Making Intimate Technologies Together

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ABSTRACT

Feminist research highlights the urgent need to challenge the oppressive design of commercial intimate technologies, particularly how the FemTech industry restricts access to intimate bodily knowledge through paywalls and proprietary systems. Yet, for decades, women and marginalized communities have turned to Do-It-Yourself (DIY) or 'hacking' practices to reclaim control over their own gynecology and intimate health, addressing gaps often ignored by medical research and healthcare. Inspired by visual themes from these movements, this pictorial critically explores how designers and HCI researchers might advance DIY approaches to intimate technologies. We exemplify this with reflections from a series of workshops on handmade intimate sensors, and draw out the joyful potential of collaborative making—building alliances, destigmatizing intimate health, and using craft to subvert gender stereotypes. We discuss matters of safety when making together and contribute to ongoing work on building feminist makerspaces.

Authors Keywords

intimate care, DIY, making, intimate sensor, menstrual tracking, open source, research through design, feminist making

CSS Concepts

• Human-centered computing ~ Interaction design ~ Interaction design process and methods

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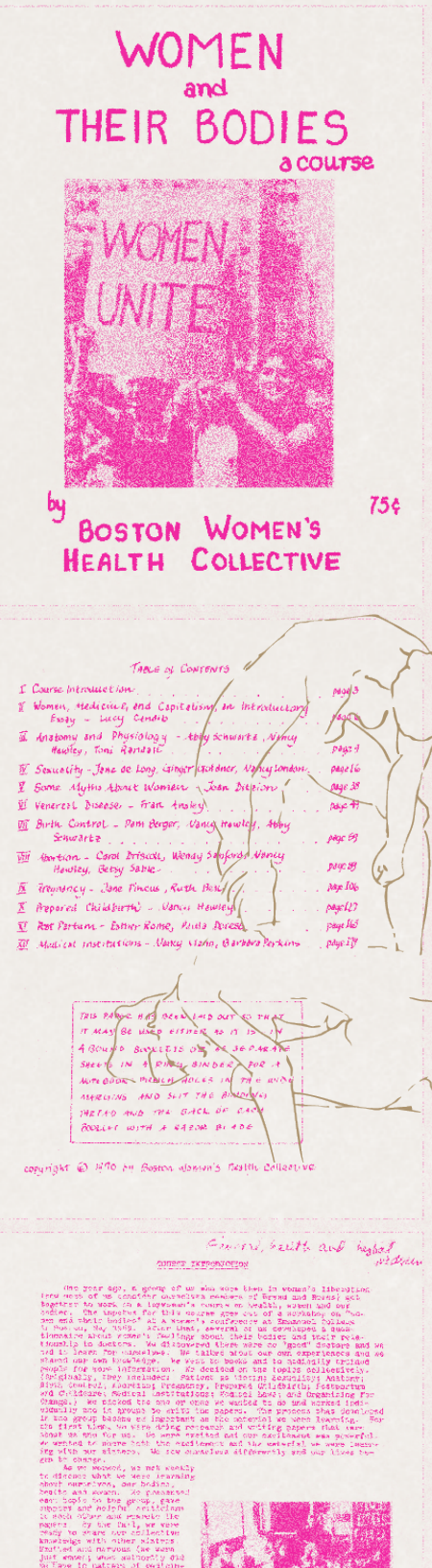
INTRODUCTION

The field of FemTech has seen significant growth in recent years, offering smartphone apps, IoT devices and smart sensing technologies aimed at supporting reproductive health, menstrual tracking, fertility, and more. However, these technologies often embed normative assumptions about reproductive bodies [30,32,56,67], rely on invasive data collection practices that compromise privacy [19,48], are often prohibitively expensive and unsustainably manufactured [25,60], and perpetuate gendered notions of reproduction [6,30,39]. Moreover, the commercial nature of these tools frequently "gatekeeps" access to bodily knowledge [17] and positions health tracking and care as an individual responsibility rather than collective endeavor. Often installed on a singular user's phone, apps like menstrual trackers do not prioritize sharing experiences with others, reinforcing isolation and concealment of often already stigmatized health issues [44]. Furthermore, with ongoing attacks on reproductive rights worldwide, people who track their cycles have deleted their apps and are reluctant to even use data-collecting intimate technologies altogether, out of fear that this data might be used against them [19]. Thus, there is a pressing need for alternatives beyond commercial products.

However, despite these pitfalls, commercial 'intimate technologies' (we use this broader term instead of FemTech to include all genders) have been welcomed by many as a way to take control of their politicized bodies, especially with menstrual tracking and contraception [23,44,51]. In most Western societies, women and people who menstruate have systemically been undermined when it comes to intimate health, leading often to a



sense of unease and lack of trust in medical and healthcare systems [24]. In parallel, many feminist efforts have focused on increasing bodily knowledge, often taking intimate and reproductive health into one's own hands. In this pictorial we look at some examples of past and recent feminist efforts in intimate health and reflect on a series of workshops that explored making our own intimate technologies.

In contrast to the values that imbue FemTech, DIY (Do-It-Yourself) approaches allow individuals to maintain control over their data and create tools tailored to their specific needs [42,61]. Making fosters not only transparency in the technical innerworkings of intimate tech, but also offers closeness and appreciation of one's own body (and bodies of others) through the collaborative nature of the process. By **crafting intimate technologies for the self, together with others**, we imagine such technologies might even eventually take the form of cherished heirlooms or precious objects, deeply embedded in their creators' lives and identities. We ask, might there be ways in which, instead of relying on the whims of large corporations or on the next generation of FemTech startups to receive funding, we design for resilient community-driven efforts that can be maintained and evolved long-term?

This pictorial explores the possibilities and challenges of coming together to self-craft intimate technologies with an aesthetic that matches the DIY ethos. We present reflections and insights from five workshops where participants crafted an intimate sensor designed to support bodily exploration and menstrual tracking. We build on our previous work on *the tactful sensor*, a sensor which measures the changing conductivity of vaginal fluids [14,18]. Previously, we discuss the initial concepts, and the fabrication and circuitry of the sensor, which used techniques that required advanced lab equipment [14]. We also discussed how the prototype facilitated a 'feminist way of sensing' the menstruating body, highlighting active and sensory interaction with the leaky parts of the body [18]. We gained insights on how self-crafting the sensors allowed people to adapt to different ways of touching their intimate bodies, and reflected on hygiene and safety of intimate technologies. We also explored the imagined data practices that emerged from a home deployment study with the sensor [18]. This previous work led us to construct this pictorial, which adds to these insights by focusing on the collaborative and DIY/open-source aspects of the design. The pictorial contributes with a visual reflection and outline of the fabrication procedure, directions how to hold such workshops and nurture feminist makerspaces, and a critical discussion on the potential of DIY intimate technologies as joyful, feminist ways of caring for our reproductive bodies.

