Hackerspaces as technofeminist sites for experiential learning

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ABSTRACT

Hackerspaces are physical community spaces where technology enthusiasts meet. Despite the term ‘hacking’ being widely associated with cybercrime, hackerspaces are not only perfectly legal but resourceful, skilled communities: members cultivate digital expertise and technological craftsmanship in experiential learning practices. While the educational value of hackerspaces has been rightfully acknowledged, not everyone equally benefits from potential learning opportunities. Many hackerspaces struggle with issues related to communal homogeneity, being frequently dominated by white, male members. Underrepresented groups, notably women, non-binary, genderqueer, and transgender members, have experienced discrimination and harassment. In response, explicitly feminist hackerspaces emerged. How are learning approaches and involved technology different in such feminist hacking communities? More specifically, how do feminist hackerspaces choose, discuss, and shape technology in their learning practices and educational approaches? Methodologically drawing on a single case study approach, the paper argues that hackerspaces have the potential to act as intersectional, technofeminist sites for experiential learning.

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Introduction

Hackerspaces are communities of technology enthusiasts, bringing together – as some put it – ‘fellow geeks’. As a collective, members usually rent a physical space: to share not only their enthusiasm about technology and (digital) DIY, but also access to workshops and workstations, electronics and machines like laser cutters or 3D-printers. Misleadingly, the terms ‘hacker’ and ‘hacking’ are predominately associated with cybercrime (Jordan 2008). This is regrettable because hackerspaces are perfectly legal as well as resourceful, skilled communities (Davies 2017; Kubitschko 2015; Lindtner et al. 2014). Hackers tend to be curious, and their curiosity makes them self-driven learners, notably in domains of technological expertise and craftsmanship (Schrock 2014). Experiential, informal learning is key to members’ activities and the educational value of such communities has been increasingly acknowledged (Bilandzic 2016; Sheridan et al. 2014). The notion of experiential learning stresses the need to actively involve the learner in learning as a practice. In his early twentieth-century critique of education, Dewey (1986, 1966) opposed the (still persistent) idea that learning is a process of internalisation and transmission. Dewey called for an understanding of learning as experiential practice, i.e., resulting from an interplay between individuals and their social environment.
Despite such ‘learning-by-doing’ being essential to hackerspaces, not everyone equally benefits from potential learning opportunities. Many hackerspaces struggle with issues related to communal homogeneity, notably the dominance of white, male members (Eckhardt et al. 2020; Dunbar-Hester 2019; O’Sullivan 2018; Reagle 2017). In some communities, underrepresented groups, such as members self-identifying as female, genderqueer, non-binary, or transgender have experienced discrimination and harassment (Bean, Farmer, and Kerr 2015; Lewis 2015). Focusing on the needs and interests of these persons, otherwise marginalised in hacking communities, explicitly feminist hackerspaces were founded as counterproject. Examples are Miss Despoinas Critical Engineering Space in Hobart (AU), MariaLab in São Paulo (BR), and San Francisco-based Double Union (US).

Most communities explicitly state to be intersectional feminists, especially when it comes to hackerspaces by and for people of colour like Oakland bases LOStspace (see also Fox, Ulgado, and Rosner 2015). As Fox, Ulgado, and Rosner (2015) show, feminist hackers are aware that feminism ‘has a lot of nice white lady baggage’ (64, interview quote). Therefore, ‘[t]he term “intersectional feminist” is used by groups to distance themselves from past feminist movements that were less concerned with issues facing women who were non-white, or who possessed varying degrees of ability or economic access’ (64). At the same time, many feminist hackerspaces were founded and are frequented by white women, with one of Fox et al.’s interviewees acknowledging that a ‘[…] lot of us are nice white ladies and we try not to be jerks about it’ (64).

Just like the term ‘feminism’, ‘hacking’ also carries its own, historically affected, associative baggage. It is not only, as initially mentioned, commonly conflated with cybercrime, but also with masculinist IT culture and solitary, sociotechnical ingenuity. Tancer, among others, highlights the regretful misconception that all hackers are white men (Tancer 2016). Coleman too points out, in conversation with Jandrić (Coleman and Jandrić 2019), that hackers are often casted ‘[…] as the male hero-technologist who conquers the electronic frontier’ (527). This goes hand in hand with an ‘individualist paradigm’ (527) of the solitary innovator, missing the point of hacking communities. In addition, hacking is often defined in tech-centric terms, as a practice that presupposes an engagement with technology. Feminist hackerspaces challenge all these associations: rather than avoiding the term and its historical baggage, however, they imbue it with new meaning.

Feminist hackerspaces move away from technology-centric activities, welcoming artistic or activist practices and crafts that have not commonly been considered hacking (Toupin 2014; Fox, Ulgado, and Rosner 2015). Nevertheless, they frequently and extensively integrate digital technology into their practices – to be discussed, curated, and developed in dialogue with feminist values (Savic and Wuschitz 2018; Rosner and Fox 2016; Fox 2015). While the relevance of learning for these communities has been noted in previous research, it has not been foregrounded and examined in detail. Therefore, this paper focuses on how learning, educational technology and approaches are characteristic for and interrelated in specifically feminist hacking communities: How do feminist hackerspaces choose, discuss, and shape technology in their learning practices and educational approaches? And, in turn, to what extent does technology influence these approaches and practices?

