The Wooden Quilt: Carving Out Personal Narratives in a Women-Only Makerspace

Tara Capel, Bernd Ploderer, Margot Brereton
Queensland University of Technology (QUT)
Brisbane (QLD), Australia
{t.capel, b.ploderer, m.brereton}@qut.edu.au

ABSTRACT
Women can face barriers to participation in universal makerspace environments and are consequently underrepresented within them. Further, women have historically been excluded from learning and working with particular types of materials, such as wood. To explore how we might address these inequalities in regards to both access to makerspaces and to diverse materials, we present the wooden quilt probe. Through this probe we aimed to 1) create a makerspace environment specifically for women where they could engage with materials and tools traditionally found in more male-dominated craft environments, and 2) facilitate the sharing of stories and experiences with other women within the community center where this work took place. We contribute a rich understanding of the stories and experiences of women from the community center, and discuss the implications of the work for Interaction Design: how designers can contribute towards diversifying makerspace environments that enable women’s participation within them, the benefits of intertwining storytelling and making, and the boundaries around sharing personal narratives.

Author Keywords
Makerspaces; Making; Crafting; Woodcarving; Wooden Quilt Probe; Digital Storytelling.

CCS Concepts
• Human-centered computing--Interaction design processes and methods

INTRODUCTION
There is increasing interest within Interaction Design in hacking, making, crafting and DIY practices, and the spaces in which these activities take place. These spaces, commonly referred to as makerspaces or hackerspaces, are open spaces designed to be accessible by everyone, providing access to a range of communal facilities and resources, and as such play a key role within the maker movement. While there are many positives to makerspaces and the maker movement more broadly, access to the benefits of these spaces remains unevenly spread [37] where women can face barriers to participation [28] and are consequently underrepresented within them [16]. Women have historically also been excluded from learning and working with particular types of materials, for example wood, particularly during their schooling [40].

To explore how we might address these inequalities in regards to both access to makerspace environments and to diverse materials, this paper presents a wooden quilt probe through which we aimed to 1) create a makerspace environment specifically for women where they could engage with materials traditionally found in more male-dominated craft environments in order to learn some of the skills, tools and language associated with those materials, and 2) share stories and experiences with other women within the community center. The wooden quilt probe was created through a series of workshops, where participants carved a story into an individual wooden panel and recorded an accompanying video describing the story behind it. The individual wooden panels then came together to form the collective wooden quilt probe. This research took place within a community care center in Australia that develops programs in response to the diverse range of needs and interests within their community.

Through the wooden quilt probe, and during the workshops to create it, our participants shared stories around their personal trajectories and life disruptions, the making practices and materials they engaged with and those they never had access to, and how these workshops contributed to feelings of wellbeing and empowerment. We explore the implications of the work for Interaction Design, including diversifying makerspace environments that enable women’s participation within them, the intertwined nature of storytelling and making, and the boundaries around sharing personal narratives. By opening up new spaces and facilitating engagement with new tools and materials, we can gain rich insights into people’s lived experiences and begin to open up new areas of design.

RELATED WORK
Feminist Making
A particular thread of making inquiry that blends critique and making is feminist making [1]. Through leveraging
feminist principles of plurality and participation [3], emerging critical research on making aims to challenge any singular making ‘culture’ through increasing the understanding of what constitutes maker cultures [16, 26, 27, 39]. There is much research detailing how feminist hackers and makers seek to make visible the lack of gender diversity within makerspaces and hackerspaces [1, 30]. Although makerspaces are built on the premise of being open to all, many of those who make use of the facilities are affluent males and early adopters who already have creative and/or technical backgrounds. Although democratization is one of the central values of makerspaces, they are not inclined to be truly equitable in regards to gender, race, or socioeconomic status [31] and participation within them can be limited to those of particular demographics [16, 20, 39, 41]. As makerspaces are a fairly new phenomenon, there is a perception that these spaces provide a blank slate where everyone has equal access, however this belief ignores the systems of inequality that remain embedded in the traditions from which these spaces emerge [16, 31, 35]. There remains an imbalance in gender, race and socioeconomic status-based representation in technical and computing-related spaces, which stems from “socially constructed stereotypes, prior access to certain types of learning experiences, and the privilege and control over how one spends their time” [31].

The question as to why women are not participating within makerspaces is not new [28, 42]. Looking into the barriers of women’s involvement in makerspaces and hackerspaces, Lewis [28] found many women felt intimidated by the often male-dominated spaces, considered the spaces unappealing and unpleasant, and found there was no easy way to get involved in the spaces, see what the spaces were or what they offered. One intervention has been the creation of women-orientated makerspaces and hackerspaces, commonly referred to as feminist hackerspaces [16, 42]. These are workspaces aimed at supporting the creative and professional pursuits of the women who utilise them [16]. Since their foundation in 2012, these “women-orientated hackerspaces have offered local residents a place to gather, share ideas, learn creative techniques, and grow professional partnerships in what some term an “emerging DIY culture”” [16].