Throughout this pictorial we have overlayed and traced images from the book Our Bodies Ourselves [68] and from Michelle Murphy's book Seizing the Means of Reproduction [49], which exposes how feminist activist groups of the 70s-80s in the USA contributed to late-twentieth-century biopolitics and still inform the ways that health is governed and politicized today.

A vaginal self-examination. The Los Angeles Feminist Women's Health Center in the early 1970s. Traced from [49].

BACKGROUND

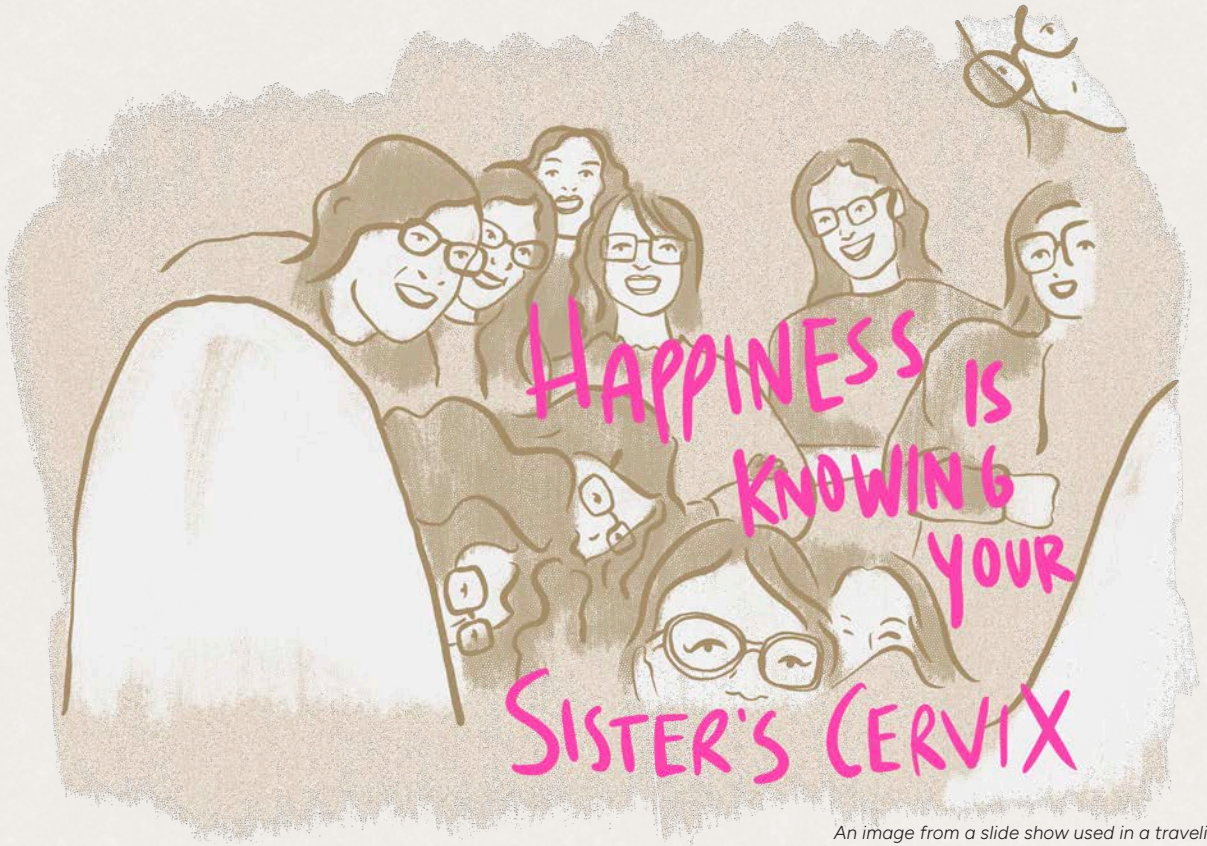
Histories of DIY gynecology and designing for intimate care

In the late 1960s and on throughout the 1970s, *feminist self-help groups* played a pivotal role in reshaping women's health and gynecological knowledge, empowering women to take control of their own bodies and healthcare decisions [49]. These groups rejected the patriarchal norms of traditional medicine, which often dismissed or marginalized women's concerns. The groups gathered in domestic settings, providing women the much-needed space to share experiences, disseminate health information, explore their bodies (often, women gathered around taking turns to use the speculum and observe each other's cervix), and advocate for better (and less patriarchal) medical practices, prioritizing the voices of the women themselves. They hosted workshops where experts

would show how to conduct vaginal and cervical self-examinations with and without speculums, inform women about the menstrual cycle, massages to relieve menstrual cramps, existing contraceptive choices, and how to perform a menstrual extraction, which was used to terminate early pregnancies [68]. Many groups formed around the need for abortion care, which was restricted at the time across the USA. Although these movements were not unique to the USA, the majority of scholarly work and documentation available pertains to this context. One of the most documented and influential outcomes of this movement was the publication *Our Bodies, Ourselves* by the Boston Women's Health Book Collective in 1971 [68], offering extensive information on sexuality, reproductive health, and gynecological self-care. Some sentiments in these movements have "resurged" in Europe, and narratives of loss and nostalgia permeate the discourse [54]. However, the nostalgia for a unified feminist past sometimes overshadows internal inequalities amongst the feminist movements, and risk glorifying these groups that were predominantly white and middle/upper-class women in liberal states of the USA.

Currently, a few collectives exist that align with the values of these early self-help groups. The artists and activists working with collectives like Gynepunk [20], Alma [66] or The Bioart Coven [38] make use of open-source technologies, uploading schematics, code, 3D models and design templates they employ, for instance, in vaginal self-examination workshops. With a philosophy of 'hacking' existing technologies like microscopes, pregnancy tests, or using household ingredients for culturing vaginal microbe petri dishes, these collectives work mostly in artistic and feminist hackerspace spheres.

