Learning Spaces and Digital Technologies (2022/2023)[SEM1]

Are Makerspaces Equitable Learning Spaces?

Jacqueline Currie

Student Number: S2269103

Word Count: 2624

Introduction

Makerspaces are a specific type of learning space, encompassing physical space and objects, digital technologies, and social learning. They have been heralded as the 'digital-age equivalent of […] English Enlightenment coffee houses' (Brooke, 2012, p. 22) but for a learning space to be considered equitable, it is vital to understand who gets to participate in the space and what type of learning is promoted, to ensure that the benefits are evenly spread throughout the global population. Therefore, an equitable makerspace not only recognizes the importance of equalising access to the space, but also considers how different participants will experience the space, due to their background, identity and community values.

Research into equity in makerspaces is focused on two intersecting fields: examining claims of makerspaces being able to increase general educational equity, and learners' experiences of makerspaces and ways in which some learners and activities are included or excluded. There is evidence from both spheres to show that makerspaces are often inequitable learning spaces, but also that instances of more equitable makerspace experiences do exist.

This essay comprises the following sections: definitions of terms specific to the topic, a brief overview of the history of makerspaces, the main exploration of equity in makerspaces (subdivided into areas of physical access and digital and social equity), ending with concluding remarks.

Terminology

Makerspaces

Many definitions of makerspaces abound, but most centre around a physical space, filled with 'facilities, tools, materials and people […], typically complemented by the affordances of virtual space' (Eaves & Harwood, 2018, p. 48). The physical aspect of a makerspace can be a dedicated building, room, or part of a room, often with an open-plan, flexible layout, containing a variety of digital technologies such as 3D printers, computers and laser cutters, alongside analogue technologies including soldering stations, woodworking tools and sewing machines. Makerspaces vary widely in their ownership, funding and governance (Ibid.) Makerspaces are sometimes known by other names, including 'hackerspaces' and fabrication laboratories ('fablabs') but 'makerspace' is the prevailing overarching term (Menichinelli & Schmidt, 2020, p. 41).

Digital Technologies

Digital technologies can be defined as 'a cluster of associated technologies defined by their functional usage in information access and communication' (Ogunsola & Aboyade, 2005, p. 7). Digital technologies commonly present in makerspaces include devices, software and machines related to the computer-aided design and manufacture of artifacts (e.g. 3D scanning and printing), components and computer code which can be embedded into those artifacts, and devices and services influencing the social aspect of the space (e.g. mobile phones, websites and social media), and the underlying facilities that make all these possible, including electricity, broadband internet and wi-fi networks.

Learning Space

The term 'learning space' can support a range of definitions; here, an interpretation by Mulcahy (2018, p. 14) that 'learning spaces are staged, performed or enacted in relations between bodies and material objects, including physical spaces', is used to underscore that learning spaces have fuzzy and dynamic spatial and temporal boundaries. In concord with Boys' (2016, p. 59) definition of learning practice as 'a messy, complex, and—most crucially—completely interconnected process, where space, objects, humans, and events are inherently inseparable', this interpretation does not privilege physical space, nor does it discount it altogether.

Equity

Equity is a concept used in social justice movements that recognises and celebrates differences among people and takes their differing needs into account (Young, 1990, p. 3). It is distinct from equality, which denies people's differences and treats everyone's needs as the same.

Constructionism

Constructionism is a theory of learning purporting that effective learning involves learners 'building knowledge structures', rather than transmitting knowledge, and being 'embedded in an activity the learner experiences as constructing a meaningful product (for example, a work of art, a functioning machine, a research report or a computer program)' (Papert, 1986, p. 1).

Makerspaces and the Maker Movement

The emergence of makerspaces in the early 2000s is inextricably linked with the rise of consumer-facing fabrication technologies, particularly 3D printing, and the associated grass-roots communities of people ('makers') interested in exploring the possibilities of the new technologies. Make magazine, founded in 2005 by Dale Dougherty, was and remains instrumental in shaping this 'maker movement' (Menichinelli & Schmidt, 2020), described on their website as a 'tech-influenced DIY community' that '[drives] innovation in manufacturing, engineering, industrial design, hardware technology and education' (Make, 2022). Inviting makers to share their ideas and projects in print, online and at local 'Maker Faires', Make heavily influenced and promoted maker culture and makerspaces, with Doughery proclaiming 'all of us are makers' (Dougherty, 2011).

Makerspace in Cambridge, UK

Stand-alone makerspaces offered local hubs for makers, providing physical and online spaces and communities to share knowledge and skills. From the mid-2000s to mid-2010s, governments looking to stimulate their economies by fostering STEM (science, technology, engineering and mathematics) skills and the '4Cs' of '21st century skills' - collaboration, creativity, communication and critical thinking (Bialik et al., 2015, pp. 3-10), latched onto the maker movement and the potentially innovative learning spaces of makerspaces. Western media hype surrounding makerspaces may have peaked in 2014, when then-President Obama hosted a ‘Maker Faire’ at the White House, and declared the maker movement ‘a revolution that can help us create new jobs and industries for decades to come’ (Obama, 2014). Recognising the links between makerspaces and constructionism, including student-centred, problem-based learning and the surrounding culture being ‘fundamental’ to learners’ engagement (Downey et al., 2022, p. 3), schools, universities, museums, libraries and out-of-school clubs started integrating makerspaces into their settings (Becker, 2016; Wong & Partridge, 2016).