Fox et al. [16] found members of these spaces “use small-scale collaborative design and acts of making to work out their place in society in ways that contest widely accepted understandings of hacking, technology and collaboration” and were “a material response to the male-dominated technology community of which many of the members were professionally affiliated.” However, while these spaces are women-orientated, they found the member bases were typically white, well-educated, well-paid, and generally already participated within the technology community in some regard. This did not always represent the group’s desired membership or set of ideals. Ethnic and socio-economic diversity within the spaces was both encouraged and sought after.

Making and Gender

Within feminist making, an ongoing focus of inquiry is how hacking and making are intertwined with gender identity. This has prompted the development of hardware and software toolkits to assist people, especially girls and women, to develop technology skills through various craft activities, such as sewing. The Lilypad Arduino is one embodiment of this particular area of making research [10, 11]. The Lilypad Arduino [10, 11] is an open source toolkit, which sparked interest in electronic textiles, or e-textiles. E-textiles consist of computational components embedded in clothing, furnishing and/or architecture. It takes an existing technology and innovates it for a domain were the dominant group is women – 65% of Lilypad Arduino projects are led by women, whereas 90% of Arduino projects are led by men. These types of technology toolkits aimed at girls and women are regarded as feminist technologies in that they work to increase the participation of historically marginalized users in technology-related activities [2]. While it is argued that they disrupt the division between what is considered ‘masculine’ or ‘feminine’ identities [2], it remains representative of the gendered nature of the materials aimed at women and girls when it comes to gender-specific makerspaces, and the making activities and materials offered within those spaces (for example: textiles, knitting and crochet).

Materialist Feminism

We create the objects that in turn create our understanding of who we can be [15]. The gendered lens placed on materials and tools is well ingrained in society, where women have long been associated with domestic tasks such as knitting, sewing and weaving [15, 35], and the makerspaces set up specifically for them generally retain and reflect this association. A materialist approach asks how factors that are beyond a person’s control shape their experience, i.e., the experience of women [24]. This approach is based on a Marxist view that economic factors are the base of social relations and inequalities. Going beyond economic factors, materialist feminism also looks at other factors that shape experiences, from access to resources and materials, to the built environment, to ways of organizing and talking about activities. Thus, it is not just the materials that are gendered in nature, it is also the workspaces, the language, and the way work is (and has traditionally) been organized in a gendered way. This presents barriers to women’s participation in spaces with tools and materials that are traditionally found in more male-dominated craft environments.

A key motivator behind the wooden quilt probe was to disrupt the gendered traditions embedded in making, while maintaining the benefits of creating gendered spaces for women to connect and create.
Making and Storytelling

Making as a Method of Design
Making as a method of design has a long history in design research, where making practices are used as part of the research method [1]. Their use is intended as a process of inquiry aimed at novel knowledge contributions. Utilizing making practices in design research reflects other trends in design, such as Research through Design (RtD) [45]. Through RtD, the design methods utilized are viewed as the research methods, and design artifacts act as the instrument for research articulation [17]. DIY making research in HCI stems from both RtD and studies of materiality [19], and has been utilized to prototype alternative ways of doing design and research [1].

HCI and Interaction Design have started to engage with makers of non-digital items (such as knitters) in order to understand how these craft practices could be leveraged to rework dominant frames of design [6, 34, 36]. For example, Rosner and Ryokai [34] developed a system for knitters called Spyn, an information sharing system that associates digitally recorded messages with physical locations on knit fabric. Through Spyn, they aimed to understand how people appropriate digital technology in craftwork, and found that the knitters highlighted the care work done between people, places and technology, as well as technological expertise. This study challenges simplistic binaries between the “material and immaterial constituents of the social world” and enables a move towards the study of the “future-directed, transformative potential of materials.”

Sharing Stories through Making Practices
Storytelling has also become a notable part of experience research; not only as a method of inquiry, but also as a means of production in design interaction. In order to elevate stories of design by people with disabilities, Bennett et al. [6] ran a series of workshops with disabled activists, designers and developers in order to create “biographical prototypes,” the “material manifestations of people’s oral or written personal stories of ‘making something work.’” Through the creation of biographical prototypes, their participants shared personal accounts and reflections around their own experiences of design and disability. While workshops such as Bennett et al.’s [6] enable stories to be shared verbally around material creations, other studies have looked at integrating digital components, such as audio files and images, into physical components in order to share these through the materials themselves [21].

