM Saves the Nation?: Toward an Anthropology of Technology" (Downey 1992), students created their own design files and instructions for 2 or 3D manufacture to better theorize the relationship between technology and production processes, as discussed in more detail below. In other build examples described later in this paper, students of ethnotechnology acted as participant-observers to develop their understandings of the subject of technology from both a personal and academic perspective. They created technologies that spoke to their own sense of self while exploring the role of academic institutions in society (i.e. the Davis and Barnas-Lionarons examples), reflected their understandings of the world as well as cultural expectations about social events (see Peramune's automated serving tray) , and helped to mediate individual relationships with existing technologies even as they provided commentary on the global commodification of technologies (as in Barrera's work on cell phone holders).

Our second inspiration for the prefix "ethno", as well as the overall construction of the term "ethnotechnology", has arisen from some forms of mathematics educator Ubiratan D'Ambrosio's use of the term "ethnomathematics". D'Ambrosio defines ethnomathematics in one of his works as "a programme which looks into the generation, transmission, institutionalization and diffusion of knowledge with emphasis on the socio-cultural environment", that draws upon the "cultural experiences and practices" of both communities and individuals (D'Ambrosio 1990, 369). Note the use of the term "programme" here to emphasis that, for D'Ambrosio, ethnomathematics is a pedagogical endeavor, an ideal way to learn mathematics—and perhaps research the topic as well— because it allows for conceptual engagement with mathematics frameworks beyond formulaic learning. D'Ambrosio suggested that ethnomathematics is a mathematics learning strategy that encourages attention to the "underlying structure of inquiry in [existing] ad hoc practices", as use of the approach by educators encourages students to ask how practices become methods, how methods form theory, how theories are developed into inventions, how inventions in turn shape methods... in a "ceaseless cycle" (D'Ambrosio 1985, 46). Thus, ethnomathematics as an epistemological program has inspired us to recognize ethnotechnology as a similar project, a process through which we allow students, and ourselves, to explore ways in which we know that technology is both shaped by and shapes socio-cultural realities.

This dynamic and fundamentally polysemic understanding of technology is inspired, from our anthropological side, by a similarly fluid disciplinary understanding of the role of culture in human lives. To emphasize the importance of this perspective, we can again turn to ethnomathematics. Many people confuse ethnomathematics with a movement in mathematics education in the United States called "multicultural mathematics", through which educators try to emphasize varied cultural mathematics backgrounds either in addition to, or sometimes within the scope of, what is considered "mainstream" mathematics. From this problematic wording we can already see the problem with such an approach — it has the potential to create hierarchies as texts/teachers/students designate some cultural forms of math as mainstream and others as marginal, non-normative, or simply "cultural". While recognition of the diversity of mathematical thought is important, if presented as a deterministic narrative (e.g., certain groups of people have certain ways of thinking/questions/technologies etc.) this approach is problematic, and simply increases cultural misunderstandings. Such misinterpretations generally depend upon a conceptualization of culture as a static category, a notion that has been largely rejected by cultural anthropologists since the 1980s. Ethnonyms and other modes of identities should not be reified as cultural categories, for, as Eric Wolf wrote, we recognize in anthropology that,

> [b]y turning names into things we create false models of reality. By endowing nations, societies, or cultures with the qualities of internally homogenous and externally distinctive and bounded objects, we create a model of the world as a global pool hall in which the entities spin off each other like so many hard and round billiard balls (Wolf 1982, 6)

Abandoning the billiard ball model of culture, ethnomathematics is ideally about situating all mathematical knowledge in systems of production/distribution/consumption (such as in the cycle described by D'Ambrosio above), and prompting reflection on the relationships between such, rather than simply creating an alternative model of mainstream mathematics.