In HCI, researchers and designers have made critical and speculative artifacts for intimate care and reproductive health. Previous works have challenged the normative and often stigmatized assumptions of the bodies in menopause [22], menstrual pain [52], and fertility tracking [14,35]. Park et al. have called for alternative forms of intimate care technologies that can evoke a sense of sharedness and solidarity among people in menstrual pain, resisting the individualization of the experience [52]. Ståhl et al. designed a shape-changing artifact called the Pelvic Chair that touches the intimate parts of the body for pelvic floor awareness. Homewood et al.'s has troubled the discreteness of fertility data through their design work which brings it into the realm of collective engagement between heterosexual partners aiming to conceive [35,36]. Hua et al. have used the crafting technique of embroidery to somatically explore sensory and intersubjective qualities of women's masturbation [37]. These works exemplify intimate care technologies that leverage touch as a somatic cultivation of bodily knowledge, an alternative to screen and app-based forms of disembodied technology.



An image from a slide show used in a traveling feminist self-help "road show". Traced from [49].

Do-It-Yourself, open source and hacking intimate technologies

Open source, DIY, and hacking practices represent overlapping yet distinct approaches to technology creation and modification, emphasizing an ethos of free and accessible knowledge. Open-source technologies prioritize transparency and collaboration, where software is made openly available via code repositories, and hardware schematics are publicly accessible, enabling anyone to fabricate, assemble, or craft devices themselves, though usually requiring the purchase of (often inexpensive) components [11]. DIY approaches complement open source, often referring to the general practice of creating, modifying or repairing objects without the aid of paid professionals [42]. Most DIY projects are not motivated by commercial purposes

[42], and many movements have expanded to include the participatory aspect of making together with other people, expanding the acronym DIY to Do-It-Together (DIT) or Do-It-With-Others (DIWO). DIY biology (DIYbio) takes a DIY approach to biotechnology, which has gained recent interest within HCI [43]. We are particularly inspired by DIYbio projects that encourage curiosity of the human body's intimate materials and microorganisms [7,9,12,38,45].

In HCI, while designing and exploring for intimate health, researchers have actively employed participatory and DIY design methods to nurture awareness of the pelvic floor [2,3] or to encourage breast self-examination [1], and to center and integrate the often marginalized lived experiences associated with menopause [22], contraception [51], sexual health [59,63], and reproductive health technologies in general [15,56]. Notably, Anuradha Reddy created her own LED lamp menstrual calendar and shared the code, schematics and design process online, reflecting on craft and data privacy [55]. In a similar spirit, Mafalda Gamboa shared her pregnancy and birth experience in a pictorial where she, among all the technologies involved in the experience, opens up and investigates a digital pregnancy test [33]. D'Ignazio et al. held a feminist hackathon around the breast pump [27], and various workshops on intimate and reproductive technologies have been held within the HCI community (e.g., [5,56]).

Beyond HCI and academia, many collectives, projects, and online communities share and participate in DIY, open source and hacking intimate technologies. On the next page we present a selection of relevant projects.

Feminist making: weaving together textiles, computation and gender

Many of the above DIY, open-source and hacker/maker cultures have built up a reputation of valuing imperfection, play, collective joy, curiosity, and fostering a welcoming environment for beginners [61]. However, feminist critiques of these spaces and communities have been raised, pointing out how they frequently reinforce traditional gender hierarchies by privileging technical skills associated with masculinity while undervaluing craft, care, and community-oriented practices [26,34,58]. Thus, the culture in many of these spaces (be it in-person makerspaces or online forums) often alienates those who lack prior technical expertise, further marginalizing women and others historically excluded from STEM fields. D'Ignazio et al. point out how this is especially true for hackathon events, which "promote technological solutionism, are inaccessible and exploitative, and rarely produce technology that can be sustained beyond its initial creation" [28]. Alternatively, embedding feminist values into these events, spaces and collectives means prioritizing a diversity of forms of knowledge, shifting attention away from artifacts, and not trying to hide or deny 'the political' [28,50]. Feminist spaces and communities thus often function also as a place for "feminist consciousness raising", emphasizing "personal experiences of oppression around stigmatized topics" [28], and, in turn, become a potent site for feminist design to emerge [31].

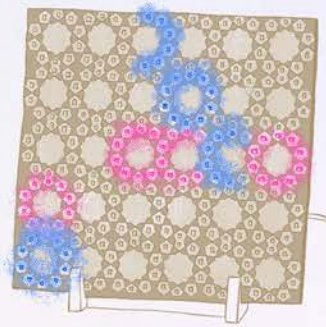
Feminist approaches to making often bring in traditionally 'feminized' forms of craft, such as textiles. In this work, we have used conductive thread sewn into silicone to create an intimate sensor. The choice to use sewing as a craft was intentional and prompted conversations on gendered associations of textiles and computation. Historically, the production, use, and symbolism of textiles have often been linked to specific gendered labor divisions. Practices like weaving, knitting, spinning yarn, and embroidery were traditionally associated with women in many societies, serving as markers of femininity and domesticity. In the book *The Subversive Stitch*, Rozsika Parker argues that embroidery, traditionally regarded as a quintessentially feminine craft, is not merely a passive or decorative activity but a medium laden with social and political significance [53].

In HCI, design and artistic practice, many feminist efforts have been made to trouble these associations and blur the distinctions between a masculine (computation) or feminine (textile) labor [41]. Other projects have retold the story of early computation, highlighting how it was deeply inspired by textile techniques, often carried out by women [57]. Textile crafts have also traditionally been participatory in nature, through things like sewing, knitting or embroidery groups. For instance, Copetti Maccagnan and Meyer showed how 'thinking together with' the very tactile craft of embroidery respected an ethos of care for oneself and each other's rhythms [46]. Overall, critical making approaches interweave the socio-political into hands-on making [29], which inspired our use of conductive thread both as a way to make the sensor-crafting accessible, but also as a critical feminist provocation for making intimate technologies.