Digital storytelling involves the creation of an audio-visual story, a particular genre of media making and facilitated user-generated content that has been used in a range of different contexts [13]. Studies have looked at the potential of digital storytelling to contribute to cultural research and social inclusion [22, 23], engage communities by creating community memory [25], and in rebuilding lives after life disruptions [13]. The process of creating and sharing stories digitally enables participants to create the stories they want to share in their own way, and has been shown to benefit both individuals and the communities they engage with through supporting self-identity, social recognition, shared values, and self-advocacy [12]. The stories are built from participants previous life experiences and involve adding digital content, such as photos and videos, to audio recordings of voice and sound. While there are many positives to digital storytelling, there are also important considerations around privacy, and how and where these stories are shared [13, 32]. Palen and Dourish [32] describe three boundaries that are central to the characterization of privacy management, which include disclosure, identity and temporality. Disclosure describes what information might be disclosed under what circumstances and the varying degrees of control; identity describes the boundary between the self and other; and temporality describes those boundaries associated with time. These boundaries, and the tensions that occur in their negotiation, demonstrate that privacy regulation is a matter that is dynamic, dialectic, and negotiated.

This work draws upon making practices and storytelling in order to explore new areas of design with women from a community center. The wooden quilt probe, and the design workshops to create it, were inspired by previous research utilizing making as a method of design and digital storytelling. However, rather than engage with pre-existing communities of makers, or with materials familiar to our participants, we aimed to create a makerspace environment where women could develop new skills through their engagement with new materials and tools.

RESEARCH CONTEXT AND POSITIONALITY
This research took place within a community care center in Australia that develops programs in response to the diverse range of needs and interests within their community. Through their neighborhood center they “offer support to people who are experiencing the challenges that life can bring, as well as opportunities to connect and get involved whatever their circumstances, background or stage of life”. One of the programs they offer is a twice-weekly drop-in session where people are able to pick up fruit, vegetables and bread free of cost. It was from this particular program that we recruited our participants for the study.

The research has been led by the first author, whose positionality is as a white, cisgender woman, who identifies as a feminist but not as a ‘maker’ or ‘crafter’. The first author is pursuing a doctorate within HCI and has experience working professionally within the technology industry. We considered how this background and experience may have shaped the research and its interpretations. None of the researchers who authored this paper participate within the community involved in the research outside of the role of ‘researcher’.

RESEARCH DESIGN
This research involved the creation of the wooden quilt probe through a series of design workshops, where two
participants from the community center carved individual wooden panels to be featured within the larger wooden quilt probe. We also conducted participant observations during these workshops and semi-structured interviews at their conclusion. Through these methods we aimed to explore the lived experiences of women from the community center, and how these were shared through their individual wooden panel, the accompanying video, and the workshops.

The Wooden Quilt Probe
The wooden quilt probe was designed to 1) engage women from the community center in a makerspace environment where they could work with materials traditionally found in more male-dominated craft environments, and 2) facilitate the sharing of stories and experiences with other women within the community center. Both the use of the ‘wood’ and ‘quilt’ elements of the wooden quilt probe were important. The use of the wood material was intended to give the participants an opportunity to work with a different material, which they had not had access to previously, in order to learn some of the skills, tools and language associated with the material. Although not usually made from wood, the quilt element of the probe was chosen due to both their narrative qualities, and the rich tradition they hold in women’s craft [9]. Quilts are embedded in a long history of women expressing themselves creatively through various craft activities. Reflecting this, the participants were able to share personal narratives through physically carving them into the wooden panels, which together would create the larger wooden quilt probe. The wooden quilt probe also included a video recording accompanying the individual panel, as well as discussions during the workshops to create their individual wooden panels. Within HCI, we see other embodiments of quilt concepts being used to share women’s stories digitally, where Rosner et al. [35] created an electronic quilt to highlight and share the invisible work of women weavers that went into assembling the core memory for the Apollo space missions.

The wooden quilt probe shares similarities with Wallace et al.’s design probes [44], in that it is a directed craft object that is both a tool for design and understanding. It also shares similarities with dialogical probes [38] in that the process of creating the probe was a form of co-creation with our participants within a workshop environment, and not taken away to be completed independently as with cultural probes [18]. The key difference of the wooden quilt probe from these types of probes, as well as biographical prototypes [6], is that the women’s involvement in creating the probe also enabled them to develop new skills and engage with different materials and tools.

Design Workshops
To create the wooden quilt probe, we ran 10 design workshops over the course of three months within the community center’s hall. These workshops were held weekly and ran for 2-3 hours each. The makerspace environment was set up with a large table in the middle of the hall where participants were able to sit and carve, and small workbenches along the side of the hall where participants could stand and carve. In the middle of the table we placed the tools, including chisels, sand paper, brushes, clamps and mallets, so that they were accessible to all. We also engaged a female instructor to teach the wood carving workshops. The instructor was a member of the community center, and she had previous experience at teaching woodworking classes within a school.

