

Accessible Makerspaces in Indigenous North American Communities

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Figure 1: Loomed Beadwork, 2024.

Abstract

Through an autoethnographic case study of an ad-hoc digital hybrid makerspace created for teaching traditional Bodéwadmi loomed beadwork, we explore the potential for using digital and hybrid makerspaces to support the renaissance of Indigenous North American cultural making across the diaspora of the tribal communities. We explore the conflict between preferred ways of disseminating information in western online culture and for Indigenous North American cultural knowledge keepers, and how that might be respected in a makerspace that incorporates both indigenous and western techniques.

Keywords

Accessibility, makerspaces, informal engineering, education, traditional crafts, beadwork, digital communities

ACM Reference Format:

Katherine H. Allen, Chris Rogers, and Elaine Schaertl Short. 2024. Accessible Makerspaces in Indigenous North American Communities. In *Proceedings of "Challenges and Considerations for Accessibility Research Across Cultures and Regions" workshop at ASSETS'24 (ASSETS ACW Workshop '24)*. ACM, New York, NY, USA, 4 pages. <https://doi.org/XXXXXXX.XXXXXXX>

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ASSETS ACW Workshop '24, October 24, 2024, Online/Saint John's, NL, CA

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ACM ISBN 978-x-xxxx-xxxx-x/YY/MM

<https://doi.org/XXXXXXX.XXXXXXX>

1 Introduction

Engineering is a collaborative endeavor, and the products created by engineers are reflections of the people who created them. The disability justice community's principle of "nothing about us without us" demands that products intended for disabled users include disabled designers, and Richard Ladner's treatise on "Design for User Empowerment" [7] succinctly summarizes why accessibility in engineering and engineering education is crucial for inclusive products, both those intended solely for disabled users and those intended for general use (which includes disabled users). This principle also applies beyond disability—general-use products should be designed by and for diverse groups of engineers. However, culturally-responsive engineering education shares many of the same challenges as accessible engineering for disabled engineers, as well as some challenges unique to cross-cultural collaborations [6]. In this paper, we will recap some of the work we have done in identifying the barriers to accessibility in informal engineering education (makerspaces), share our current work in designing an accessible online/hybrid makerspace, recount an autoethnographic experience of participating in an ad-hoc hybrid makerspace for Indigenous North American loomed beadwork, and explore the similarities and differences between what is needed for cross-culturally competent online makerspaces and for accessible online makerspaces. We close with some open questions for the workshop and brief biographies of the authors.

2 Overcoming Barriers to Accessibility in Informal Engineering Education

As part of the National Robotics Initiative program of the National Science Foundation, we are developing a hybrid maker space community, focused on the needs of people who encounter accessibility

challenges in their day-to-day lives. We call it the Accessible Accessibility Makerspace, or “A2 Makerspace”.

We believe that the best team to solve accessibility problems is one where disabled people and others who need access¹ are centered – not just as a client but as the primary designer and builder of the system. This means providing accessible tools and tutorials for interested people to learn how to create their own solutions, or for them to team with others with complementary skills, and empowering them to create their own solutions.

The center of our community will be a WCAG AAA compliant website, with English and ASL captioning on all videos and English transcripts, where makers can share their projects. We explored the barriers to and benefits of accessible makerspaces through interviews with makerspace operators and disabled makerspace participants, and identified hybrid community makerspaces as a potentially powerful tool for making spaces accessible[4]. In particular, physical and transportation barriers out of the control of the makerspace operators often prohibit disabled makers from accessing physical spaces, but the community built in physical spaces can provide a nucleus around which a digital space can be anchored.

Many of the features which make physical makerspaces inaccessible to disabled participants are also barriers to North American Indigenous participants, especially transportation and pathways. Tribal reservations are most often in rural areas, and reservations often have even less access to transit than other rural communities. Infrastructure is often less well-maintained and buildings are often older and thus less likely to be ADA-compliant. Digital makerspaces have the potential to open up makerspace/maker community access for North American Indigenous communities as well, but come with some distinctive cultural concerns.

3 Autoethnographic Case Study of an informal hybrid makerspace: D1 Bead Loom Zoom

A hybrid makerspace where the online component is accessible anywhere in the world has the potential to be not only a powerful tool for engineering education for disabled participants, but also a powerful tool for collaboration across regional and cultural boundaries. Collaboration across distance and national borders have a powerful potential in cultural dissemination, preservation, and growth. For example, over the past year the first author has participated in a hybrid digital maker community, formed amongst the District 1 residents of the Citizen Potawatomi Nation. The successes and challenges of that endeavor can illuminate the possibilities of digital makerspaces for Indigenous North American artists.

