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Collaborative Housing Design: A Case Study on Developing Learning Activities that Cross Cultural, Climatic and Geographical Differences

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Abstract

In *Designs for the Pluriverse*, Arturo Escobar argues that the act of designing involves "much more than the creation of objects"; it also produces "diverse forms of life and, often, contrasting notions of sociability and the world" (2018: 3). In our anthropological fieldwork with Alaska Native communities that have grappled with housing insecurity issues for multiple generations, we have found this concept to be a reality. As we learned about collaborative housing design practices in Alaska, we found that socio-material artifacts are useful for engaging with a wide range of critical stakeholders. Alternative design frameworks are needed to address the complexity of problems and solutions in remote Alaskan villages, where technological and cultural practices can contrast in settings of extreme climate conditions. As engineering students prepare for complex challenges like those faced in Alaska, they must learn ways of adapting to and developing alternative design frameworks. Drawing on Escobar's frame of "sociability," we have developed a series of design learning activities that guide students in alternative design projects while learning about the Alaskan context using situated examples from our anthropological fieldwork and research. In learning contexts ranging from design courses to community co-design and engineering workshops that we are currently planning, we are integrating active learning activities that bring our experiences to the classroom and offer opportunities for learners to imagine, hack, and make. In this paper, we explore theoretical and alternative design frameworks for integrating research into school and work, using a student-designed learning artifact called *AlaskaCraft* as an example of how the complexity of this history and research has made its way into the classroom.

Keywords: design, active learning, complexity, anthropology, Alaska, housing

Research Background

The learning activity presented in this paper – an education game called *AlaskaCraft* – is based on a case study of the construction of home-building projects often referred to as cold climate housing projects by the engineers, builders, and Alaska Native community members who contributed to our research. These building projects are examples of engineered responses to the complexity of designing and constructing homes in remote and predominantly indigenous communities (Nicewonger, Fritz, & McNair 2022). These projects are often not linked to interstate road systems and must depend on barge and aerial transportation services for shipping building supplies and heavy equipment. Extreme winter temperatures that regularly dip below negative 10 degrees Fahrenheit, high fuel costs, and the threat of coastal flooding, along with limited available land for building homes, further complicate the building of affordable homes in the region. Additionally, over 42 villages in this region are being threatened by climate change and, in the very near future, will have to decide whether to protect-in-place or relocate to higher ground (Goode 2016). The complexity and urgency of this situation often result in discourses of "vulnerability" finding their way into the creative and shared work of designing and building housing solutions in this region. But as anthropologists Elizabeth Marino and A.J. Faas argue, discourses of "vulnerability" in Alaska perpetuate misunderstandings of the local histories and

resilience that shape native approaches to housing issues in a region that these people have lived in for thousands of years (2020).

Taking heed, our research team is co-creating a body of ethnographic analyses of building projects in remote Alaskan villages that attend to both the technical and social decision-making processes of local actors. As instructors in engineering and anthropology programs, we were also concurrently developing curricular approaches to guide students and design participants to comparatively examine, map, and reflect on the relationships between the building projects, with an emphasis on collaborative design and incorporation of alternative perspectives. We see these learning goals to be important for graduates who will engage with increasingly complex challenges in their careers. Our curricular design addresses learning outcomes for students to be able to describe and compare different forms of "sociability" in cold climate housing projects, analyze challenges of building affordable, quality homes in communities impacted by climate change, and explore approaches for developing housing that consider diverse networks involved in complex work. In this way, we see bridging our research with classroom activities as a means for broadening understandings of housing insecurity in the far north and the role that engineers can play in addressing these issues.

This manuscript is a scholarly consideration of how socio-material artifacts can be used to engage students in reflection and experiential learning about co-design and co-building processes. Our example of a learning activity incorporates findings from ethnographic research exploring how cold climate housing specialists in Alaska are addressing housing needs. The methods applied in the research informing the curricula include approximately 85 semi-structured interviews and observations of design activities that were primarily carried out using virtual platforms (e.g., phone calls, Zoom meetings, etc.) beginning in 2020 (McNair et al., 2023; Nicewonger et al., 2021;2022a, b; 2023; van Doren et al., 2024). In the summer of 2021, the lead ethnographer began traveling and interacting with building specialists at a not-for-profit organization in Fairbanks who have worked on cold climate housing projects in remote Alaska communities for almost two decades. This allowed for observation and participation in the work activities of cold climate engineers, architects, builders, and other specialists working on housing projects for remote Alaska communities.