During the first workshop we introduced ourselves and the project, and asked the participants to introduce themselves, their motivation for attending, and what they hoped to learn. We showed a video demonstration of how to carve wood and talked through health and safety considerations. We provided pieces of wood for the participants to practice on and the instructor introduced them to different techniques with different chisels. At the end of the first workshop, we asked the participants to consider what story they wanted to share and what they wanted to carve, now having some experience of carving the wood. The second and third workshops were dedicated to refining their skills on the practice pieces before they started on their final pieces, and finalizing the design of their panel. In all subsequent workshops, participants would come into the workshops and work on their final wooden panels. During the workshops we conducted participant observations and created field notes on how the participants engaged with the space, each other, and the stories that they shared.

During the final workshop we created videos with the participants designed to accompany the wooden panel. Based on the concept of a 60-second documentary, the participants were filmed describing the story behind the wooden panel, why they decided to attend the workshops, and the process of carving their wooden panel. We then edited the videos to include photos and videos that highlighted the progress of their wooden panel and their participation in the workshop.

Participation
To recruit participants, we visited the drop-in sessions organized by the community center twice a week. An announcement was made at the beginning of each of these drop-in sessions explaining our research activity and members of the research team were present to informally discuss with potential participants. At the beginning of the project we had four participants who attended the first workshop. Before the start of the second workshop, one participant called to say she would have to end her participation due to a personal situation. Another participant attended five workshops and then did not return. At the conclusion of the workshops, there were two remaining participants who completed their panels, Claire and Jennifer (names have been changed). Claire is a 70-year-old white woman and Jennifer is an Aboriginal Australian woman in her 50s.
Post-Workshop Semi-Structured Interview
At the conclusion of the workshops we conducted semi-structured interviews with the two participants at their homes. Throughout the workshops we had captured stories that the participants had shared, which we then shared with the participants during the interview. This enabled them to remove or change elements, or add to the stories. We were also interested in exploring their experience during the workshops and in creating their wooden panel, as well as other making activities they may engage in. The stories, as they are reported within this paper, have been edited by our participants and we have their permission to share these stories through this medium under different names.

Narrative Analysis
Our analysis was guided by a narrative approach [14] to create written accounts of the lived experiences of women from the community center. Through this analysis, we highlight the lived experiences of women who attend the community center, based on the personal narratives shared through the wooden panels and accompanying videos, the workshops, and the interviews. In re-telling the stories of the workshop participants, we framed each story around three themes developed from a process of thematic analysis [8]: personal trajectories and life disruptions, making and materials, and wellbeing and empowerment. We present the stories of the two participants who completed the panels.

FINDINGS
The stories collected during this research provided rich insight into the lived experiences of women within the community center. Below we will introduce the two participants who completed wooden panels for the wooden quilt probe and explore the stories they shared, both through the workshops and the wooden panels themselves. We first explore the story carved into the wooden panel and verbalized through the accompanying video, and then organize the stories shared during the workshop around the key themes of personal trajectories and life disruptions, making and materials, and wellbeing and empowerment.

Claire’s Panel
The overall theme of Claire’s panel was ‘life’ and was split into two parts. The top section was a series of stairs that represented the ups and downs of life and the bottom section represented the twists and turns of life (Figure 1).

“My tile represents my interpretation of life. It is abstract, and although it’s not my life, some of it is indicative of what has happened to me. The top section represents the steps, we go up and down throughout our lives. Sometimes there can be a major sudden disruption and we find ourselves at the bottom. The second part of my tile represents the twists and turns life takes. Tracing from the bottom up, time passes slowly and as we move on time passes more quickly. The twists and turns get shorter. In this tile at the top of the curve, there are three dots indicating that life is not over yet there is still more to come. My initials are on the tile and the flower was just me playing.”

Figure 1: Claire’s panel

Stories of Personal Trajectories and Life Disruptions

Health: As was alluded to in her wooden panel, Claire had suffered two strokes which were represented by the large drops in the stairs of her wooden panel. While she has recovered completely from both strokes, she shared many stories within the workshop around these experiences in her life, particularly around her recovery. Claire had lost three quarters of her peripheral vision in one eye and half in the other eye, and had to retrain her eyes. She also had to teach herself to read again. She remembered the alphabet and taught herself to recognize words by reading the big text in Readers Digest magazines. She worked her way up to being able to read a book but when she finished she realized that she had no comprehension of the book. So while she could read, she could not comprehend it all together. She had lost a lot of memories, so her friend from primary school would sit with her, show her photos and tell her who everyone was to help her memory. She eventually got the majority of her memories back, mentioning there was only one person who she has no memory of.

Housing Insecurity: Claire described herself as being homeless and in the process of learning how to find housing, which she expressed was a “steep learning curve in today’s world when you’ve never done it before.” When she started the workshops, she was living with one of her daughters, but was needing to find a place of her own and was in the process of doing so. Over the course of the workshops, Claire would update the group on her housing journey, including the houses she was looking at, her plan to stay with her mother until she could find something, and how student social workers from the community center and her daughter were helping her with the online applications.