Methodologically, I follow a single case study approach, focusing on Mz* Baltazar’s Laboratory in Vienna, Austria. I elaborate on the values behind this feminist hacking community and analyse events, including technical and non-technical or low-tech workshops. Conceptually drawing on technofeminism (Wajcman 1991, 2006; De Hertogh, Lane, and Jessica 2019; Bassett, Kember, and O’ Riordan 2019) and the notion of experiential learning (Ingold 2018; Dewey 2005, 1986, 1966), I examine how digital technology is embedded in learning practices and educational approaches of feminist hackers. I am particularly interested in how feminist values influence which and how technology is used, including the latter’s discursive negotiations.

The paper is structured as follows: I first provide an overview of feminist hackerspaces in relation to experiential learning (Ingold 2018; Dewey 2005, 1986, 1966). I then introduce the notion of technofeminism, also called ‘technological feminism’, to conceptually frame my case study. In the case study section, I analyse interrelations between technology, feminist values, and learning practices.
set in Mz*Baltazar’s Laboratory. Lastly, I summarise my results and conclude with pointers for educational research and practice concerning learning with/about technology.

**Literature and theory**

**Feminist hackerspaces and experiential learning**

More attention is being paid to what technology is doing to women than to what women are doing with technology. Already in the 1990s, if not earlier, this argument was a starting point for feminist work on technology (Faulkner 2001; Light 1999; Wajcman 1991). And yet, beyond research from feminist researchers and allies (Webster 2014; Sørensen, Faulkner, and Rommes 2011; Faulkner and Lie 2007; Herman and Webster 2007a, 2007b; Scott-Dixon 2004), it is still widely applicable today (Hicks 2017; Wyatt 2008). While there are undoubtedly significantly fewer women working in technology professions than men, this much-repeated truism continues to feed into gendered misconceptions, regarding for example women’s alleged lack of aptitude for technological work (Shevinsky 2015; Herman and Webster 2007a, 2007b). The relevance of feminist hackerspaces in this regard is twofold. On the one hand, they tend to be founded and frequented by individuals exposed to the consequences and harms of such misconceptions. On the other hand, they are among those venues illustrating women’s practical and critical engagement with technology. Feminist hackerspaces show how women devise, choose, and discuss technology to facilitate their creative practices and learning efforts.

Feminist hacking communities are mostly framed as ‘women-centred’ or ‘women-only spaces’, though they also welcome members and participants identifying as genderqueer, non-binary, or transgender. They support the LGBTQIA movement and often draw on intersectional feminist insights (Fox, Ulgado, and Rosner 2015; Henry 2014). It has been argued that feminist hackerspaces serve as sites for ‘feminist design of technology’ (Fox 2015, 341), while also challenging and diversifying what is considered ‘hacking’ (Toupin 2014). Feminist design does not merely refer to technology and artifacts representing and supporting women’s individual or collective interests. Instead, in combining technological learning and innovation with feminist values, such practices hope to work for the benefit of other marginalised groups and society more broadly. This occurs, for example, in addressing environmental issues through communities’ emphasis on reuse, repair, and recycling; or in addressing socioeconomic issues, by creating communal learning spaces for skills relevant to gender-biased professions and in high demand on labour markets worldwide. Notably, the importance of infrastructure production through feminist hackerspaces has been highlighted: as social communities and physical environments, they make space for and give voice to groups who tend to be marginalised in conventional, i.e., non-feminist, hackerspaces (Rosner and Fox 2016).

It has been shown that conventional hackerspaces facilitate variations of experiential learning (Schrock 2014 Toombs, Bardzell, and Bardzell 2015; Sheridan et al. 2014). The latter concept, originally explored by philosopher John Dewey (2005, 1966, 1986), is better known as learning-by-doing. Dewey opposed an idea of learning as a process of internalisation and transmission. The author called for an understanding of learning as experiential practice: a practical, hands-on engagement — grounded in an interplay between individuals and their social environment. Drawing on Dewey’s work, anthropologist Tim Ingold argues that ‘[...] education is really about attending to things, and to the world’. It ‘[...] is a practice of attention, not of transmission – that it is through attention that knowledge is both generated and carried on’ (2018, 2). Dewey and Ingold see the experience as necessary condition for learning and suggest that, in every experience, moments of ‘doing’ and ‘undergoing’ are inextricably interwoven. Experiences are at the same time enacted and undergone — transforming the person and resulting in a different quality of future experiences.

Such ways of learning grounded in experience also occur in hackerspaces. Members learn, individually and in social interactions with their peers, by taking technology apart, tinkering with
materials, making objects, discussing, and developing their ideas. But (how) are these learning practices different in feminist hackerspaces? Toupin (2013) names communal learning among the main activities and goals of feminist hackerspaces, suggesting that ‘[…] the creation of safer feminist spaces within hackerspaces may help to build community, find allies and move forward with sharing and learning skills, in a feminist and anti-oppression hacking environment’. Despite the relevance of learning having thus been acknowledged in previous research on feminist hackerspaces, among others by authors such as Toupin (2013) or Rosner and Fox (2016), matters of learning and education have not been examined in detail. It remains largely unclear how feminist hacking differs from learning activities in conventional hackerspaces. Still, some pointers can be taken from related observations of community dynamics.