The research team initially included three anthropologists with backgrounds in engineering education, Arctic studies, and design anthropology. The project has expanded to involve several other local collaborators from the fields of engineering, building science, economics, and policy. Additionally, five Alaska Native community research assistants who live in the remote communities where the housing projects being studied in this project are located have played an active role in collecting data and continue to consult on its analysis.

Our ethnographic approach uses immersive, collaborative, and attentive methods to explore social realities and generate insights into human experience. These methods emphasize situated understanding and participant engagement. In semi-structured interviews and participant observation, we foreground *participant listening* and *attending*. Defined by Forsey (2010), participant listening involves exploring and identifying patterns across contexts where participants are embedded. In this process, ethnographers attend to participants' concerns and meanings, synthesize qualitative data to reveal connections and questions for further exploration, and ensure findings resonate with participants' intimate knowledge of the issues. They trace how

value systems shape actions and resource allocations (Lederman 2023). As Lambek (2024) explains, attending involves observing participants' judgments, actions, and their responses to others. As ethnographers, we analyze how people describe and interpret events, exploring the ripple effects of these judgments.

In addition, one of our primary goals is to support and engage in the co-creation of artifacts, collaborating with participants to transform data into practical tools and resources, such as designing homes with diverse stakeholders. This method emphasizes producing tangible outcomes that reflect participants' lived experiences and aspirations. On the other hand, immersive approaches of observing participants' environments and social realities in real time capture moments that cannot be reproduced, contrasting with objectivist research paradigms focused on replicability (Lederman 2023). The significance of these different orientations towards research is explained by the anthropologist Rena Lederman who writes:

> Being with people wherever they actually are and cultivating an openness to one's hosts' concerns, ways of talking, and ways of being together have been long-standing anthropological values (Evans-Pritchard, 1976). These (realist) values are nevertheless difficult to justify from a conventional (objectivist) social-behavioral science research perspective: realist and objectivist stances on proper research are, in several important respects, antithetical. (2023: 2)

Our introduction of *ethnographically informed artifacts* in project-based learning involved learners in co-design processes, thus extending what it means to attend to how engineered building projects are studied and critically reflected on. Students used ethnographic data to create prototypes of tools and artifacts, which engaged them in socio-material complexities not just in the design of a home but also in moral quandaries facing the field of cold climate housing building in Alaska. By engaging deeply with participants through these methods, our goal as ethnographers was to uncover nuanced understandings of social worlds and create meaningful, actionable insights. As educators, we sought to incorporate these methodological principles into active learning environments.

Theoretical and Ethnographic Framing

In addition to integrating real-world examples in project-based learning activities, we also introduced students to ways of theoretically framing the need for alternative design frameworks. Drawing on the works of Arturo Escobar, Roger Säljö, and Lev Vygotsky to highlight the interconnectedness of design, cognition, and sociability, we aimed for learners to see that design is a deeply social and cultural act that extends far beyond the creation of physical objects. Central to Escobar's work is a view of design as world-making and sociability (2018). Escobar critiques traditional design paradigms for focusing too narrowly on creating objects and systems. He emphasizes that design inherently shapes "worlds"—systems of relationships, values, and practices that influence how people live and relate to one another. Further, different design approaches promote contrasting forms of sociability. For instance, designs rooted in individualism prioritize competition and efficiency, while those inspired by collectivism foster collaboration and mutual care. Escobar's decolonial and pluralistic ethos advocates for designs that respect diverse worldviews, particularly those of marginalized and Indigenous communities.

He calls for transformative design practices that foreground sustainability, equity, and the flourishing of all life forms.

Focusing on socio-material artifacts in cognition and collaboration, Säljö argues that human cognition is deeply embedded in a material world composed of increasingly agentic artifacts (2022). These socio-material artifacts, which can range from physical tools to digital technologies, are not merely aids but integral components of cognitive processes, mediating how individuals interact, solve problems, and generate knowledge. This sociocultural perspective challenges the traditional separation of mind and material context, proposing that cognition is distributed across people, tools, and environments.