Domestic textile crafts, like knitting, are often gendered activities. Traced from the 1945 Swedish housing exhibition pamphlet "Bo Bättre"

Free and open source software

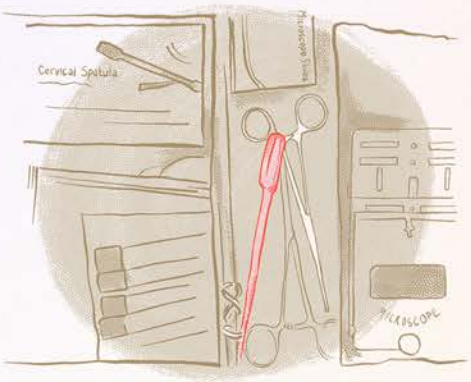
Several open source menstrual tracking apps have been developed, notably the app Drip [69]



Anuradha Reddy's open source Islamic geometry menstrual tracking calendar [55]

Mary Maggic's Open Source Estrogen: a biohacking project with hints of speculative design asking "what if it was possible to make estrogen in the kitchen?" [73]

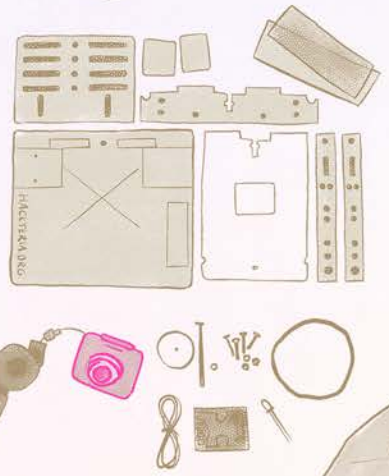
Gynepunk's workshop kit



DIYbio, biohacking

Open source hardware

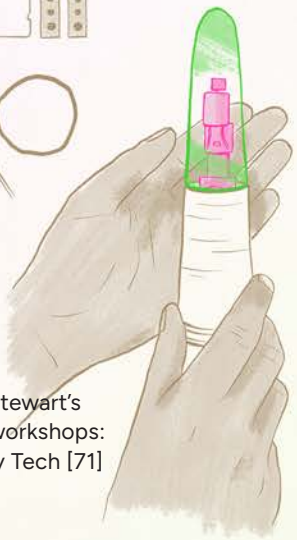
The Gynepunk collective develops tools and hosts workshops for self-gynecological practices with DIY microscopes made from repurposed webcams [20]



The Bioart Coven is a group founded by WhiteFeather Hunter exploring bioart, feminism and witchcraft. Below, the Sentient Clit by Li and Hunter [45]

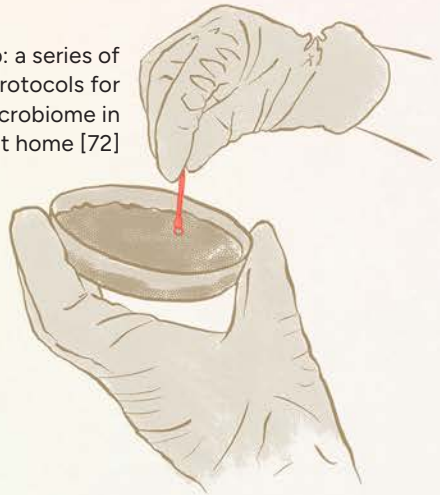
Biomenstrual: recipes for making biomaterial menstrual pads [16]

Too Much IoT hacked a pregnancy test to tweet the results [70]

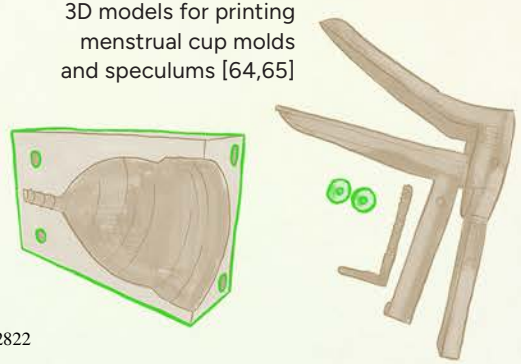


Artist Alice Stewart's DIY sex toy workshops: Touchy-Feely Tech [71]

ALMA's Biofilie Lab: a series of workshops and protocols for growing the vaginal microbiome in petri dishes at home [72]



3D models for printing menstrual cup molds and speculums [64,65]



Open source 3D models and digital fabrication

WORKSHOPS: SEWING A VAGINAL FLUIDS SENSOR

This work is part of the first author's long-term Research through Design project on designing and developing *the tactful sensor*, a conductivity-sensing wearable that can be used to track the menstrual cycle and/or fertility [14,18]. The sensor, worn on a finger, can be inserted momentarily into the vagina to measure the conductivity of cervical mucus (present in vaginal fluids), which varies throughout the menstrual cycle, increasing in conductivity right before and during ovulation. At this stage of the project, we redesigned the sensor, originally made with liquid metal, which requires specialized equipment and protective gear to make, and instead use silver-plated polyamide conductive thread. This thread, common in e-textiles and aligned with our expertise, made the sensor easy to fabricate with resources available in our makerspace on the KTH campus in Stockholm, Sweden.

We hosted five workshops: four in May and June 2024 at our lab facilities in Stockholm and one in November 2024 in Vancouver, Canada, at a design research lab that the first author was visiting. The first four workshops invited a total of 17 menstruating participants to fabricate sensors for personal use, while the final workshop welcomed the research group (11 people attended) to speculatively design sensors for any intimate body part or bodily fluid. Thus, the goals and overall attitude of the last session differed from the ones in Stockholm: for this session we wanted to test making intimate sensors in a context away from the familiarity of our own lab, and invite all genders to more casually drop in and make together. Most attendees of the Stockholm workshops were women, some with queer identities, aged early 20s to early 60s. For extensive details on the demographics of these participants, see [18]. Written consent was obtained for audio, photographs, and scans in the first workshops, while oral consent sufficed for photos and notes in the final session. Images in the pictorial have been edited to ensure anonymity.

The workshops were led by the first author, and our research team comprises women with varying experiences of menstruating, pregnancy, abortion, and other reproductive health experiences. Among the group there are several queer identities, and several of us have been researching intimate technologies for 5+ years, thus share experience in hosting workshops on stigmatized topics and feminist design.

The workshops focused on crafting the electrodes —two non-touching lines that sense the electrical resistance difference of vaginal mucus between them— rather than assembling the entire circuit from scratch. We connected the sensor electrodes to a microcontroller and circuit according to the original design [14], observing the real-time data on a plot, and demoed it during sessions. Since our aim was to explore collaborative crafting rather than sensor accuracy, participants were asked not to use the sensors or collect any sensor data.

We found common reflections across the Stockholm and Vancouver workshops, thus we consolidated all data and analyzed them together with a focus on the method of collaborative making and DIY. We present three reflection themes based on our analysis of quotes and visual material: The joys of making together: forging alliances and comradery, Nurturing conversations on reproductive health and Sewing sensors as a subversive feminist act.

Materials and equipment

Silicones:

Skin-safe silicones. We used **Smooth-On EcoFlex 00-30** for the base and **Smooth-On EcoFlex Gel** to stick the sensors to the skin. Wear gloves when mixing silicone.