Typically, hacking communities tend to perceive themselves as meritocracies (Reagle 2017; Kostakis, Niaros, and Giotitsas 2015). Feminist hackers however have cautioned against the pitfalls of following meritocratic ideals in a community space: particularly with regards to members’ inclusion and equity (Toupin 2014). While meritocracy promises an allegedly ‘neutral’ self-regulation of members’ community standing and hierarchies, according to merit, such an approach ignores issues and biases resulting from systemic privileges, structural inequalities, and discrimination (Nafus 2012). Feminist hackerspaces start from the assumption that inclusion requires purposive community engagement and group-effort, rather than asking (in a somewhat neoliberal manner) for members’ individualistic integration. This is also illustrated in feminist communities complementing the conventional DIY (do-it-yourself) ethos of hackerspaces with ideals of DIT: doing-it-together (Haralanova 2019).

In this paper, I am notably interested in how feminist hackerspaces’ ethos and values interrelate with their learning practices and educational approaches. In the case study section, I will elaborate on the following argument: Feminist hackerspaces foster experiential learning and, in their learning approaches, draw extensively on open source technology; in this respect, they resemble conventional hackerspaces. However, in contrast to conventional hackerspaces, their experiential learning practices reflect insights and values that Wajcman (1991, 2004) and other scholars (see also Wyatt 2008) have conceptually framed as technofeminism.

**Technofeminism**

The technofeminist framework originally outlined by Wajcman (1991, 2004) stresses that ‘[…] technology is both a source and a consequence of gender relations’ (107).

This implies that technology development is shaped by and shaping gender relations – and the same applies vice versa. Therefore, to understand and intervene in technological change in ways countering societal privileges and inequalities, it needs to be considered how gender relations have figured or could figure into such change. At the same time, to understand the position of women, non-binary persons, or men in relation to technology, one needs to consider not only the technology as such but notably the gendered relations between social groups.

Technofeminism bridges early feminist work on technology and gender, which was predominantly pessimistic (Cockburn 1988), and 1990s cyberfeminists’ optimism regarding women’s empowerment through the internet and digital media (Hawthorne and Klein 1999; Plant 1997). Being wary of tech-deterministic and tech-solutionist positions, Wajcman argues for an approach that is perceptive to the role of technology in perpetuating gender relations privileging white-male positions and perspectives. At the same time, technofeminism avoids to essentialise technology as patriarchal, thus leaving space for women’s sociotechnical agency.

Wajcman points towards matters of intersectionality in acknowledging that ‘[…] gender is not the only axis of social hierarchy identity’ (2004, 8). Intersectionality, a notion coined by critical race scholar Kimberlé Crenshaw, examines how different elements of a person’s identity, for example being a woman and being black, yield unique, layered experiences of discrimination or privilege (Crenshaw 2017, 1989). As De Hertogh, Lane, and Jessica (2019) highlight:
[...] for Crenshaw, intersectionality points particularly to the differential imposition of power and state violence on women of color. Throughout the 1990s and beyond, intersectionality helped reshape how feminist scholars and practitioners understood overlapping issues of race, class, disability, and sexuality. (5)

While Wajcman demonstrates awareness of related issues, her work largely glosses over how identity markers other than being a woman — race, class, ethnicity, sexuality — influence societal hierarchies, inequalities, and privileges.

Therefore, De Hertogh, Lane, and Jessica (2019) and Bassett, Kember, and O’Riordan (2019), among others, stress the need to link technological feminism to intersectional theory. To De Hertogh, Lane, and Jessica (2019), this not only means that technofeminism and intersectionality need to be inserted and combined in research on (digital) technology and computing: also, such insights need to be integrated into teaching pedagogies. For example, the authors suggest that

‘courses with technological components such as coding should decolonise reading lists to better reflect the feminist roots of computing, and our design courses should include an activist component that asks students to explore design as a force for social change’ (11)

Their suggestions refer originally to tertiary education, however, feminist hackerspaces show that the same need has also been recognised by civic communities.

**Approach**

Methodologically, I have followed a case study approach as pursued in cultural studies research. Notably, I draw on the principles and techniques outlined by Sterne (1999) and Alasuutari (1996). As a field of research, cultural studies are distinctly concerned with matters of power, stressing that the latter permeates sociality in not per se obvious manners. While Sterne (1999) considers the analysis of texts and artifacts practically a key element of cultural studies, as will be the case in this paper, the author argues that these are mainly means to an end. What characterises cultural studies approaches is their attention and commitment to politics. They seek ‘[...] a richer understanding of the political character of cultural and social life’ (Sterne 1999, 262ff.) and scrutinise how this character is co-constructed by people, their practices, related objects, and places.