Vygotsky laid the groundwork for embodied and mediated learning (Vygotsky & Cole 1978). Embodied learning emphasizes the role of physical actions, sensory experiences, and interactions with cultural tools in shaping cognitive development. Recent studies looking at the transformative effects of designed things on learning processes (cf. Beddoes & Nicewonger 2019a, b; McNair et al. 2015; Nicewonger 2015) include the introduction of carbon footprint calculators in elementary classes (Lantz-Andersson et al. 2019), the creation of experimental prototypes in architectural research to explore new techniques and theories (Ivarsson & Nicewonger 2019), and the introduction of digital technologies that allow professionals to collaborate across vast distances on international engineering and science projects (Keating 2019; Kasperowski, Kullenberg & Rohden 2019). Gestures, movements, and engagements with artifacts are not peripheral but central to how knowledge is constructed and internalized. Learning is a socially mediated process deeply tied to the cultural and material contexts in which it occurs. Tools and artifacts enable and constrain how individuals and groups learn and interact.

Integrating these perspectives, we explore the interplay of design and learning, where socio-material artifacts not only mediate human interaction and the co-creation of knowledge but are also embodied in design and learning. They actively shape not only outcomes but also the processes of collaboration and sociability. Escobar's argument that design is inherently interconnected parallels Säljö's and Vygotsky's challenges to the traditional separation of mind and matter, highlighting how artifacts and practices embed values and assumptions that influence collective life.

Taken together, these perspectives underscore that design and learning are deeply intertwined processes that shape and are shaped by sociocultural and material contexts. They challenge us to consider the broader implications of our creations—whether tools, systems, or learning environments—and to prioritize approaches that promote equity, sustainability, and relational flourishing. This synthesis calls for recognizing the active role of artifacts and design in fostering the value and respect we should accord to all individuals and communities in our design and learning practices.

This paper presents an example of integrating these principles into hands-on prototyping projects in an interdisciplinary undergraduate design class. The primary goal of this paper is to show how ongoing research can be brought into learning contexts where people use tools and processes to gain insights. Key to this formulation is the idea that boundaries can be crossed in a kind of looping fashion that leads to meaningful learning experiences and new ways of expanding research processes. Given the societal issues that future engineers and communities tackling

challenges associated with climate change will be working to address, often in interdisciplinary teams and contexts, the need for teaching about these issues is critical. The example outlined here is meant to contribute to this complicated but important debate.

Co-Design Learning in Practice: Imagine, Hack, and Make

The example of the *AlaskaCraft* game described in this section shows how ethnographic approaches can be used in research and in teaching to encourage learning, sharing alternative perspectives, and using socio-material artifacts. The ethnographic approaches that we highlight include practices of *listening* and *attending* that are foundational to *iterative design, data-informed artifacts,* and *responsive critique.*

AlaskaCraft: Experimenting with Knowledge Transformation Processes: Iterative design, data-informed artifacts, and responsive critique

In a design anthropology course that the first author taught, and the second author participated in through a series of feedback sessions, undergraduate students engaged in "hacking" and making activities applying principles of ethnography and sociability. The assignment involved using the content of a research article to iteratively design a socio-material artifact for learning about the complexities of designing and building homes in remote Alaskan communities that are located off the road system. The article provided a real-world case of a participant-centered approach that highlighted the value of multiple sources of cultural, climate, and technical considerations necessary for success. In the example described below, students "hacked" this article and used its contents to design an educational board game that situates players in positions where they depend on multiple sources of information to navigate complex, regionally specific design challenges. The assignments were designed to result in learning outcomes that included practicing iterative design, conceptually analyzing a research article, applying research data in prototyping activities, and engaging in critique processes focused on giving and receiving responsive feedback.