Optionally add **SLIDE™ STD Liquid Surface Tension Diffuser** to provide a softer, less tacky sensation.

Sewing materials:

A sewing machine

Metallic thread needles for the sewing machine. Optionally hand-sewing needles.

Madeira HC 12 conductive thread or any conductive thread spun for the sewing machine. Optionally any conductive thread can be hand-sewn.

PVA film: Polyvinyl alcohol (PVA) film is a water-soluble material typically used to stabilize fabrics for embroidery.

+ Optional:

- A plotter or computer-controlled cutting machine suitable for cutting out the shapes from the silicone
- A demo circuit according to [14].

Instructions

Prepare silicone sheets:

1 Prepare silicone sheets (the day before the workshop or a few days in advance) by pouring silicone onto PET plastic sheets (we used recycled plastic folders or plastic transparencies). To get the sheets as thin as possible, use a rod or a wooden stick to spread the silicone out. Wear gloves when mixing.

Design the sensor shape and electrodes:

2 Brainstorm and sketch the shapes for the base of the sensor and the sensor elctrodes. The electrodes should be two lines that do not touch. Sketch directly on your hand or trace your hand and sketch on paper.

Cut out the sensor shapes:

3 Cut the sensor shape from the silicone using scissors or a plotter/cutter. This will be the base of the sensor.

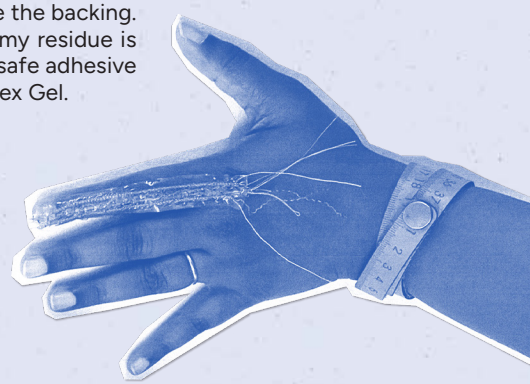
Sew the electrodes:

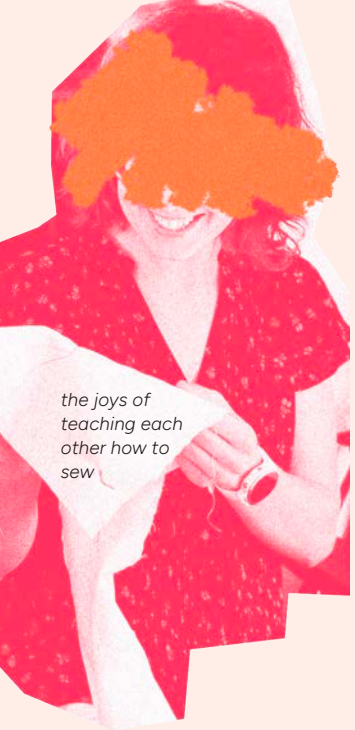
4 Carefully transfer the silicone sensor shape to a piece of PVA film, add another layer of PVA film on top to sandwich the sensor in between. Use the sewing machine to sew conductive thread along the drawn lines, ensuring electrodes do not touch. Use a stitch that works well with stretchy materials, such as zig-zag stitch. Alternatively, hand stitch with needle and thread.

Finish the sensor:

5 Trim any excess PVA film. Rinse the sandwich under lukewarm water, rubbing gently to dissolve the backing. Stop rinsing when the slimy residue is fully gone. Apply a body-safe adhesive like makeup glue or EcoFlex Gel.

Share and discuss!





the joys of teaching each other how to sew

"How's it going?"
"Good. I want to embroider all day."

REFLECTIONS

The joys of making together: forging alliances and comradery

The process of crafting handmade sensors fostered joyful social interactions, both within the workshop setting and beyond. A sense of allyship and comradery emerged as participants assisted one another during fabrication, offered compliments on each other's work, and suggested materials or techniques to enhance each other's creations. Participants offered compliments, *"Yours looks really great,"* and shared material tips and techniques: *"You probably should use that material—it's less sticky."*

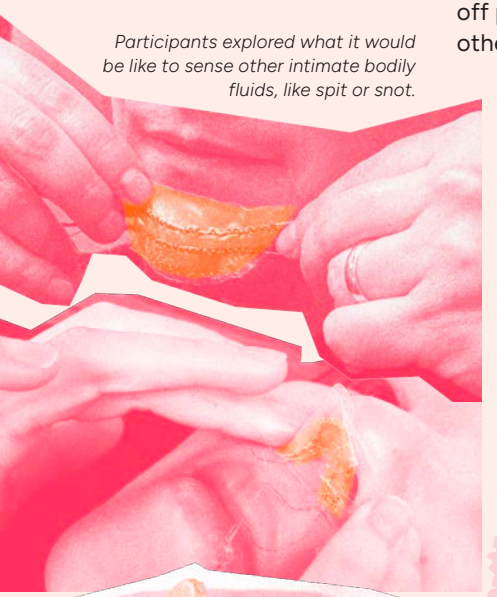
Participants who were more familiar with sewing, embroidery or with the machines took the role of mentors and assisted troubleshooting, also offering quick sewing tutorials. Likewise, conversations often trailed into sewing and embroidery tips, where to buy materials, whipping out phones and showing off personal projects, sometimes ending up in discussions on other hobby textile mediums like knitting, weaving or crochet.

Participants found joy in rediscovering the pleasures of making with their hands. One participant nostalgically remarked to her mother, who was also participating, *"Don't you remember how I did this [crafting] when I was little? It's like returning to childhood."* Others embraced the imperfections inherent in the process, with comments like, *"It's not the line you wanted, but it's still really good,"* highlighting the acceptance of mistakes and the mindful, slow pace of crafting.

The collaborative atmosphere extended to playful language, as participants made up terms like "sandwiches" to describe their processes. The messy but relaxed environment encouraged these candid exchanges. Spare materials, bits of paper, and silicone scattered across the workspace fostered a sense of creative chaos.

The handmade nature of the sensors also spurred conversations of how they would work and fit into their daily lives. For instance, participants discussed how trust in new technologies often arises from shared experiences and recommendations, reflecting comments such as, *"If someone explains it to you, it's automatically less scary"*. One participant also highlighted the importance of community in navigating such self-made technologies, suggesting, *"If there were a community behind it where you could share experiences, my trust [in the sensor] would increase."*

Participants explored what it would be like to sense other intimate bodily fluids, like spit or snot.