I examine this political character of feminist, sociotechnical practices through a case study approach, analysing *Mz*Baltazar’s Laboratory (*Mz*Bs) as an example of a feminist hackerspace. In terms of the paper’s corpus, I draw on unstructured data: mainly online documents about and by the community, remote workshop participation and conversations as well as email exchange with affiliated persons. Ethics approval for the research was provided by the University of Sussex’ Social Sciences and Arts Cross-school Research Ethics Committee. In terms of my own position within the research field, I have not been affiliated with a feminist hackerspace though I have been a member of a ‘conventional’ hacker/maker community (see also Attia and Edge 2017 on reflexive practice in/as research methodology).

As Alasuutari writes,

> instead of assuming that any corner of social reality leads to the traces of some universals to be pointed out in the final analysis, in cultural studies a case study is understood to reveal a local and historically specific cultural or “bounded” system. (see also Stake 1995)

While such an approach may invite criticism as enabling merely ‘exceptionalist’ insights, i.e., not allowing for representative conclusions, case study approaches have been shown to facilitate ‘a high level of explanatory richness’ (Brydges and Sjöholm 2019, 124). In choosing and analysing *Mz*Bs, this paper does not aim at drawing generalisable conclusions. Instead, its purpose is to explore the potential of hackerspaces to serve as technofeminist sites for experiential learning. This is also related to the fact that explicitly feminist communities are in the minority among hackerspaces.

Among feminist hackerspaces, *Mz*Bs has been selected, as it is one of the longest established communities and therefore well-documented. Moreover, its key characteristics are widely shared across feminist hacking communities. These characteristics are: first, a focus on including female,
transgender, non-binary, and genderqueer persons – which in turn results in some events excluding persons identifying as men; second, an intersectional perspective and an often theoretically and/or politically motivated communal philosophy; third, an encouragement and inclusion of creative and discursive practices that would conventionally not be considered hacking (and may be frowned upon in conventional hackerspaces). The latter point also tends to facilitate artistic and experiential projects. Having said that, also feminist hackerspaces as such may be quite specific in their approaches and an analysis of other communities will likely raise additional points for consideration. For example, Mothership HackerMoms (Berkeley, U.S.) caters particularly to the needs of members with childcare responsibilities (see also Rosner and Fox 2016).

In terms of data analysis, I interpretatively examined the material shown in Table 1. When analysing this corpus, I looked for similarities, contradictions, and interrelations within and in between different sources. Such an approach is best known from grounded theory (Glaser and Strauss 1967), though has been widely used in cultural studies research not explicitly drawing on this methodological strand (Alasuutari 1996, 373ff.; Stake 1995, 78ff).

Case study: analysis and discussion

Mz*Baltazar’s Laboratory was founded by Stefanie Wuschitz in 2008 and established as physical community space in Vienna in 2011. In an interview [9], the artist and scholar remember being inspired by the /ETC (Eclectic Tech Carnival) meetups and events: an initiative by the Dutch feminist programmer collective Genderchangers. The tech carnival gatherings bring together individuals self-identifying as women. This women-centred approach made them different from the technology communities, meetups, and workshops Wuschitz had been visiting previously –

| No | Source | Link |
|----|--------|------|
| 1 | Website | www.mzbaltazarslaboratory.org |
| 1a | Welcome | |
| 1b | About U.S. | |
| 2 | Website: workshop description “For all unruly bodies” | https://www.mzbaltazarslaboratory.org/event/for-all-unruly-bodies-workshop/ |
| 3 | Website: workshop description “Anti-racist robot” (6/11/2020) | https://www.mzbaltazarslaboratory.org/event/anti-racist-robot-workshop-by-stefanie-wuschitz/ |
| 4 | Kunsthalle Wien website: workshop description “Anti-racist robot” (4-5/10/2019) | https://kunsthallewien.at/en/event/workshop-with-stefanie-wuschitz-anti-racist-robot-workshop/ |
| 5 | Website: workshop description “Artivism, Feminism, Queerness” | https://www.mzbaltazarslaboratory.org/event/workshop-artivism-feminism-queerness-by-anna-t/ |
| 6 | Website: workshop description “Let’s spit hormones” | https://www.mzbaltazarslaboratory.org/event/digitales-funken-workshop/ |
| 7 | Website: workshop description “Digitales Funken” [Digital Radio] | https://www.mzbaltazarslaboratory.org/event/beerpong-or-voltaire-workshop-by-lidia-pereira/ |
| 8 | Website: work workshop description “Beerpong or Voltaire” | https://twitter.com/mzbaltazarslab?lang=en |
| 9 | Twitter profile and posts | |
| 10 | Facebook page | www.facebook.com/MzBaltazarsLaboratory |
| 11 | Instagram page | https://www.instagram.com/explore/locations/1019391679/austria/vienna-austria/mz-baltazars-laboratory |
| 12 | Vimeo | https://vimeo.com/user5827620 |
| 13 | YouTube video: Introduction | www.youtube.com/watch?v=qTjiGxP-ecw |
| 14 | YouTube video: About the Lab | www.youtube.com/watch?v=Pynl99O7QPk |
| 15 | YouTube video: FIBER festival talk by Stefanie Wuschitz | www.youtube.com/watch?v=IDYwV7hQcsk |
| 16 | Interview with/about S. Wuschitz | www.redhat.com/en/open-source-stories/because-we-had-to#stefanie |
| 17 | Interview with S. Wuschitz | http://peerproduction.net/issues/issue-8-feminism-and-unhacking/art-essays/dear-arduina-an-interview-with-miss-baltazars-laboratory |
| 18 | Interview with Patricia Reis and S. Wuschitz | http://creatingcommons.zhdk.ch/feminist-hackspace/ |
where she often felt somewhat alienated, due to spaces being mainly frequented by (white) men. She started organising events modelled after the /ETC idea, addressing themes at the intersection of art and technology. These were initially open to everyone. However, when ‘[…] she realised that many female artists slowly stopped coming because they didn’t feel the space was truly for them’ [9], she decided to focus on women-only events and founded Mz*B’s.