The board game, *AlaskaCraft*, was created by three undergraduate students. The game emerged from a final project assignment that asked students to "hack" an article about the climatic, cultural, and engineering complexities of building homes in remote Alaska communities. The article was written by Nicewonger, McNair, and their colleague Stacey Fritz (Nicewonger, Fritz & McNair 2022a). It outlines six areas of concern that create challenges that are mostly unique to Alaska when compared to other regions in the US. This outline was originally devised to communicate to engineers, policymakers, and related experts from the Lower 48, information that Alaskan housing specialists feel is necessary in order to develop building projects that reflect the unique and complex socio-environmental contexts of this region. As two interviewees cited in the paper explain:

> "My colleagues outside of Alaska are always amazed at how complicated it is to build homes in rural Alaska," explained Stefan, an Alaskan housing expert and head of one of 14 regional housing authorities in Alaska. "I know," agreed Julie,

> an anthropologist working on affordable housing.[1] "It's really perplexing to people who don't understand how different tribal, state, and federal governments work up here. I tell people from the lower 48 about how over a dozen agencies worked with one tribal council that had been trying to get a 3-mile road built for over 20 years. Even the agencies couldn't keep track of which permit, or study was needed, and by the time they were getting somewhere, some of the earlier permits had expired!" (Nicewonger, Fritz & McNair 2022a)

Working to develop a resource that could be shared with Stefan and Julie's colleagues from the Lower 48, we wrote and published this paper. The authors then shared it with Stefan, who appreciated the paper but worried that no one would read it, which was something the authors of the paper had also been debating. This led Nicewonger to introduce this example of a curricular activity in his design course that focused on hacking the article by transforming it into a multimodal activity or artifact that could educate people new to the complexities of building homes in remote Alaska. The assignment included the following steps:

Iterative Making with Research Data: The first half of the course focused mainly on traditional seminar pedagogy, including reading ethnographic material on design anthropology's histories, ethnographic work on design, and social theory germane to the subject matter. Additionally, a small but growing body of literature about integrating design methods into ethnographic research processes was introduced and used as a prompt for exploring complex social problems through experiments in making. About this literature, the instructor began introducing short activities where students engaged in experiments as makers, often involving ethnographic or sociological data. Each assignment involved multiple experiments, thus introducing the concept of iteration as a means for scaffolding the process so that it wasn't overwhelming, but also as a means for gathering sociocultural insights through feedback and questioning processes. For example, students were asked to create sociocultural artifacts and processes that would help them gather information about a question they were interested in.

Hacking: The prompt for this assignment was introduced in the last 5 weeks of the class. Students were asked to develop a multimodal form of any type. Form, in this context, was defined as any medium except a written paper. Examples could be anything from an art installation, a podcast, a game, an interactive activity, an art experience, or a short film or video, including something designed to be shared on a social media platform. To begin the process, students were asked to individually read the article and create a concept map of ideas and information that they wanted to work with. They developed their concept maps and provided feedback to each other, iterating on their ideas at least twice. After this process, they were asked to work in a group and create a 3D prototype using simple materials (recycled paper, tape, toilet rolls, tape, sketches, cut-out pictures, and found objects and materials). They were also asked to research forms, aesthetics, and experiences that they were drawing on to create their initial prototypes.

Questioning and Feedback: Using Liz Lerman's Critical Response Process (CRP), in each class students presented their prototypes and received and provided feedback with their peers (2023).

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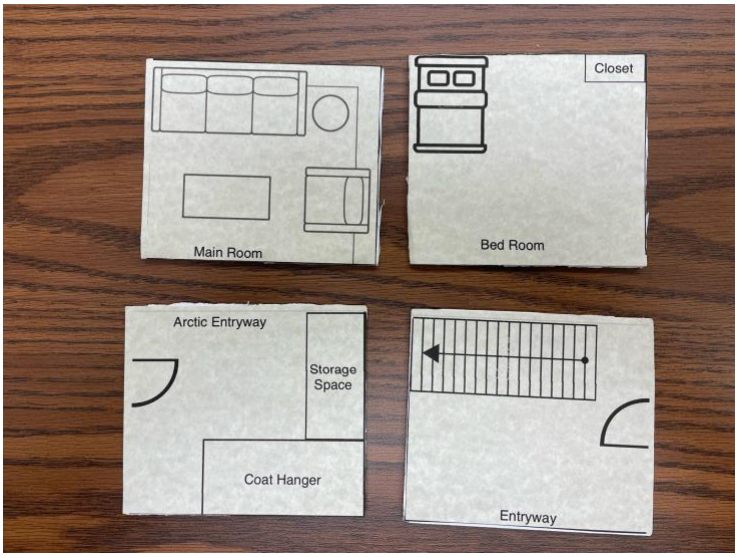
[1] Pseudonyms have been used in place of the names of all participants cited in this paper.