Similarly, ethnotechnology from a combined art/anthropology perspective is an attention to understanding the cultural role of technology without simplifying and reducing either notion to static categories. Cultural anthropologists, while frequently employing different definitions of the term culture (see for example the discussion in Borofsky et al. 2001), generally recognize that culture is, while shared, constantly changing, and while symbolic is not located in one fixed signifier (e.g., language, dress, religion, geography) or even a cohesive set of these.

Therefore an art/anthropology dialogue on the study of ethnotechnology does not simply involve noting the various forms of technology used in different settings; we begin by rejecting the intertwined ideas that technology is limited to one particular cultural form (e.g., only electronics are forms of technology in the contemporary era) and/or that cultural forms are determined by technology (e.g., that there are objectively high/low/advanced/primitive forms based on material objects). Instead, we study technology as a form of material culture, which is most simply all of the "things" produced by people, with a focus on the relationship between humans (both on the individual and socio-cultural level) and objects. The long-standing focus in anthropological work on human relationships with objects is significant because it underlies a fairly common assumption in the field that inanimate objects are not socially inert. This idea has arisen from the work of many classic anthropologists who study material culture — both cultural anthropologists and archaeologists — and have written about how identity can be intimately linked to particular commodities (e.g., Cohen 1974; Brenner 1998; Burton 1981; Miller 1995; Mintz 1987; Spooner 1986).

As ethnotechnologists, we can consider all technologies made by humans and the values (as well relations, economics, symbols, etc.) reflected in these technologies. Therefore while we begin the class with a discussion of early human technologies such as stone tools, hearths and shelters, clothing, earthen vessels (pottery), jewelry, etc.,

we do so not to emphasize a flawed notion of cultural progression, but to expand students' definitions of the term "technology", and consider how these technologies contribute to our own (culturally situated) notions of what it means to be human, as discussed in some of the assignment examples below. In the ethnotechnology framework, there is no such thing as "high" or "low" tech, or one particular material form that "counts" as technology. We encourage students to critique any divisions and material hierarchies, whether between the past and the present, or bounded notions of cultural groups. Our aim in the class is not to label, sort, or categorize material forms, but rather to engage in the ethnographic study of our technological surroundings, as participant-observers in the making process, as demonstrated in the following examples from classroom assignments and activities.

3. Ethnotechnology Bricolage: Defining and Debating Technologies through Academic Scavenger Hunts

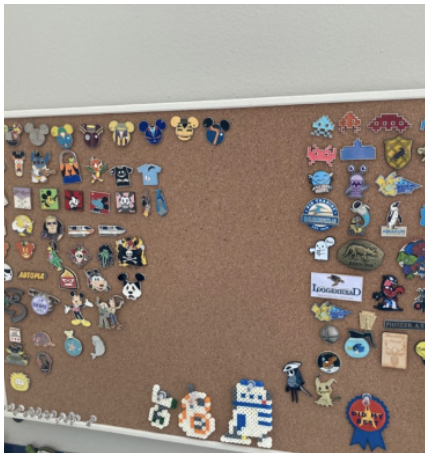

Figure 1: Example of a visual answer to concept question prompt number 3 in the list above (posted using the GooseChase platform, 2021). Ethnotechnology student Jackson Eagan produced this photograph of a board with pins as the foundation of a conversation about the relationship between objects and identity. In his accompanying text was the useful suggestion that we consider both the material conditions and symbolic nature of material culture in our exploration of this concept.

In our ethnotechnology classroom there are a series of concept questions that students are given throughout the semester in a "scavenger hunt" format, that are intended to challenge and expand students' notions of technology. In order to complete a conceptual scavenger hunt assignment, students need to answer the concept questions with a collection of images — either ones they have found in the onground world and taken themselves or found online (with attribution) — accompanied by a brief written explanation of their images. The concept questions are issued and answered through online forums (instructors can use discussion boards in any LMS or participatory platforms such as Flipgrid, Goosechase, Padlet etc. for these assignments).

Some of our concept question prompts to promote such participant-observation include:

1. Find and take a picture of a technology you use every day without thinking of it as a technology. How does the use of this technology change your life?