After operating as a mobile initiative, organising workshops and satellite events at various institutions, the community eventually settled in Vienna. Today, the non-profit organisation is coordinated by a collective of artists, curators, teachers, and (artistic) researchers. Bridging between art, activism, and technology, the community hosts exhibitions, performances, workshops, and courses. Drawing on Mz*B’s as a case study, this section explores— to shortly recap— two main questions: how do members/affiliates of this community choose, discuss, and shape technology in their learning practices and educational approaches? And, in turn, to what extent does technology influence these approaches and practices?

**Educational technology, educational techniques**

A key selection criterion, to assess technology’s suitability for the feminist hacking taking place at Mz*B’s, is the question whether it complies with open source principles. The notion of open source refers to non-proprietary technology and design, concerning e.g., software or hardware (Powell 2012). For example, open source software implies that the underlying code is publicly accessible, using a license allowing users to distribute and adjust it. For open source hardware, design elements like mechanical drawings or circuit layouts, are made available for legal reuse and adjustment. For reasons elaborated on below, it is important to consider that open source technology may be used for commercial purposes. Copyleft-versions of open source licenses might merely require that respective software needs to be further distributed using the originally assigned license. Already at the /ETC Wuschitz noticed the political, normative importance of using open source technology among feminist programmers:

> They were all about open source, and they were really particular about why open source, and why Linux, and what it means, and how it’s part of your own emancipatory practice on how to do things, fix things, or create things through open source technology. [9]

In order to, legally, enhance their understanding of technology and skills, and to create technology in dialogue with feminist values, the Genderchangers stress that access to tech’s inner workings is needed. Such an access is ensured by open source approaches, thus making them central to feminist hacking. This emphasis on open source was taken up by Mz*B’s: non-proprietary approaches are seen as essential for the community’s feminist, sociotechnical practices too — since open source enables people’s learning with and about software/hardware, while also allowing for further developments and adjustments of the latter [1b]. Thus, open source technology is chosen for its non-proprietary character and, in turn, co-shapes the learning practices happening at Mz*B’s in enabling legal access to technical details and allowing for alterations.

If it were just for the open source element, feminist hackerspaces might not be considered so different from ‘conventional’ hacking communities. After all, the open source movement (OSM) has been ‘[…] traced back to the “hacker culture” that created Unix, Linux, and parts of the Internet infrastructure’ (Zhao and Elbaum 2003, 66). Still today, the relevance of open source is stressed by hackerspaces worldwide, with the latter even having been called ‘the meatspace equivalent of open source projects’ (Rix 2011). However, feminist hackerspaces’ reasons for using open source software go beyond the pragmatic motives that drive the OSM. Open source software is historically founded on rather utilitarian ideals. This originates in open source being a more commercially oriented spin-off from free software (Bergquist, Ljungberg, and Rolandsson 2011). While open source software licensing partly overlaps with free software, free software is more restrictive when it comes to the commercial reuse of code — for idealistic reasons: ‘[F]ree software bases its activity on the
argument that sharing code is a moral obligation and open source bases its activity on a pragmatic argument that sharing code produces better software (Yeats 2007, 13). For the feminist hackers at Mz*B’s, too, the possibility to share code and other design instructions does not simply produce better soft-/hardware in the sense of it being ‘technically superior’. Instead, it facilitates feminist learning practices and feminist design. Therefore, despite drawing on open source technology which has evolved for rather pragmatic reasons as explained above, in feminist hackerspaces such technology takes on a political relevance – in supporting hackers’ feminist agenda and aims. This also brings up the point that technology used (as opposed to produced) in feminist hackerspaces may not be different from other hackerspaces as such: it only becomes ‘injected’ with feminist values in how it is interrogated, discussed, and altered.