These feedback sessions alternated from class to class with several external discussants participating via Zoom or in person. Through this process, they gathered new ideas, which they used to revise their projects. Over the five weeks dedicated to this activity, several additional research articles were introduced; these introductions were made more than one week apart to give students time to revise, prototype, and experiment. The articles provided another layer of information that could be included, used as inspiration, or not included in the design. The choice of how to use the extra literature was up to the students. This entire process culminated in a final course presentation to McNair and another professor from another university.

In *AlaskaCraft,* players work cooperatively to co-design a home for a client in a remote Alaskan village. Using the six areas of concern identified in the hacked article—histories; land ownership & culture; cultural complexities; environmental multiplicities; time sensitive logistics; and networks of advocacy & innovation—the students created gameplay that requires players to use knowledge to make decisions and gather enough "resources" to begin building their homes.

Figure 2
AlaskaCraft Floor Plan Tiles

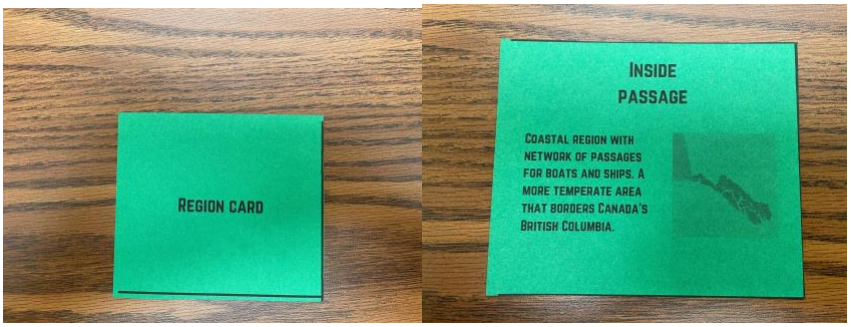


Note. The tiles describe parts of a floor plan. Players acquire a floor tile, and as they acquire more "resources," they can expand on the home's design. Clockwise from top left, the tiles depict a floor plan for a main room, a bedroom, an arctic entryway, and a standard entryway.

Figure 3
AlaskaCraft Resource Cards

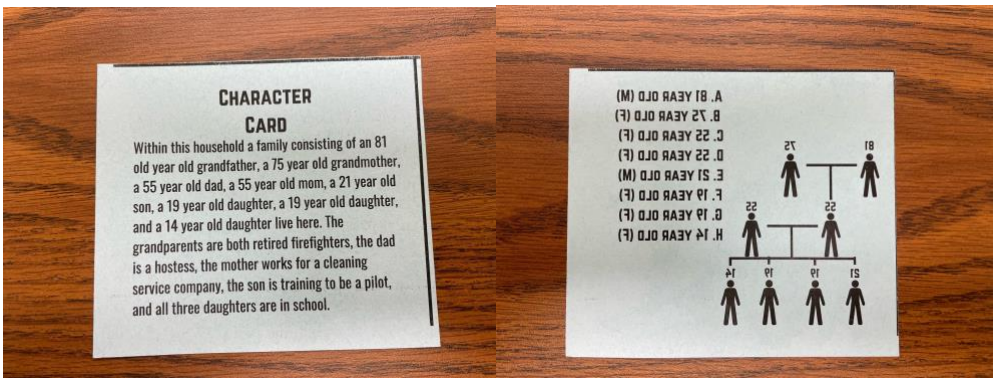
Note. Small square tokens imprinted with chests represent "resources." Players need to acquire resources to be able to build a home. Dice are used to determine how many resources a player will receive each go-round. Tally Sheets are used to keep track of a player's ability to progress through the game and complete a home design.

Figure 4
AlaskaCraft Region Cards



Note. Green Region Cards provide information about the geographic area that the players must account for as they build their homes. Students obtained the information for these cards through their original research.