Makerspace at University of North Carolina, USA

Primary School Makerspace in Heerenveen, Netherlands

Menichinelli and Schmidt (2020, p. 44) estimate that the number of permanent makerspaces worldwide now exceeds 3500. Assertions still abound that ‘students who may not find success in traditional learning environments may achieve high success levels in a makerspace environment’ (Nadelson, 2021, p. 106). However, there are problems arising from trying to ‘fit’ makerspaces into mainstream education alongside ongoing issues of representation and inclusion within maker culture (Dawson, 2017, p. 539). As 3D printing has been overtaken by the next big thing in technology, only recently reaching a ‘plateau of productivity’ (Valdivieso, 2019), so too have makerspaces had to transcend their hype and adapt to stay relevant and valuable as learning spaces.

Library Makerspace in San Mateo, USA

Mobile Makerspace in Aruba

Makerspaces and Issues of Equity

Many researchers have questioned whether claims of the maker movement 'revolutionising' education, and being for 'all', are really true. Key issues related to the contribution of makerspaces to educational equity, and of diversity, equity and inclusion in makerspaces, are discussed here across three main areas: physical access, digital equity and spatial equity. It should be kept in mind, however, that these spheres are fully interconnected, able to resist or reinforce each other, and produce effects that go beyond education.

Physical Access

Although notions of educational equity have moved on from mere equality of access, to encompass power, representation and culture, Dawson (2017, p. 540) argues that 'both pieces of the puzzle' are still required to achieve 'strong' equity. Makerspaces rely heavily on physical learning spaces, and providing shared access to their facilities therefore can increase educational equity for makers who otherwise may not be able to use or interact with digital fabrication technologies.

However, access to makerspaces is restricted by geography, as the majority are located in the Global North and in urban centres (Menichinelli & Schmidt, 2020, pp. 45-47), likely due to the expense of the buildings and digital technologies required of makerspaces, and the need for reliable, fast internet and dependable water and electricity supplies, which may not be possible geographically or in unstable political environments (Hodgkinson-Williams & Trotter, 2018, p. 210). Projects such as mobile makerspaces have shown promise in reducing physical access inequality, but often run into their own problems of funding, staffing and storage (Fox, 2014, p. 28; Moorefield-Lang, 2015, p. 469).

Other accessibility barriers to makerspaces may be financial (e.g. membership or usage fees at a private makerspace, or entrance fees at a museum makerspace) or explicit exclusion (e.g. age minimums, or a university makerspace requiring a student or staff ID card to enter). Futhermore, makerspaces can be expensive to set up and run, and the differing magnitude and reliability of their funding sources (whether from membership fees, government grants, corporate sponsorship or institutional support) means there are many disparities between makerspaces in terms of size, facilities, type and quantity of equipment, and the presence and level of trained staff and volunteers (Menichinelli & Schmidt, 2020, p. 57). Free, public makerspaces located, for example, in libraries and schools, can counter exclusionary obstacles, but may be smaller and less well-resourced (Cao et al., 2020, p. 1212). Increased physical access does not always translate to reduced inequality.

Digital Equity

Alongside unequal infrastructure access to digital technologies, digital equity considers the knock-on impacts of 'limited digital literacy' and 'restricted communication opportunities', which can hamper student progress (Rodríguez et al., 2021, p. 263). The inclusion of digital technologies distinguishes makerspaces from traditional machine shops and industrial arts classrooms (Browder et al., 2019, p. 462), and offers the potential to increase digital equity by providing opportunities of both how to use digital fabrication technologies and how to learn *with* other digital technologies such as computers and the internet.

Development of digital skills in a makerspace sometimes relies on existing high levels of digital literacy. For example, learning to use a 3D printer requires building upon more basic skills of ‘information and data literacy’ by searching online repositories for 3D models to download and assess suitability for particular equipment, ‘digital content creation’ by creating or modifying a 3D model using computer design software, and ‘problem solving’ by working out why a 3D model may fail to print as expected (Rayna & Striukova, 2021, pp. 9-10). Of course, a makerspace can also facilitate the acquisition of digital literacy skills, but it has been found this only happens with ‘explicitly targeted educational policies and programmes’ (Ibid., p. 14). Digital equity in a makerspace is therefore bound to levels of funding and resourcing, of both equipment and trained facilitators.

Privileging of the physical space and in-person instruction in makerspaces can lead to less development of digital collaboration and communication skills (Ibid., p. 9); conversely, viewing makerspaces as hybrid learning spaces, with their access to online maker resources, communities and training materials, could increase educational equity by allowing learning to occur beyond the walls of any one makerspace. However, hegemonic English language use and institutional or government censorship of websites may limit access to online educational resources (Hodgkinson-Williams & Trotter, 2018, p. 207). Furthermore, while completely virtual makerspaces may facilitate learning from anywhere (Lock et al., 2020, p. 959) such mobile learning spaces are themselves subject to issues of digital inequity (Tammi, 2020, p. 61) and spatial inequity (Singh et al., 2021, p. 136).