Arguably, a decisive characteristic of specifically feminist hackerspaces is therefore not simply their use of certain technology in their learning endeavours. While open source may be a key criterion for using technology, feminist hackers’ sociotechnical practices are moreover embedded in a philosophy asserting the relevance of women-centred as well as non-binary, queer and trans-inclusive environments (Haralanova 2019; Toupin 2014). In this sense, feminist hackerspaces place emphasis on the implications of educational technology as well as educational techniques. Practically, this means that some of the events and roles at Mz*B’s are open only to persons identifying as female, queer, non-binary, or transgender. The exclusion of men from certain contexts is meant to foster dynamics in which individuals and groups that are otherwise marginalised in technology and science cultures, feel free to explore, ask questions, learn, and create. Historically, similar gender-segregated learning environments and so-called ‘single sex-schooling’ were once not a choice but the only option for women. They were moreover often built on the assumption that women were less capable in scientific and technological fields than men (Purvis 1989; Hansot and Tyack 1988). Somewhat fallen into disrepute due to their historical background, gender-segregated learning approaches have undergone several periods of re-emerging interests and ongoing debates concerning the pros and cons of e.g., women-only learning environments (Sullivan, Joshi, and Leonard 2011; Rommes, Faulkner, and Van Slooten 2005; Salomone 2008).

With regards to information technology, Rommes, Faulkner, and Van Slooten (2005) observe that women-only vocational courses had become popular and received increased public funding during the 1980s, though lost much of their traction and support by the 2000s (293–294). This was despite, as the authors argue, there still being great need for such trainings. Drawing on qualitative research, they conclude that ‘[…] women-focused practices and women-only “safe spaces” are a necessary prerequisite for gender equality’ and ‘a steppingstone to women then re-entering the mixed-sex world, but on a more equal footing’ (2005, 311). This argument is also reflected in Mz*B’s approach to educational events such as workshops and courses as well as in its communal ethos. It aims to build ‘an accessible, inclusive, open, safer and radical space’ and generate ‘a culture of fearless making’ [1b]. In creating such a space and culture, the community intends to support and include ‘people who have traditionally been excluded from or have felt unsafe in spaces where science is taught, or technology is being used’ (1b). To achieve this, workshops and courses often have a ‘FLIT only’ (Female, Lesbian, Intersex, Trans) door policy [2], while exhibitions and performances are open to all genders. Such workshops, as I will show in the next section, do not follow a tech-deterministic logic of developing technology according to feminist values. They also and notably reflect critically – and non-tech centrically – on technology, in relation to gender, race, sexuality, and matters of intersectionality more broadly.

Mz*B’s rejection of tech-determinism and tech-centrism mirrors a broader aim among feminist hackerspaces: to ‘dethrone’ technology as pivotal element of hacking cultures, and to legitimise and bolster otherwise underappreciate forms of artistic, activist, and/or critical-discursive engagement. Technological exploration and innovation are depicted as means to an end, rather than, as often the case in conventional hackerspaces, as ends in themselves. In their sociotechnical, critical, and creative-artistic activities, feminist hackerspaces confront the widespread idea of technology as a masculine domain. At the same time, they challenge common assumptions about societally and
economically valuable skills and innovation. Technofeminist scholars have pointed out that, ‘[t]he association between technology, masculinity, and the very notion of what constitutes skilled work is still fundamental to the way in which gendered division of labour is being reproduced today’ (Wajcman 2006, 27). Therefore, any ‘feminist intervention disputing the masculinisation of computational culture’ (Bassett, Kember, and O’ Riordan 2019, preface) also challenges gendered inequalities concerning the economic value assigned to certain professions and their societal status.

It is consequently decisive that Mz*B’s emphasises the relevance and value of artistic, activist, and discursive practices in addition to ‘strictly’ technological activities. The community’s purpose is neither framed in technology-centric terms, but as a space to learn about and ‘experiment with things as gender, hardware or our selves’ [1b]. While much of the community’s work and engagement does indeed involve technology, it does not necessarily start from tech as such: rather, it considers tech’s embeddedness in society and how it relates to social (in-)justice. Such a wariness of tech-determinist and tech-centric approaches (and explanations) is key to technofeminism (Wajcman 2004, 32ff.). Considering, among other examples, the case of the microwave, Wajcman stressed that its success ‘[…] is as much a story about the transformation of quintessentially human activity, cooking, as it is about a technical invention’ (37). To understand technological evolution, social factors, contingencies, and an ‘interpretative flexibility’ rather than an agency inscribed into technology need to be considered. These insights and their ramifications are notably reflected in the events hosted at Mz*B’s.

**Workshops**

Technology’s interpretative flexibility and social embeddedness has implications for how technofeminism conceptualises and approaches possibilities for societal change, to counter gendered, racial, and/or heteronormative inequalities. Technology is not assumed to be inherently patriarchal and hence can be potentially employed for supporting marginalised individuals/groups. However, to resist and tackle societal inequalities, technofeminism emphasises the need to address gendered social relations and intersectional dynamics, rather than merely developing ‘technology with feminist values’. Reflecting these insights, Mz*Baltazar’s Laboratory is just as much about feminist technology and design as it is about feminist critique of technology and its societal implications. These implications do not only concern ‘women’ but seek to foster feminist activism and ‘reorientations that more deeply – and meaningfully – consider the inequalities of all people’ (De Hertogh, Lane, and Jessica 2019, 6). This echo of technofeminist and intersectional insights is best illustrated in considering some of the workshops offered by Mz*B’s. I selected the following events, as these reflect the range of technical and low-tech approaches among the community’s events. At the same time, they speak to the rationales behind workshops’ respective door policy as an educational technique.