3.1 A Brief Bodéwadmi History

The Bodéwadmi started as a single tribe in the Great Lakes area, part of the Three Fires Council of Ojibwe, Odawa, and Bodéwadmi. Through numerous instances of forced removals and migrations, the Bodéwadmi are now represented by at least 12 separate Nations

¹We recognize “people who need access”, in addition to people who identify as disabled, to recognize that accessibility assistance is universal - many people who do not identify as disabled might have barriers (whether physical, social, cultural, racial, socioeconomic, or other) which limit their access. We furthermore want to emphasize that tools developed for and by people who identify as disabled in one arena can be useful to people with other disabilities or outside the disabled community, and to encourage solidarity among all who experience limitations in their daily lives.

or Federally recognized Tribes across Turtle Island (North America)². In addition to the legal and physical separations, members of the various Nations may live far from their tribal lands or reservations, if they or their ancestors left seeking opportunities not available on the reservations, were sent to residential schools as part of 19th and 20th century forced assimilation movements[1], or were part of tribes that were encouraged to split their tribal holdings into individual allotments under the Dawes Act[2] and later encouraged to sell off their allotments to west-bound White settlers. This diaspora leaves many native tribal members without access to traditional practices, including crafting practices. In addition, the reservation model itself created and maintains an “urban-rural binary on Native peoples and spaces”[5], which both isolates the tribal members on reservations and other tribal lands collaboration with other makers (both in traditional making circles and more modern makerspaces), and stigmatizes the fusion of traditional Indigenous and modern Western making practices by people with traditional making skills who reside in urban areas with a high concentration of other makers from diverse backgrounds and modern makerspace resources. However, in the wake of the CoViD-19 pandemic, which forced many more people to become familiar with online collaboration tools, some indigenous knowledge keepers have found ways to share their knowledge with tribal members who had otherwise not had access to traditional making practices.

3.2 District 1 CPN Zoom Loom & Chat

Last year, the District 1 Counselor (an elected position representing members in the Northeastern US) of the Citizen Potawatomi Tribal Council started a sequence of monthly Zoom classes and a running Messenger chat for the participants. He collaborated with a master beadworker and sent beginner bead looms and beading materials to a dozen interested tribal members from Missouri to Maine, reducing the cost for participants to shipping costs only to encourage participation.

The group met monthly from November 2023 until May 2024, with conversations, progress photos, debugging help, and pattern-sharing via Facebook Messenger in between live Zoom work sessions. After a few sessions, the community welcomed more experienced participants to join, providing an online version of the “craft circle” type of gathering common to handcrafts across cultures—but which echoes the gatherings of people long ago around the fire in the winter lodges around the Great Lakes. After the first few sessions when the beginner questions began to become more infrequent, the elders leading the group invited guest speakers—including a tribal language expert who joined the Zoom for a January session to share traditional stories while the beaders worked on their projects, just as storytellers might have engaged the listening beadworkers on snowy evenings of generations past. Currently, a new group of interested beginners has joined the group chat and is awaiting their looms, and there are over 40 participants in the District 1 Zoom beading community chat. Figure 1 shows the

²These include the Anishanabeg of Kettle and Stony Point First Nation, Beausoleil First Nation, Chippewas of Nawash First Nation, Citizen Band Potawatomi Nation, Forest County Potawatomi, Hannahville Indian Community, Pokagon Band of Potawatomi, Prairie Band Potawatomi Indian Nation, Match-E-Be-Nash-She-Wish (Gun Lake Potawatomi), Nottawaseppi Huron Band of the Potawatomi, Walpole Island First Nation and Wasauksing First Nation, in addition to other smaller groups which may not be formally recognized by the US or Canadian governments.

first author's original beadwork following a traditional pattern as interpreted by the master beader.

4 Discussion

In one sense, this kind of ad-hoc technology solution for sharing “maker” skills, tools, and practices is inferior to a permanent online space like the A2 Makerspace (described in section 2). However, some of the things considered features for the A2 Makerspace could be considered dealbreaking flaws for sharing traditional cultural practices. While some practitioners are happy to share some teachings in permanent, impersonal forums like YouTube videos[8], other teachers or other kinds of skills or cultural practices are only taught in-person, or are only taught during certain parts of the year or in certain circumstances. For example, many kinds of traditional stories (including the ones shared in the January D1 Zoom Loom session) are only told if there is snow on the ground, and not shared online or recorded lest they be shared aloud in the wrong season and attract the attention of unfriendly spirits (who are believed to sleep in winter). A culturally competent accessible makerspace needs to take into account that the holders of some knowledge may have restrictions on where and with whom that knowledge is shared, which can be in conflict with the ethical principles of digital open-access movements. A hybrid makerspace for North American Indigenous communities might need to have materials that are only accessible at certain times or to participants who have engaged with the community in certain ways. Perhaps this could be implemented technologically, similar to forums in western-dominated makerspaces that award points for various kinds of participation, but perhaps the knowledge-keepers would prefer to control dissemination of some teachings personally, maintaining an access control list for their work that is based on personal connections. While access conflicts occur frequently in communities that are attempting to be accessible to people with a variety of disabilities, it is an open question (see section 5) whether this kind of values conflict can be managed in similar ways or whether it requires new techniques.