The open-endedness of the workshop helped nudge participants to explore and step slightly outside of their comfort zone without worrying about logistics of navigating technical challenges (such as trying to create a 3D sensor shape from 2D sheets). They prioritized exploration and learning by doing rather than focusing on building a solution to a problem or a fully-functional sensor. Some participants even ended up with sensors that perhaps were not functional because the two electrodes ended up touching, or they would be less practical to use, but explored a different technique (like crochet) or a new body part (like the nose, nipple, or chin). Overall, participants did not feel constrained by technical requirements, imagining cyborg possibilities — What if the sensor was a permanent tattoo, or embedded into a nail? What if it didn't measure conductivity but other biomarkers in breastmilk, snot or spit?

"sandwiches" of PVA sheets to stabilize the silicone sensor shapes

Nurturing conversations on reproductive health

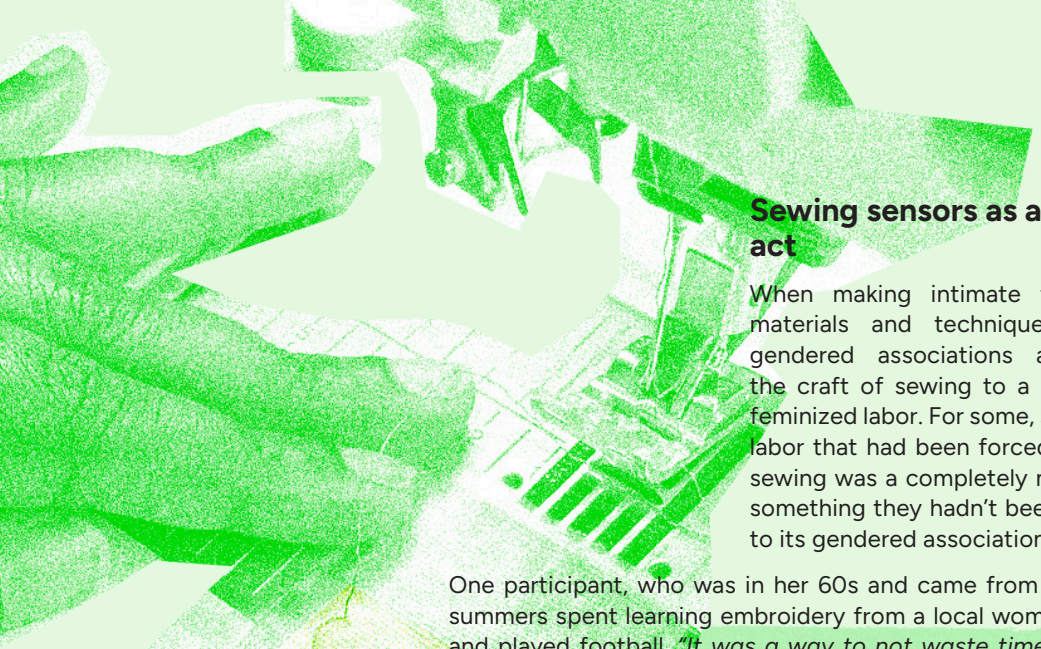
The workshops facilitated discussions beyond the technical aspects of the sensor and its fabrication, covering more general topics in reproductive health —PMS, PMDD, PCOS, pregnancy, abortion, bacterial vaginosis, menopause, and more. Discussions ranged from the impacts of ADHD on menstrual cycles to bodily changes during exercise, offering a space for connecting with others about similar experiences. The gatherings also became a means of learning about the body, the menstrual cycle, the changes in vaginal fluids, vaginal anatomy, etc., and some participants expressed a newfound appreciation for their bodies, remarking how they would now pay more attention to their bodily fluids.

Conversations touched on cultural taboos and beauty standards, with participants sharing insights into practices and norms in their home countries. For example, one participant mentioned how they had read about a rise of vaginoplasty in their home country, while another compared the sexual education between her home country in southern Europe and the country we were in in northern Europe. Many discussed how menstrual taboos varied, and how the workshop design would need to change depending on the cultural context.

Participants (re)learned aspects of reproductive health, like the menstrual cycle, curiously asking others about their experiences, or collectively recalling anatomical facts and biological processes.

Experiences with contraception also featured prominently, as participants shared their personal journeys with various methods, reinforcing the role of community and shared knowledge in reproductive health. Gynecological issues related to the sensors' materials surfaced as well, with one participant recalling an anecdote about her mother, who unknowingly had a piece of plastic from a tampon wrapper stuck in her vagina for weeks, but that hadn't caused any health issues and was safely removed during a routine gynecological visit. Participants were cautious about facing the same issues with hand-made sensors, but talking about them also made them less scary, highlighting how *"women put all kinds of things up there!"*

Additionally, since the last workshop involved people of all genders, including many who didn't necessarily have experiences of menstruating, the workshops served as a way to bring up taboo and stigmatized topics in a professional research setting. Research questions were mixed with casual and sometimes silly anecdotes, which aligned with a feminist philosophy of uplifting subjective knowledge in research.



Sewing sensors as a subversive feminist act

When making intimate technologies with e-textile materials and techniques, participants confronted gendered associations and memories, connecting the craft of sewing to a broader cultural narrative of feminized labor. For some, sewing emerged as gendered labor that had been forced upon them, and for others, sewing was a completely new skill to explore, as it was something they hadn't been interested in precisely due to its gendered associations.

One participant, who was in her 60s and came from southern Europe, recounted summers spent learning embroidery from a local woman, while boys climbed trees and played football. *"It was a way to not waste time"* she explained, highlighting how sewing was framed as a productive but gendered labor. Such memories carried mixed emotions—nostalgia for the care embedded in learning these crafts, but also frustration with their patriarchal associations.