The Anti-Racist-Robot workshop, hosted by Stefanie Wuschitz in collaboration with the Schaubude Berlin, is an insightful example in that it relates matters of racial injustice to technology as a means of resistance. It took place multiple times, with the author having attended the online event from 6 November 2020. Open to all genders, the workshop aims to ‘develop a high-tech countermechanism together, build an anti-othering or anti-alienation device, and invent anti-racist-robots that wildly counteract racism’ [3]. During previous versions of this workshop, participants had been meeting physically over the course two days [4], with the aim of building robots using open source technology like Arduino boards. During the shorter, 3-h workshop, participants instead envisioned anti-racist-robotics technology using ‘paper, pens, scanners, social media accounts to share our designs’ [3]. This low-tech approach illustrates Mz*B’s rejection of tech-centric technology exploration, while still employing experiential learning approaches in asking participants to draw their visions, discuss and exchange designs. Encouraging participants to reflect on the link between technology and racism, by conceptualising anti-racist devices, it also underlines the community’s
emphasis on education concerning intersectional issues. It particularly stresses the opposition of racial injustice as part of feminist hackerspaces’ aims and politics.

Similarly starting from political issues and taking an experiential yet non-tech-centric approach, during the workshop *Artivism, Feminism, Queerness* [5] by Anna T., participants from all genders explored and discussed the ‘aesthetics of activism and resistance through art’. To do so, they experimentally analysed music, street and performance art from various cultures. Anna T.’s event, which took place on 5th May 2020, addressed issues of heteropatriarchy, supporting participants in a better understanding of queer resistance through art. Using once more a low-tech and non-tech centric approach, intersectional issues of feminist and queer alliances and frictions were brought up for discussion.

It is characteristic for the workshops offered at Mz*B’s that those with a rather low-tech-educational approach are open to all genders, as also the case for the two events discussed above. In contrast, the workshops *Let’s spit hormones* [6] on 20th October 2019 and *Digital Radio* (original: *Digitales Funken*) [7] on 17th January 2019 had a ‘FLIT only’ door policy. Both involved experiential learning with/about technology. During *Let’s spit hormones*, participants built their own microscopes. They used these to observe hormonal levels in their saliva and to reflect on their insights. Emphasising shifting oestrogen levels during menstruation or pregnancy, participants created and utilised devices that are widely associated with the natural sciences and medical research. The DIY microscopes were applied in feminist citizen science, supporting participants in a better understanding of their own bodies and chemistry. Similarly drawing on an experiential learning approach to technology, the *Digital Radio* [7] workshop practically guided participants through building a radio device with the help of a Raspberry Pi. They turned this small, single-board computer, which is running on open source software, into a digital radio. Mentioning radio as means to bring ‘art in the aether’, the workshop also invited participants to consider unconventional purposes of using radio technology.

Both workshops, *Let’s spit hormones* and *Digital Radio*, tie back to Wajcman’s (2004) reflection on “male designs of technology” (10ff.). As opposed to framing certain technology as inherently patriarchal, the author stressed that technology takes on normative meaning in use. This also implies that technology predominantly linked to male-dominated or male-associated domains of expertise may well be re-utilised in feminist practices and for feminist aims. In pursuing such a re-utilisation, the *Let’s spit hormones* workshop also foregrounds technofeminist criticism that certain skills, tasks, or purposes are not inherently more or less valuable but are assigned value by being linked to masculinity. Arguably, this characteristic not only applies to specific workshops though functions more broadly as one of the community’s technofeminist goals too: to breach and break associations with what is considered ‘skilful’ and ‘valuable’ (see Wajcman 2004, 27ff.).

The workshops discussed so far heavily rely on open source technology: with e.g., the remote *Anti-racist-robot event* having been conducted via the open source video conferencing software *fairmeeting* and the *Digital Radio* workshop using Raspberry Pi. However, proprietary technology does have its place when it comes to critical, discursive interrogations. For example, the workshop *Beerpong or Voltaire* [8], developed by Lídia Pereira and Lucia Dossin, encouraged participants to critically examine *Facebook*, a commercial platform largely based on proprietary software. Using a fictional dataset of user ‘Likes’ and other information typically obtained by the social network, the workshop allowed participants to analyse these data. Thereby, it initiated a discussion about the ramifications of ‘big data’ and digital surveillance. The workshop examined the consequences that corporate data collection about users’ preferences/interests and their profiling, … […] might have for our daily lives, economically, politically and socially’ [8]. In this context, the implications of the commercial and proprietary conditions were part of the critical technology assessment and learning experience.