2. Technology, labor and social interactions: The development of the ATM has fundamentally changed banking practices for customers who use them. Not only does the existence of the ATM mean that we can access money in different ways than previously, but that social interactions, norms (the relationships between people, norms, or expectations of interactions) between customers and banking professionals as well as customers with each other have changed. Consider what happens when technologies change social patterns associated with labor practices. Who uses a technology? Photograph a common technology (other than an ATM) and write a brief caption explaining how its use has changed our social interactions.

3. How does technology differ between cultural settings and reflect cultural beliefs, behaviors, or values? What is one technology that you find that you consider to be culturally specific and/or significant? Take pictures and share with a brief caption explaining your answer.

4. Function and Form part 1: Consider the relationship between technological function and form, how does the form of a technology contribute to its function? Take a picture of one technological item and briefly discuss the functional properties of its form in the caption.

Figure 2: Image in an answer to concept question prompt number 1 (posted using the Padlet platform, 2022). Although starting with ancient Babylon to situate soap as a technology, in the rest of the accompanying text ethnotechnology student Ben Crawford reflects on how it has taken on new meanings during the Covid pandemic, aiding class discussion about the ways in which the meanings of technologies are always changing in relation to historical contexts.

5. Function and Form part 2: Return to the item that you chose for "Function and Form- Part 1". Study the image(s). Are there aspects of its form that are NOT directly related to its direct function? Why is that? Consider the aesthetic, cultural, symbolic, and/or social implications of the non-functional form factors and write a brief description of that here.

6. Function and form part 3: Imagine a machine that would look NOTHING like its function — that you would design in such a way that it would appear — at least at first glance — not indicate its function at all. OR imagine a machine that had a form ONLY defined by its function, what would it be like? Choose one of these two tasks, and sketch what your machine would look like. Then take a picture of your sketch to upload here; write a brief description in the caption to explain your machine.

This concept question approach is effective for classroom use because it allows all students to share preliminary ideas before coming to class, making later classroom discussion more focused and evenly distributed between students. This is particularly useful in classes where students come from a variety of disciplines, and many (if not most) are not used to participating in anthropological or art discussions. The collage-style answers provide a theoretically rich approach as the use of images grounds more theoretical discussions about the general concept (technology) in concrete images (specific iterations of material culture). The students therefore interact with onground and online material realities as participant-observers and have the chance to reflect on previously known environments in a critical manner.

4. What Does It Mean to Be Human? Creating Technologies That Reflect Beliefs, Values, and Behaviors

In our ethnotechnology classroom a majority of the semester is spent creating electronic objects with students, as they become participant-observers of technology. We begin the semester with a study of some early examples of technologies that humans have created

in order to explore notions of what it means to be human, studying the history of entertainment robotics popular in ancient Greece, the Islamic Golden Age, the Renaissance, and the Enlightenment Age. Many of these technologies were intended by their creators to mimic organisms that seem "alive" or exemplify aspects of what it means to be alive, thus we are interested in exploring objects such as Jacques de Vaucanson's Defecating Duck and parallels to modern humanoid robots, as well as reading academic works on the topics (i.e., Richardson 2016, Riskin 2003). Although we did have some anthropology and art students in our ethnotechnology classroom, a majority of our students came from other disciplinary backgrounds including environmental studies, neuroscience, biology, and creative writing. Their work in response to our assignments is therefore not done in a classical art and design school context — even though the outcomes might look like they are made by art and design school students.
In the first associated creative assignment titled "Extend Yourself", students are asked to use what they have learned in class about conductivity, LEDs, and switches to build an object or installation that either extends them as a human or reacts to human presence. These creations allow students to be a part of the human histories of creativity they have read about, while examining the fluidity of human/machine categories.