In addition to being aware of cultural conflicts around information sharing, a culturally competent digital makerspace needs to be particularly cognizant of issues of identity and belonging. As we identified in our 2023 paper[4], many people who participate in making activities don't identify themselves as “makers” or participate in makerspaces. Certainly many North American indigenous knowledge-keepers and elders are unlikely to identify as part of the highly technical Maker Movement of the early 2000s, and many cultural practice learners likewise may not associate what they are learning with makerspaces full of servomotors and laser cutters and young White men. Many in-person makerspaces are actively working to combat the stereotypes that have arisen around “making” as a practice, incorporating traditionally female-coded maker practices such as fiber arts into their makerspaces and inviting multimedia projects using a variety of techniques. There is an opportunity for makerspaces to also invite in practitioners of North American indigenous cultural making techniques in communities where they would be relevant. Techniques are needed, however, for how to invite in traditional practices to a physical makerspace in the context of a majority-non-Indigenous population center while

preventing cultural appropriation and showing appropriate respect to the knowledge-keepers. (See section 5)

The forced diaspora of the Bodéwadmi (as discussed in Section 3.1) is far from unique. Most North American Indigenous communities have stories with similar themes, though they are each their own unique tragedy. The loss of traditional knowledge and practices, as well as the removal from tribal lands that are intimately connected to those practices is often called cultural genocide[3]. In the Seven Fires Prophecy of the Neshnabek[9], this time of loss is associated with the part of the prophesy called the Sixth Fire, the time of sickness for the people, after they were betrayed by the false promises of the strangers who came to Turtle Island. Many modern Neshnabek (“first people” in Bodéwadmi) believe that the Seventh Fire (the rejuvenation of culture and language and the people's recovery from cultural genocide) is occurring now, and we are interested in how technological tools can help re-establish connection and community across the indigenous diaspora of Turtle Island.

5 Questions for the Workshop

How can communities that span globally but originate from anglophone, western, highly technical, wealthy communities be inclusive to participants from communities that are different from the origin community in one or more of those features?

How do we remove the stigma from non-electronic making practices in typically electronics-centered making spaces? While this is an ongoing topic of discussion for female-coded making practices (e.g. knitting, weaving, etc), it is also an issue for traditional North American Indigenous making practices.

Is it better to have communities that are centered around a single disability or a single culture or community, even though it limits the potential size of the collaborations (especially for intersectional issues, like the experiences of Deaf Indigenous cane-users making ceremonial regalia, or of blind wheelchair-using Spanish speakers interested in making navigation aids) or is there a way to provide space for “insider” discussions while also making space for sharing practices, techniques, and tools that are of interest to other communities?

Is there a broader class of values conflicts, similar to the conflict between the Western and Indigenous North American ideas for how to handle who has access to particular knowledge, that might encompass values conflicts between other pairs or sets of cultures?

How can a makerspace community that includes a broad range of participants handle values conflicts? Are there things we can borrow from the disability community's techniques for handling access needs conflicts?

How can multicultural makerspaces invite in practitioners of traditional making in the context of a majority-non-Indigenous community, while preventing cultural appropriation and showing appropriate respect to the knowledge-keepers?

6 Author Biographies

Katherine (Kat) Allen (she/her) is a PhD Candidate in the dual-degree Human-Robot Interaction and Mechanical Engineering program at Tufts University. She holds an MS in Human-Robot Interaction and Mechanical Engineering from Tufts University, and an

SB in Aerospace Engineering with Information Technology (XVI-2) from the Massachusetts Institute of Technology. She is a member of the Citizen Potawatomi Nation and a neurodivergent single parent of three twice-exceptional children. She is interested in how the design and creation of assistive technologies and technologies generally can be made more accessible across barriers including disability, race, gender, and economic inequality. Her research interests include accessible makerspaces and informal engineering education, physical human-robot collaboration and haptic technologies, and how accessible technology development might be brought beyond universities and the communities surrounding them and into other communities in a way that is respectful and reflective of the values and interests of those communities.

Chris Rogers completed his PhD at Stanford in 1989 on particle-laden turbulence before coming to Tufts, where he has been ever since. He has worked with Boeing, Intel, Cabot, Steinway and Sons, Bach, Selmer, PTC, Amazon Robotics, National Instruments and others on a wide range of engineering problems. But much of his effort over the last three decades has been in engineering education (with the NSF and LEGO Education), looking at the difference between learning the knowledge of others and learning to think for yourself.

Elaine Schaertl Short is an Assistant Professor of Computer Science at Tufts University. She holds a PhD and MS in Computer Science at the University of Southern California (USC) and a BS in Computer Science from Yale University. Her research applies human-centered design and disability community values to the development, deployment, and evaluation of AI and machine learning for robotics, including: human-centered human-in-the-loop machine learning; disability-friendly assistive robotics; autonomous HRI in groups, public spaces, and other human-human contexts; and accessibility and disability inclusion in robotics education and the computing research community. She is as committed to human-centered research practices as she is to algorithm and robot design: her work spans from designing a low-cost open-source open-hardware robot platform, to understanding family group interactions with socially assistive robots, to designing new neural network architectures for improving human-in-the-loop robot learning. As a disabled faculty member, Elaine is particularly passionate about disability rights in her service work. She is a co-PI of AccessComputing and co-Chair of AccessSIGCHI, an advocacy group that works to increase the accessibility of the 24 SIGCHI conferences.

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