The discussed workshops involve experiential learning approaches that foster critical, hands-on engagement with and discursive explorations of technology. This combination also serves as a reminder that experiential learning concerning technology does not (and should not) need to be
tech-centric. In contrast, the events at *Mz*B’s start from a politically motivated desire to examine intersecting inequalities of gender, race, ethnicity, and sexuality – in relation to technology and feminist values. Community members and participants educate themselves with and about technology: paying particular attention to its implications for persons/groups marginalised in societies privileging white, male, and heteronormative positions. Reflecting the nexus of feminist activism and intersectional theory, feminist hackerspaces confront misconceptions of technology as a white-masculine domain. At the same time, they critically interrogate technology as both a ‘source and consequence’ (Wajcman 2004, 107) of gender relations, racial injustice, and heteropatriarchy. Thereby, *Mz*B’s illustrates that feminist hackerspaces can function as intersectionally-aware, technofeminist sites for experiential learning.

**Conclusion**

In conclusion, I will first summarise how organisers and participants of events at *Mz*Baltazar’s Laboratory’s choose, discuss, and shape technology in their learning practices and educational approaches. In doing so, I also reflect on to what extent certain technology influences feminist hackers’ practices. Second, and lastly, I point out implications for tech-educational research and practice.

Technology used for experiential learning at *Mz*Baltazar’s Laboratory’s is selected based on whether it classifies as open source. This preference may seem, at a first glance, not specifically characteristic for feminist hackerspace. However, the preference for open source is not merely grounded in the pragmatic reasoning that open source facilitates collaboratively developed, assessed, and thus better working soft- or hardware, irrespective of its purpose (Yeats 2007, 13ff.). Open source is rather preferred for idealistic reasons, since it allows hackers to understand, interrogate, alter, and further develop technology in relation to feminist, intersectional values. Especially educational workshops during which participants practically examine soft-/hardware or develop their own technological projects, draw on open source solutions.

While proprietary technology is avoided in contexts involving practical exploration, it does play a part in feminist hackerspaces’ critical practices and discussions. The community examines proprietary and commercial approaches, such as Facebook’s digital surveillance and profiling of users, as illustrative examples: to discursively scrutinise technology’s problematic, societal ramifications. In their technical and non-tech centric explorations of technology, feminist hackerspaces also flag technofeminist criticism on widespread assumptions about what is considered skilful and economically valuable work. In doing so, they challenge the notion of technology as (white) masculine domain (Wajcman 2004, 27ff.).

In terms of how technology is being (co-)shaped, this question too goes beyond mere technological or tech-centric matters. The community puts emphasis not only on educational technology but also on educational techniques. At the heart of its philosophy is the creation of learning environments in which individuals/groups that are typically marginalised in technology or science communities feel free to explore their interests and develop their skills. This is notably realised through privileging access for individuals identifying as female, non-binary, transgender, or genderqueer – hence excluding men from some, particularly more technical, workshops. The communal reasons for favouring such an exclusive approach to certain educational events relates back to research on women-only learning environments for technological skills. Such research has shown ‘[…] that traditional associations between masculinity and computer technology are more likely to operate in a mixed-sex setting’ (Rommes, Faulkner, and Van Slooten 2005, 310). Moreover, the workshops conceptualised and hosted by *Mz*B’s encourage participants to critically discuss the societal implications behind technology and mould technology in ways fostering feminist and intersectional values. For example, the *Anti-Racist-Robot* workshop starts from issues of racial inequalities and injustice: it draws on intersectional insights and aims to envision technological devices that expose and counter racism. In this sense, the educational approaches of the feminist hacking community
start from societal issues, framing technology as means to an end rather than as an end in itself. Workshops at Mz*B’s facilitate experiential learning practices that are as much about feminist technology and design as they are about feminist critique of technology and its societal implications. This echoes technofeminism’s emphasis on the pitfalls of technological determinism and the mutual shaping of technology and gender relations (Wajcman 2004, 107ff.).

Tying these insights back to the start of this paper, it can hence be concluded that hackerspaces have the potential to not only act as venues facilitating experiential learning grounded in technology enthusiasm and tech-centric practices. Rather, they create space for technofeminist critique and critical technology exploration, resisting the common assumption that technology as such is the linchpin for driving sociotechnical change. In this, feminist hackerspaces serve as an important reminder for educational researchers and practitioners concerned with technological skills and expertise: Learning about technology, also experiential learning, does not need to start from technology. It can, and should, likewise involve critical and discursive, creative, and artistic explorations of how technology might contribute to countering societal issues and inequalities – and how it plays a part in maintaining and advancing these.

Notes

1. With ‘non-technical’ and ‘low-tech’, as opposed to ‘high-tech’, I refer to workshops involving traditional and non-mechanical devices and crafts, such as pen and paper or wood and metal tools (Cuban 1998).
2. It has been debated whether some feminist hackerspaces are problematically exclusive, due to their women-centred or even women-only philosophy (Marchan 2016).
3. Wajcman speaks interchangeably of an ‘emerging technofeminist framework’ (2004, 7), a ‘technofeminist approach’ (8), and of a ‘theory of technofeminism’ (103).
4. The original material is in English and German.
5. See https://www.genderchangers.org/etc.html.
6. The Raspberry Pi series involves mainly open source hardware elements, with schematics having been released; however, strictly speaking, parts like the CPU/chip design are closed source.

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