Figure 3: Ethnotechnology student Paolo Berrara reflects upon cell phone holders as a form of technology that extends the self and suggests other extensions that could connect people to their cell phones (2022, https://www.youtube.com/watch?v=WeVt0ZZWPdg).

In a second creative assignment "Machine Animism", students learn how to use motors and LEDs, and are again prompted to create an object or installation, in this case one that seems "alive" or "present" (broadly defined). While showing examples such as Maywa Denki's Whha Go Go (2009), we explain to students that the project does not need to have humanoid or animal form, or even associated features. However, they need to think critically about what "alive" means to them.

Exploring contexts of technological production for our third creative assignment "Creating with CNC", we read an ethnographic study in

which the anthropologist studies CAD/CAM education and production contexts to ask how "technologies serve as both the products and producers of cultural meaning and power by transcribing human activity into object form" (Downey 1992, 143). Students are then asked to create a plan for a 3D object or series of 3D objects out of 2D material (paper), with the instructions for producing it using a CNC cutting machine. We, the professors, act as a production facility by providing assistance with the CNC machine and producing the objects based on the students' plans and instructions. The purpose of this assignment is to explore Downey's aforementioned question further by experiencing for ourselves the process of prototyping an object (by hand), then implementing it in computer-assisted design (CAD) software, and finally using computer-assisted manufacturing to produce it.

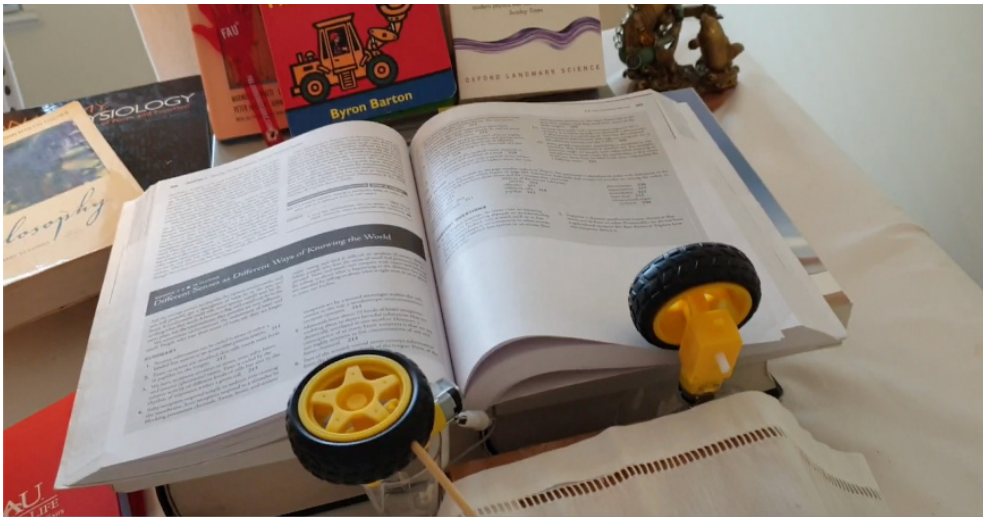

Figure 4: In "Electronic Page Turner - The Art of Being an Efficient Human!" (2021), Ethnotechnology student Ewa Barnas-Lionarons abstracts a human process, flipping the pages of a book, into a machine process. The result is mesmerizing and startlingly efficient (https://youtu.be/TF9oI2zF6XU).

These creative ethnotechnology projects allow students to engage with immense conceptual questions — e.g., "what does it mean to be human", "how does society shape technology", "what are the boundaries between the organic and mechanical" — in a concrete manner, to focus their experience around both the theory and practice of technology. As a result, they are able to ethnographically bridge the divide between the particular and the general, critically engaging in ethnotechnological praxis.