Figure 5
AlaskaCraft Character Cards



Note. White "character" cards provide information about the clients a player is building a home for. Some include families with just two seniors in them, while others may represent multigenerational families all living together. Several variations reflect data outlined in the article that the students hacked for this assignment.

Throughout this one-semester course, the continuous practice of iterative design and productive critique encouraged students to imagine designs, prototype data-informed artifacts, and then "attend" by incorporating critiques into subsequent prototypes. Through analyzing articles including the instructor's research along with social theories on design ethnography, and then "hacking" an article to apply the content, students paired considerations of reproducible deliverables with an expanded approach that values sociability principles in providing knowledge critical to success.

In terms of challenges, students were resistant to looking for sources of inspiration by gathering examples of cheap toys, figurines, old games, etc. and play around with them. They liked to talk about ideas and look things up on the computer. They also didn't understand how creating a "mood board" or idea board of things they researched on the internet would help them organize their materials further. Additionally, they didn't experiment with the background or qualities of the materials they worked with. Design or art students tend to present work that has been experimented with before asking for feedback, and the students appeared to be either unaware or didn't understand why it mattered (cf. Nicewonger 2018). There was also a lack of experience with this type of curriculum, so it would have been helpful if the course were part of a multi-semester curriculum. Finally, it would have been helpful to develop more prompts and/or assignments, including using CRP in other ways than initially used, to expand on this aspect of the process.

Discussion

The primary goal of this paper is to show how ongoing research can be brought into learning contexts where people use tools and processes to gain insights. Key to this formulation is the idea that boundaries between academia and community can be crossed in a kind of looping fashion that leads to alternative learning and co-design frameworks in research and education. Furthermore, a range of learning outcomes can be incorporated, and thus our pedagogical example can be helpful to other educators using different research sources. For instance, students engage with lifelong learning principles such as navigating uncertainty, valuing multiple

perspectives, and productively collaborating across variable contexts, problem areas, and expertise.

As our research team continues to co-create a body of ethnographic analyses of building projects in remote Alaskan villages, we seek to attend to both the technical and social decision-making processes of local actors and to bring these principles into learning activities. This includes carrying out research on modular housing designs in the region and post-occupancy studies of both the performativity of previously built homes and the social aspects of living in those homes. To ensure that our research finds broader audiences, we have also been actively gathering data to co-create immersive media and design tools to facilitate co-design housing collaborations involving non-indigenous building specialists and indigenous homeowners with deep understandings of their communities' land, culture, and infrastructural needs. Bringing these principles into the classroom, the example of a game created by undergraduate students shows how alternative approaches to knowledge building can help engineers from the Lower 48 recognize the flaws of continuing inappropriate home designs and policies for Arctic communities.

This example also provides opportunities to reflect on artifacts and morality through the lens of Säljö's argument that underscores the profound impact of the increasingly complex and autonomous tools we create on our cognitive processes, suggesting that understanding human cognition necessitates considering the material and technological contexts in which it is situated. Lesley Sharp's work with bioengineers working on medical innovations is an interesting comparative example for thinking about how the ethnographic research that illuminates moral quandaries figures into scientific domains also overlaps with the field of design (2018). Her use of "everyday morality" is an extension of the "ethics" Lambek speaks to above, but it draws attention to a specific set of "moral questioning and actions" that ethnographers can contribute insights on through their ethnographic products, but not solve. The artifact-focused curriculum design presented here represents this line of thinking and anthropological engagement with engineering and related building processes. The *AlaskaCraft* game situates its creators and players in a design setting that requires seeking information from many sources to design homes appropriate to geographical and sociocultural contexts in remote Alaskan communities, which vary widely across the region. The students who designed the game collaboratively researched real-world material conditions and created meaningful artifacts for social activities that highlight the interconnected nature of cold climate housing.

Conclusion

We have described an example that invites situated analysis of building projects as sociocultural learning. This example was inspired by our commitment to engaging in collaborative infrastructural and home-building processes in Alaska. It is vital to teach alternative frameworks to students and those working in communities because it draws attention to the role of artifacts, particularly in specific contexts, and creates scaffolded ways for people to collaborate and learn from each other. By indexing sociocultural learning theory focused on sociability, and methods of listening and attending, teaching alternative frameworks can also embed the valuing of interdisciplinary perspectives in engineering curricula.

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