“It was a couple of student social workers who showed me how to work my way through an online electronic application, otherwise I didn’t have a clue. And my daughter had to find her own place.”
Towards the end of the workshops, Claire was accepted for housing and started the process of packing up and moving into her new home.

Travel and Adventure: A participant who dropped out before the conclusion of the workshops was going on a cruise. This sparked Claire to talk about stories of her own travels, including the small cargo ships she had travelled on when she was younger. She had taken a five-month trip from Brisbane and travelled by herself to Hong Kong, Russia, Finland, Sweden and Denmark and she shared various stories of her trip. For example, the group of men they saved from the water during a storm. The storm had smashed one of the rescue boats on the cargo ship, but they were able to send another one down to the water. The men got into the rescue boat and as they started to pull the boat up one the ropes came loose and they landed back in the water. She described how lucky it was that one of the men was able to fix the rope and they were pulled up to safety.

Claire had a group of friends that she had known since primary school, and she shared that they were in the process of planning a cruise to celebrate them all turning 70.

“It’s just a five-night cruise down to Sydney and back. I don’t know if I’m going to enjoy it or not. Bit too far away from the water. My idea of being on a boat on the ocean is to be within, not reaching distance of the water, but fairly close up because I love watching the movement of the ocean, I love feeling it move. I even like the occasional salt spray on my face. And on something that size you don’t get that. But I don’t know until I’ve tried it.”

Building and Maintaining Relationships: During the process of finding housing, one of the people from the community center had offered to let Claire stay with her. The friend had said that she would take the couch and let Claire use the bedroom. She spoke of how people who do not have a lot are generally willing to help those who also do not have a lot.

“Oh the whole, the majority of people that come up to the [center], they’re happy people. It’s almost as if “I’ve got nothing, so what?” They are happy people compared to people I’ve come across in the workforce over the years. They’re not trying to pretend to be somebody else.”

Claire would often share stories of her mother, children and grandchildren. One of Claire’s daughters was serving overseas in the army, and travelled home to visit during the workshops. The next workshop Claire came in and shared how she had been able to spend time with her daughter, son-in-law and grandchildren. She would often show us photos of her daughter in her uniform and her grandchildren that she received via Facebook. She also shared that her husband had left her after her second stroke. He was interested in owning horses and wanted to move out to a property with land in order to do so, but Claire was unable to move to a remote location due to her health concerns.

Making and Materials
Claire enjoyed creating counted cross stitch, but did not know how to sew or knit. She had mentioned this to one of her new neighbors who was surprised, given her gender and the generation she was from.

“The lady down in Unit 1, she goes down to craft classes but I can’t sew to save myself, or knit or crochet. She was amazed that I didn’t know how to sew – my generation they learnt to sew. I knew another woman who used to go off to craft classes if something took her fancy but her main interest was quilts...but I don’t want to do that.”

Claire had not been able to participate in woodworking during her schooling and had signed up to the workshops to learn new skills around working with wood. She was hoping to learn more woodworking skills and basic power tools in order to do her own repair work, as well as mosaics.

“I’ve been wanting to work with wood for ages and this project was the start of it. This is my kitchen table that I want to do up. I’m going to take the old paint off and give it a light sand back, because I want the scars and everything on it. This was my parents table and that’s why it’s solid wood. It was our kitchen table at home as my kids were growing up. There’s red wine somewhere, [grandchild] was sitting at the table one time drawing with a marker and that was on paper but the marker was going through onto the wood. I don’t mind that, I’m not going to sand it off so it’s nice and smooth as if it’s come out of a shop, it’s been a kitchen table for 70 years and I want it to show its scars.”

Claire found the women-only environment friendly to learn within, and described the workshop as a group of people getting together.

“I wouldn’t say it was important [that it was women-only] but it was an advantage as that was a level playing field with all women there. I think if you’d had any men there they might have tried to put the women down. That’s just an assumption, depends on the men, some men think they know it all.”

Wellbeing and Empowerment
Claire shared stories of being a medical laboratory technician and how closely related the skills she was learning for carving the panel was to the work she used to do, including slicing small specimens under a microscope and testing samples. These stories of her time as a medical laboratory technician were generally triggered by something happening in the workshop, for example the first author was sharpening one of the knives and she shared a story of how they used to have to sharpen their knives on a spinning sharpening stone. She felt empowered that she had not lost her fine motor skills and was able to transfer them over to a new skill and different material.

A key motivator for her participation in the study came from her own experiences as a student and researcher. She was conscious that post-grads need to have participants.
“Bit disappointed for you that there were only the two of us there, but you’re dealing with people who come and go.”

Jennifer’s Panel

The overall theme of Jennifer’s panel was ‘nature’ and ‘home’. She carved a tiger snake’s head and had also carved the wood surrounding the snake head in a way that the texture looked as if the snake was swimming through it (Figure 2). She spoke about her love of nature and growing up in a small coastal town, where she was often either swimming or hiking.