5. Ethnotechnology Works

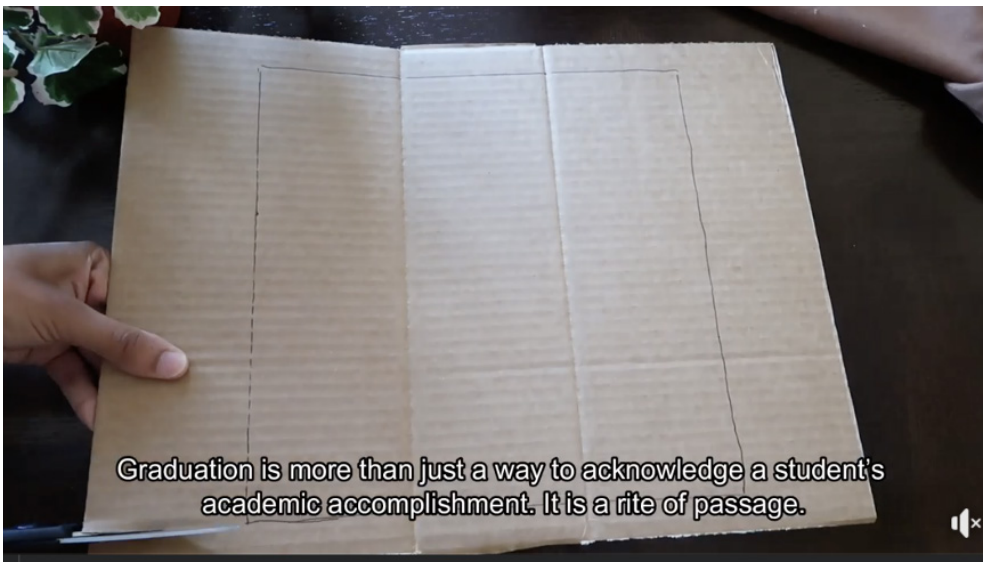

Figure 5: In "Graduation Liminality" (2021), ethnotechnology student Chelsy Davis combines her anthropological studies with technological skills to produce a creative and thoughtful reflection on university graduations, particularly during the Covid pandemic (https://youtu.be/0TDsw3Cac0M).

Figure 6: Ethnotechnology student Esther Peramune's 2021 work is on the surface simply a practical solution to an everyday social challenge — how to serve gatherings of people — but provided the maker with the chance to reflect upon cultural beliefs and values about food and community (https://www.youtube.com/shorts/_zdhNndVE-o).

6. Future Work and Conclusions

The work that ethnotechnology students (and professors) complete as technology producers is crucial for allowing participants to engage in the type of participant-observation that generates multiple perspectives on the topic, making ethnotechnology an effective tool for developing a critical epistemology of technology, informing discussions on the relationship between socio-cultural issues and art, and suggesting new avenues for scholarly/maker exploration of these topics. The ethnotechnological work described above focuses primarily on creating electronic objects because of the expertise of the artist in this dialogical endeavor, however there are many forms of technologies that can be explored through this approach. For example, several well-known existing anthropological works on virtual reality worlds, digital games, and social media suggest methods for participant-observation scholarship on these technologies as well (e.g., Boellstorff 2015; Wesch 2008). There is therefore a range of possibilities for the expansion of ethnotechnological work into those areas.

As mentioned in the Introduction, we commend efforts such as Critical Making and Speculative Design, similar to ethnotechnology, and hope to contribute to the types of discussions made possible in art by these works. We also admire and build upon the work of the anthropologists mentioned earlier, valuing anthropological perspectives on topics such as material culture and digital worlds, while depending upon classic participant-observation methods from the field. It is the generative nature of both of these disciplinary trajectories that makes possible this dialogical exploration of technology, bridging the humanities and social sciences to develop a critical praxis of technology making. The experiential aspect of this approach is key to the ethnotechnology pedagogy; as demonstrated, ethnotechnology is not the type of effort where a social scientist is simply "brought in" by engineers or industrial designers to evaluate the efficacy of an engineering or product design effort. The interdisciplinary effort requires a collaborative dialogue, where practitioners from each discipline are valued as equal contributors.

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