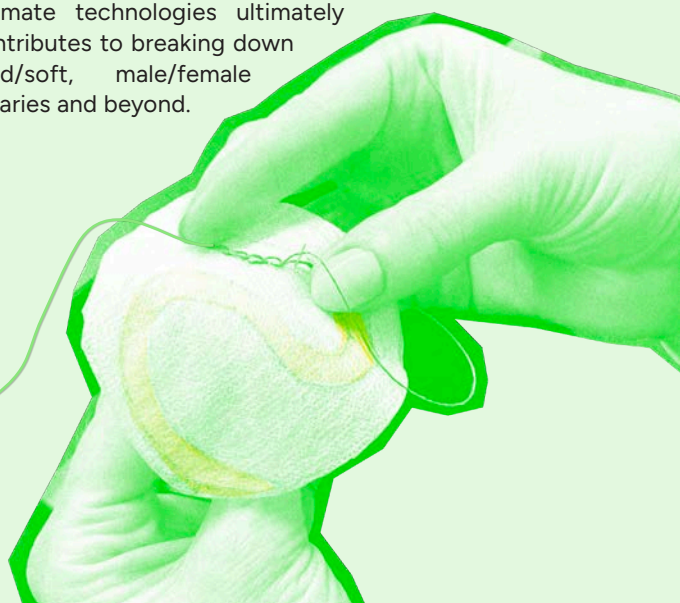
For others, sewing emerged as a potent metaphor for reclaiming traditional, feminized, and often undervalued skills. One participant envisioned handmade sensors as "a form of resistance", likening the sewing machine to a secret tool: *"I could actually make the sensor at home, and nobody can stop me"*.

The idea of sewing as subversive and inconspicuous, because of its gendered associations, resonated strongly: *"No one would ever know that women are making their own contraception, their own sensors"* a participant noted, sparking laughter and the suggestion that sewing machines themselves would end up being banned in a dystopian context where reproductive rights were fully restricted.

Conversations were politically charged, discussing ongoing reproductive rights struggles (both in terms of restrictions and feminist victories) in participants' home countries, and how, for many, these dystopian scenarios are an unjust reality.

Younger participants recalled their mothers and grandmothers' sewing proficiency, wishing they had the same skills, yet cautiously acknowledging the patriarchal context many of them grew up in. This sentiment evolved into a collective imagining of sensors as intergenerational menstrual heirlooms, passed down like crafting knowledge from grandmothers to granddaughters: *"Imagine if that's what you got at menarche, like your grandma could have made you your sensor".* These reflections connect to discussions in HCI on designing for legacy: crafting records, archives or cherished objects containing intimate stories, for example, related to menopause [21], or supporting family relationships and intergenerational closeness [8,40]. We envision perhaps how some parts of these self-made technologies, or the making process itself, might be "passed down", similar to the knowledge and craft of sewing.

These discussions underscored how crafting, once relegated to domestic spaces, was reimagined as a powerful tool for autonomy and resistance, while also evoking both joy and ambivalence about its gendered history. Most of all, participants felt joy and pride in reclaiming sewing in the context of technology. Sewing (a traditionally "soft" skill) to build a technology (a traditionally "hard" skill), subverted and challenged gender norms of technology and computation. In line with many feminist efforts to combine textile and computation, we find that incorporating this craft into the making of intimate technologies ultimately contributes to breaking down hard/soft, male/female binaries and beyond.



DISCUSSION: WHY SHOULD WE MAKE (FEMINIST) INTIMATE TECHNOLOGIES TOGETHER?

Throughout this pictorial, we have seen an example of how making intimate technologies together nurtures collective joy and comradery, destigmatizes intimate health topics, and prompts a feminist resistance to gendered craft. Our workshops are just one approach of many ways we might get together and craft, tailored to a particular context and, notably, in countries where reproductive rights are not currently restricted. Also, we have worked with a specific sensor in the context of menstrual and fertility tracking, but there could be many more possibilities of making together for other intimate experiences, many of which are already being explored, such as self-making pleasure objects [62,63], hacking and transforming pregnancy tests [33], crafting technologies for menstrual pain [52], culturing our own intimate microbiome [7,12] and beyond.

As designer-makers of these technologies, we face critical questions of responsibility and accountability, also acknowledging that we are not medical or gynecological experts, nor are we policymakers. We ask —and are often asked—what happens when these self-made intimate technologies are misused? Who is responsible? Taking a feminist-ecological perspective [67], we find that answering these questions is not straightforward, many agencies are at play, many with fluctuating roles, responsibilities and goals: the designer-researchers, the user-makers, the collective group of workshop attendees, the online communities, the FemTech developers, the sexual health educators, the gynecologists and medical-healthcare systems, the governmental agencies and policy-makers, the current state of the body's microbiome, etc. Yet we believe that making intimate technologies together offers a safe, joyful and caring approach, one which arguably differs from the majority of individually-framed and capitalistic-driven FemTech ventures [6,47]. Rather than diverting responsibility to certifications or standards, we see the potential for the process of making to be a praxis of also learning about unavoidable risks and how to address them. Below we discuss aspects of safety and facilitating joyful and caring spaces when making intimate technologies together.

Safety when making together

Designing with the intimate body, and in particular with the vagina, raises a lot more tensions in material safety than other artifacts that only interact with the skin, or are not 'inserted' [13]. It is also difficult to understand what standards apply to technologies that interact with intimate parts of the body, as these are often excluded from classifications, and dichotomized between medical or erotic [13]. Thus, the lack of official concern for these matters has led DIY communities to fill in the missing pieces.

We see workshop settings as a positive way to mitigate mistakes in processes like pouring silicones or using body-safe materials. When a designer-researcher is present at the workshops, they take the role of procuring all safe materials ahead of time, especially if they have undergone research and testing to find the best ones for the case. Making together is safer than making alone: the researcher or expert in materials can provide some certainty for the material safety, and others in the room can help each other when following instructions. Still, since we want to provide room for error and experimentation, it can be important to lower the risks of harm no matter what outcome, which, in our workshops, was reflected in our decision to remove liquid metal from the original design. Overall, our workshops highlighted how the more we do things together, the more we become aware of the risks of intimate technologies and understand how to take informed decisions on our health.