“The snake itself, it came to me because I grew up alongside a river in a small coastal town and coming across snakes is pretty common. I’ve even been swimming in the river and looked over and found them swimming next to me. It’s got memories for me, holds memories, by the way I’m terrified of snakes.”

The snake had a double meaning in that it also represented some of the people she had encountered in her life.

“It’s akin to people who look beautiful, like a snake looks beautiful, but then they turned out to be not so nice. I got a taste of the venom. It’s happened to me my whole life; I’m thinking why, you’d think by my age I would learn not to get sucked in but apparently not. I’ve met more nice people than snaky-type people.”

Jennifer enjoys telling traditional stories and spiritual narratives of Aboriginal culture and traditions, and also performs Aboriginal Storytelling at the community center’s childcare.

Making and Materials

Jennifer identified herself as an artist who described the table she had at home filled with her different art projects. She talked about various projects she was working on, including finger puppets to send to her grandchildren and a painted boomerang for her son. She had also recently been commissioned to paint a mural at the community center on one of the walls outside, and shared what she was planning on doing with the mural.

“There are four panels and I’ve designed one, I thought I would do a panel each with an Aboriginal story. The first one is Tiddalick. I’ve tweaked it a bit with snakes, but the snakes are the things that make him laugh and spit all the water out...I haven’t painted a mural in 10 years, it’s going to be exciting.”

Jennifer had never tried woodcarving, she decided to participate as she thought it would be a nice challenge and a good opportunity to pick up a new skill. Beyond the materials she was currently working with as an artist, she also reflected upon those she had not had access to during school and the importance of women-only spaces.

“Learning to make anything with wood would be good. Back in my day girls weren’t encouraged to do the woodwork units in high school, the girls did cooking and sewing and the boys did woodwork and metalwork, so it’s never been on offer. I could make a whole house full of furniture if I got good enough at that. I would start with bird boxes or something easy. Just being able to learn how to use power tools too. I think it gives us an opportunity, especially us older women, to work with a medium we have never worked with before because you didn’t grow up being taught it, it was never on offer. It’s really nice, and it’s less pressure when it’s just women, especially doing something new. Men have their own stuff, like Men’s Sheds. It’s...
important to have women-only spaces, it’s important for security, it’s important for togetherness, and you might talk to someone who has been through the same thing as you and you can relate to it, that might help you in some way.”

Wellbeing and Empowerment
Spending time in nature and participating in making activities were both important elements to Jennifer in terms of maintaining wellbeing. Due to her schedule, Jennifer ended up taking her wooden panel and some chisels home with her for a short period of time so she could finish her panel. The next workshop she attended spoke of how anytime she reached for an activity to work on from her table, the carving was the first thing she wanted to do. She said there was a therapeutic and meditative element to the woodcarving that she was going to continue to incorporate into her routine. Jennifer brought up the therapeutic and empowering nature of the woodcarving over a few workshops, where she described it as “empowering to do stuff you didn’t know you could do before” and “good to just have your brain focus on one thing for a time.”

“It’s been a really nice fun project. I’ve enjoyed meeting [Claire] and while we worked we more or less chatted away about our lives, it’s nice to hear about somebody’s life. I recommend this for anyone, once you start doing it it’s actually quite soothing. I would have all these different jobs to do at home and I would think no I’ll just do some snake for a while, everything gets put on hold while I carve.”

A therapeutic element also came from being able to not only share elements of her life, but also hear about other women’s lives and being able to empathize with what was being shared.

“It was a women thing, kind of like secret women’s woodcarving business. There’s a time and a place for including everybody, but I think there should be times where it’s just women. I could relate to [Claire] telling me about her having to move, because I’ve had that happen so many times. It’s actually a huge thing to happen in your life and it can be quite stressful. I like to care about people and I was really pleased for her when she said she had somewhere. I can relate to her when she was talking about her elderly mother because of the area I work in. To not focus on just yourself; it’s nice to be able to have a civilized conversation and realize that everybody else has things going on for them.”

The Quilt Comes Together, the Panels Come Apart
During the first workshop, all of the participants started to discuss the upcoming renovation of the community center where we were running the workshops. The discussion touched on the possibility of having the wooden quilt probe added as part of the renovation as a way to leave their mark on the center. Over time however, as they worked on their wooden panels and their story became more intertwined with the piece, we observed an increase in ownership over their panel where they expressed interest in wanting to keep them at the conclusion of the project. As Jennifer stated, “they come together, they come apart, and they come back together again.” The nature of the wooden quilt probe being a collective piece made up of individual components allows the participants greater control around the boundaries of sharing their stories. As we can see from the above narratives, the stories shared through the panels and accompanying videos were small snapshots of the participant’s larger personal stories and experiences that were shared within the workshops. In this way the participants were placing their own boundary around what may be shared beyond the context of the workshop through their wooden panel. For example, Jennifer kept the double meaning of the snake shared during the workshop out of her video as she wanted it to be a positive piece with no negative connotations attached to it, but was happy for her wooden panel and video to be shared beyond the workshop and the community center. Claire had more considerations around her anonymity. She expressed pride in what she had achieved and wanted to share that both within the community center and beyond, but there was also some comfort in these stories being shared within environments where she was not known.

“Going beyond your supervisors and things doesn’t bother me, I’m not likely to run into them, and to the best of my knowledge I don’t have any relatives or friends in your field. The people that work [at the community center] sign a confidentiality agreement that they don’t talk about what they see there or who they see there, so no it doesn’t worry me. I’m quite happy with myself and what I managed to achieve and given what my life’s been like for the last 15 years, I’m quite happy, I’m quite comfortable, I don’t need to hide away from anyone.”

DISCUSSION
The wooden quilt probe and the design workshops provided rich insights into the lived experiences of women from the community center. Our participants shared stories around their personal trajectories and life disruptions, the making practices and materials they engaged with and those they never had access to, and how their participation in the woodcarving workshops within the women-only makerspace environment contributed to feelings of wellbeing and empowerment. The wooden quilt probe also provided participants in our study with an opportunity to develop new skills, and to work with materials and tools that they had previously not had access to. Learning these new skills, working hands-on with materials, and the ongoing dialogue between the materials and other participants over an extended period of time in turn allowed stories to unfold with greater depth than would have emerged from methods such as interviews, or from cultural [18] or design probes [44] designed to be taken away and completed independent of researchers and other participants. In the following section we will explore the implications of the work for Interaction Design through our insights, including
reflections on diversifying makerspace environments that enable women’s participation within them, the intertwined nature of storytelling and making, and the boundaries around sharing personal narratives.

**Diversifying Makerspace Environments**

Diversifying makerspace environments that enable women’s participation within them is an important topic for Interaction Design, where women can face barriers to participation in universal makerspace environments and are consequently underrepresented within them [1, 16, 30]. One barrier to participation stems from women’s exclusion from learning and working with particular types of materials, such as wood [40], where they have historically lacked opportunities to learn with tools and materials that are traditionally found in male-dominated craft environments. We hope that the wooden quilt probe will inspire other interaction designers to create makerspace environments that allow for more diverse participation, along with creating artifacts and nurturing creative practices. In creating a makerspace environment, designers should consider the tools and materials made available, as well as the activities and interactions that work to support participants in forging connections and building confidence. We have found that building confidence often comes from building competence around using materials and tools participants have not worked with before. Both of our participants’ lack of access to making with wood and learning skills associated with it stemmed from their schooling, where they were not allowed to participate in woodwork. Claire did not necessarily identify with, nor was she interested in, the making activities typically aimed at her within existing women-only groups. She did not want to sew or knit, but wanted to learn skills around woodworking and power tools. Jennifer also expressed interest in furthering her skills beyond the woodcarving to possibly create her own furniture. The woodcarving was seen as a useful introduction to building competence around working with wood materials and a stepping stone towards learning other skills and tools. While it was important to both participants that they have access to wood materials in order to learn new skills, they also expressed the benefit of doing so within a women-only environment in terms of security, togetherness, privacy and comfort. The women-only workshops “leveled the playing field” [17] when it came to learning with new tools and materials typically associated with men. Their participation within the workshops and working with the wood material was an empowering experience in that they had a chance to do something that they had not done before.

The makerspace environment and length of time the workshops ran for also enabled us to “be with” our participants [7] in a way that forged new partnerships, and built rapport between us and our participants, and between the participants themselves. From this perspective, we emphasize the importance of long-term engagement within the communities we are working (either existing or those we create), and engaging participants in hands-on activities over a period of time.

While the wooden quilt probe and the workshops overall were a positive experience for the participants, and the discussions held within them were valuable to all involved, we do acknowledge that participation also required a large commitment from our participants due to the time-consuming nature of woodcarving. Consequently, we faced challenges in sustaining participation over the course of the workshops. Beyond the time-consuming nature, participation issues could also be attributed to the type of probe activity we chose. We consider the potential for other probe activities that could be explored that are not so reliant on participation over an extended period time, but also teach practical skills. For example, running a series of workshops to create a shadow box where the participants could share stories around the important possessions that they would place on the shelves within it.