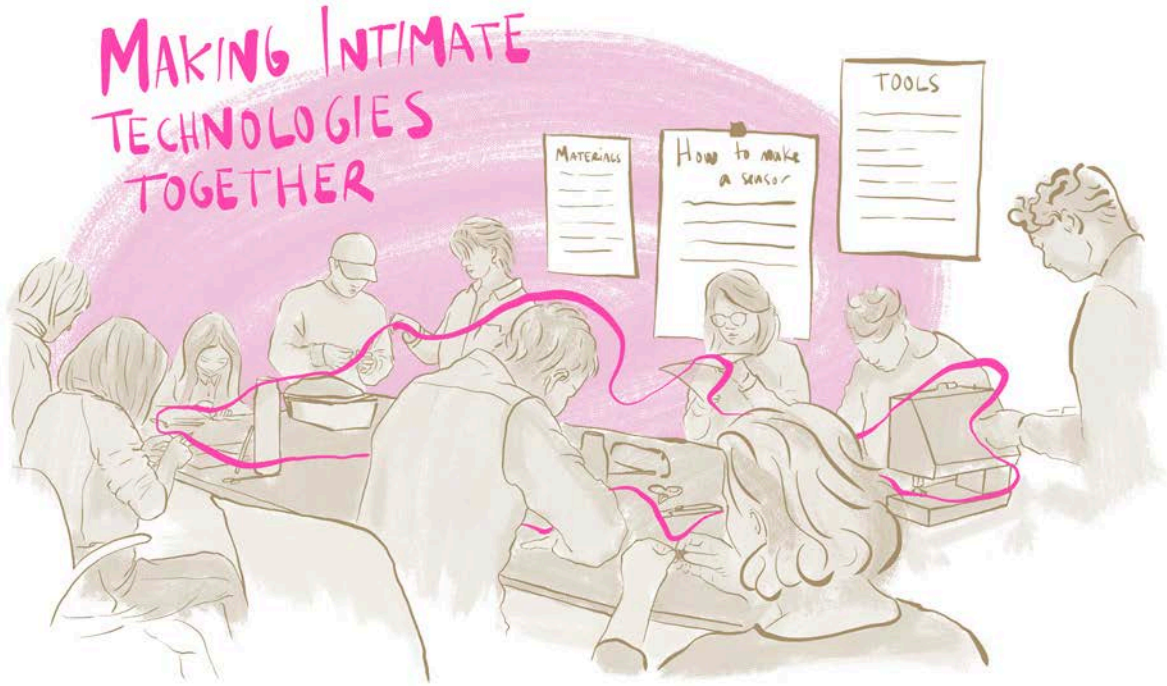
Furthermore, self-making intimate technologies could be done in slow steps, first making together, attending workshops and learning crafting techniques, and then, once comfortable, making on your own, and still with a community available to support. Making together also encourages an attitude of shared resources, like equipment and machinery which aren't available in everyone's homes, which aligns with values of repair and sustainability often championed by makerspaces.

Making our own intimate technologies also has implications for data safety and privacy, especially in how we design and make data storage systems. I f the sensors we have fabricated together were used for daily self-tracking, and were to be integrated with other tools to process or visualize data, they might introduce further challenges of data privacy [4,19,48] . However, we envision that a local data storage option (on the device itself) would be ideal for the case of intimate technologies like these sensors, where the user would have full control and ownership of their data. Such processes of making space for data ought to be incorporated in the DIY instructions. Moreover, we also envision making intimate technologies that can fluctuate between being a single-use test or snapshot of the body's health and a long-term project [18]. Thus, when making intimate technologies together, talking about risks and the intended use and needs of each person is necessary, since the risks vary greatly depending on the case, and people's needs and goals will also fluctuate throughout their life.

Creating feminist spaces and entangling knowledges

What could spaces for making intimate technologies together look like? In our workshops, and in our work in general, we (the authors of this pictorial and many others in our research team) have collectively sought ways to foster a feminist space at our workplace, and how we might bring these values with us when traveling (as in the case of the last workshop).

What could spaces for making intimate technologies together look like? A (likely physical) space to gather and make intimate technologies might differ from conventional makerspaces or hackathons. As mentioned previously, makerspaces have often isolated women, queer people, and people marginalized in STEM [26].



Feminist makerspaces instead propose alternative, inclusive spaces, where intimate and taboo topics can be discussed comfortably. Similar conversations happen in online spaces centered around a commercial technology (e.g., Oura Ring) or a specific topic (e.g., the subreddit r/WomensHealth). These communities carry benefits such as anonymity and accessibility, yet they lack in-person interaction. At the same time, in-person interaction can also be inaccessible to many. We might envision a mix of in-person and online efforts, for instance, in this pictorial, we have included detailed instructions on how to make a sensor, and this article is open access. A combination of physical-virtual spaces thus might help people collectively craft and discuss their making process, yet also draw the line of privacy where they choose (for instance, when using the intimate technology, or with their data).

Furthermore, we ask, what kinds of knowledges does making together bring forth? Making together (asynchronously or not) enables tricky questions to be asked and intimate stories to be shared. This encourages knowledge about the (individualized) body, where the self and the subjective are central and the collective elevates and contextualizes the self-knowledge. Commodified FemTech technologies are proprietary, paywalled, and often make it complicated to understand or download one's data, essentially blackboxing technical knowledge about how their algorithms or sensors work. Thus, making together also invites newcomers to learn about electronics, data science or computer science, in ways that don't overwhelm, but also allows them to dig deeper if they are curious. What's more, in terms of medical knowledge, a culture of feminist allyship, which emerged during the workshops, offers encouragement to seek help when needed, ultimately aiding individuals to advocate for themselves in healthcare contexts.

Perhaps this approach to intimate technologies is not one that centers the 'you' in Do-It-Yourself, but rather a *Do-It-Ourselves,* echoing the thinking behind the book *Our Bodies, Our Selves*. The book's title evolution reflects a feminist philosophy and epistemology of blurring the 'hard' facts of the body's biology and the 'soft', emotional and messy subjectivities: *"Over time the facts and feelings melted together in ways that touched us very deeply, and that is reflected in the changing titles of the course and then the book—from Women and Their Bodies to Women and Our Bodies to, finally, Our Bodies, Ourselves"* [10]. Making intimate technologies together means melting together medical knowledge and personal stories, critically acknowledging the patriarchal harm and neglect that the history of medicine and gynecology has done, while still being aware of the boundaries of our knowledge as makers, and being serious when medical concerns arise. During our workshops, we were prepared to refer people to different gynecological and sexual health resources and organizations in our city if issues were brought up. We also started each session with a code-of-conduct check-in, discussing some brief in-house rules, similar to the code of conduct of FLINTA* spaces [74], as a way to set a tone of respect and empathy. Intimate and reproductive health is riddled with harmful myths, and it is our collective endeavor to shed light on some of these myths, without shaming or being condescending .

CONCLUDING REMARKS

With this pictorial we hope to engage in conversation with researchers, designers and makers working with intimate technologies, but also with experts in fabrication, hybrid craft, DIYBio, and critical making, to further engage with the joys and tensions of making intimate technologies together. We hope that our workshop reflections spark new possibilities for feminist resistance to dominant narratives and FemTech solutions, and invite researchers, designers and curious people inside and outside academia to forge connections and make together with us.

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