**Making Stories Material While Materialising Stories through Making**

One of the main insights from this work is how closely intertwined storytelling and making are. Stories become the materials for making, and conversely, the process of making opens up opportunities for generating stories. Both designers and participants can benefit from this interplay between stories and materials in order to nurture curiosity, and allow stories to unfold in much greater nuance and with a greater depth than is possible to bring forth through methods such as interviews and focus groups. Seen from this perspective, makerspaces are not simply places to work or to innovate [4, 43], they are places for participation and socializing [16, 37], making sense of one’s life and hearing about others’, whilst learning about and engaging in hands-on activities. The stories carved within the wooden panel enabled our participants to commit their stories to material, however their wooden panel and accompanying video captured small snapshots of the participant’s larger stories and experiences that materialized through making their wooden panel within the workshops. In Claire’s panel, she talked about the ups and downs and twists and turns of life, however it was through the workshops that we learnt the specifics of her own ups and downs, and twists and turns, including the experience of her two strokes and her recovery from them, and that being a catalyst for her divorce. Claire would also share stories around her experience working as a medical laboratory technician, generally in response to certain events within the workshop or her engagement with particular tools. In Jennifer’s panel, she talked about tiger snakes and how they reminded her of her childhood where she spent a lot of time in nature. Through the workshop we learnt that the snake had a double meaning and also represented some of the people she had encountered throughout her life, and how she was in the process of recognizing and surrounding herself with different people. We also learnt about her studies, the workshops she was running at the community center, and
her experiences as an artist and the types of materials she worked with.

While the process of creating the wooden panel was important and at its completion held a lot of meaning for our participants, their engagement in the workshops themselves were also meaningful in terms of building relationships and connecting with other women over shared experiences, and enabling self-reflection around how they see themselves and how they want to be seen. By opening up new spaces and facilitating engagement with new tools and materials, we begin to open up new areas of design. It also allows for new opportunities for self-expression, dialog and reflection between the participants themselves, participants and researchers, and participants and their wooden panel.

**Making Boundaries for Stories**

Finally, as designers it is also important to consider when not to design [5], and to engage in dialogue with participants to elaborate, negotiate and protect boundaries. We started this research with ideas around sharing stories within and beyond the workshop by embedding the wooden quilt probe and the accompanying video recordings in a digital noticeboard in the community center. However, as we engaged more with our participants, we learnt that sharing stories is not always desirable, and that it can create drawbacks, and shift the dynamics and perceptions within a community [13, 32]. In reflecting on how we might design interactions in ways that ensure that participants remain in control of their personal stories, and if we even should design, we found the notion of boundary management as a dynamic process useful [32]. In particular, we reflected on the notions of disclosure, identity and temporality discussed by Palen and Dourish [32] in the context of privacy management, and how these apply to managing the boundaries of sharing personal narratives.

**Disclosure:** Our participants were able to determine what they shared within the workshops, their wooden panel and the accompanying video. An unexpected benefit of the nature of the individual wooden panels of the wooden quilt probe is it allows the probe to both come together as a collective piece, and also come apart. This element allows participants greater control over where their stories are being shared, as they can determine when their panel is featured in the wooden quilt probe, and when it is not (or even not at all).

**Identity:** An increased ownership over the wooden panel that had our participant’s story embedded within it developed over the course of the workshops, likely due to the time and effort that went into carving the wooden panel over time. Participants considered how the personal narratives shared through both the wooden panel and the video might be perceived, and how they themselves might be perceived through their narratives. For example, Jennifer did not want negative connotations associated with her wooden panel by sharing the double meaning of the snake through her video. They created a boundary between what was shared about the panel in the workshop, and what was shared within the wooden panel’s accompanying video.

**Temporality:** A benefit to the number of workshops it took to create the carving is that it enabled participants the time to share ongoing experiences currently occurring in their lives during that moment in time. Had the workshops gone for less time or were a one-off, we likely would not have captured these ongoing experiences. For example, Claire was in the process of finding housing and over the course of the workshops she would talk to the group about updates on her housing journey, including the houses she was looking at and having to learn the online application process.

For our project this meant that we did not continue with the design of a digital noticeboard as we had initially intended. While the wooden quilt probe is currently in the possession of the first author, the wooden panels belong to the participants and will be returned to them at the conclusion of this research.

**CONCLUSION AND FUTURE WORK**

This paper presents a wooden quilt probe to explore how we might address the inequalities around both access to makerspaces and diverse materials. Through the wooden quilt probe we created a makerspace environment specifically for women, where they could engage with materials traditionally found in more male-dominated craft environments, and where they were empowered to learn some of the skills, tools and language associated with those materials. Through the design workshops, participants were also able to share stories and experiences with other women within the community center and consider their own boundaries around how they wanted those shared. They shared stories around their personal trajectories and life disruptions, making practices and materials they engaged with and those they never had access to, and how their participation in these workshops contributed to feelings of wellbeing and empowerment. Diversifying makerspace environments to enable women’s participation is an important topic for Interaction Design. By opening up new spaces and facilitating engagement with new tools and materials, we can gain rich insights into people’s lived experiences and begin to open up new areas of design. The wooden quilt probe is a starting point from which we continue to investigate this space, with future work aimed at sustaining participation within workshops and exploring how we could share the work with other members of the community center.

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