Spatial Equity

Mulcahy et al. (2015, p. 578) warn against a realist perspective of learning spaces, where ‘building design […] should reflect its contents’ or where ‘space is, or can be used as, a device for changing behaviours and practices’. Makerspaces can suffer from this stance, with a focus on their open-plan, flexible layouts leading to expectations that innovative learning will simply follow; instead, school administrators are often left with makerspaces that ‘sit unused because students and teachers are uncertain about how or why to use them’ (Salisbury & Nichols, 2020, p. 50). It is also seen in research where space is viewed solely a container ‘given in advance and appropriated or used by social actors’ (Mulcahy et al., 2015, pp. 578-579), reproduced in claims that certain makerspace architectures can increase ‘creativity’ (Wu et al., 2021) or encourage ‘perceptions of belonging and enhance inclusion’ (Nadelson, 2021), while ignoring social learning factors.

In contrast, a relationist perspective of learning space considers ‘encounters *between* space and its occupation’ (Boys, 2011, p. 51). Physical access is not enough; to achieve educational equity it is imperative to understand that the ‘character of the learning space changes with changes in its practice’ (Mulcahy et al., 2015, p. 580). Despite surface similarities, no two makerspaces are alike, and their relative equity is dependent upon the ‘maker culture’ within, including issues of representation, inclusion and social justice.

Regardless of the constructionist ideal of making activities being highly interdisciplinary, school and university makerspaces have become ‘commonplace’ in STEM departments (Andrews et al., 2021, p. 1), and makerspaces often reproduce inequities found in STEM communities. For example, there is a large gender disparity in makerspaces - 81% of makers self-report as men (Make/Intel, 2012, p. 24) – which is compounded by unwelcoming social spaces: when women and girls do engage with makerspaces, they are often subject to gender bias and sexism (Alemán et al., 2022, p. 351). This lack of representation is heightened by the centring, often physically in the space as well as culturally, of fabrication technologies coded as ‘masculine’, such as woodworking, metalworking, electronics and robotics, and the marginalisation of those coded as ‘feminine’, including crafting and textile arts (Alemán et al., 2022, p. 362).

Likewise, there can be a fetishisation of digital fabrication activities over analogue making activities in makerspaces, sometimes leading to a neocolonial erasure of making traditions from non-white and non-Western cultures (Barajas-López & Bang, 2018, p. 8). It is also important to recognise the inequitable environmental impacts of digital technologies (Selwyn, 2021, pp. 504-505) such as those found in makerspaces, which tend to adversely affect already vulnerable communities, particularly Indigenous groups and those in the Global South.

Specialist makerspaces are tackling these issues by cultivating alternative maker cultures focused on social justice, for example: feminist and queer makerspaces (Capel et al., 2021; Wuschitz, 2022), makerspaces for people with disabilities (Bosse & Pelka, 2020) and out-of-school makerspaces for Black and Indigenous youth (Barajas-López & Bang, 2018; Worsley & Roby, 2021); plus makerspace projects focusing on environmental justice (Honma, 2017) and on sustainability (Singh, 2022). However, there are concerns that such ‘segregated’ makerspaces do not change mainstream maker culture (Dawson, 2017, p. 544). Therefore, it is important to focus on diversity, inclusion and social justice in *all* makerspaces to engage minoritised learners in ‘equitable and consequential’ making experiences (Barton et al., 2017, p. 39).

Conclusion

Makerspaces may no longer be considered ‘new and shiny’, and their claims of revolutionising education for all generally overblown, not least because of the prevailing norms of who gets to be a maker and what counts as making. Over the past twenty years, it appears that makerspaces have travelled through a similar ‘hype, hope, disappointment’ cycle usually used to refer to the unrealised ‘disruption’ of education by digital technologies themselves (Selwyn, 2017, p. 62); however, important ‘pockets of equitable practice’ (Dawson, 2017, p. 544), including mobile and social justice focused makerspaces, have appeared that signpost ways to make the benefits of makerspaces available to all.

The question of whether makerspaces are equitable learning spaces has been considered through the lenses of physical access, digital and spatial equity, and the intersections therein. From this analysis, two clear characteristics emerge for makerspaces to be considered equitable learning spaces. First, the need for free, public, well-resourced, worldwide makerspaces, located in subject-neutral facilities such as libraries, which can reduce barriers to access and promote interdisciplinary learning. Second, the importance of a diverse, well-trained makerspace staff, who can counter realist views of the learning space and help close digital skills gaps, ensure a safe and inclusive learning space and celebrate a range of making activities. It is only by attending to the interconnectedness of all their human, physical, material and digital factors that makerspaces can fully realise their potential as radical, world-changing learning spaces.

References

Alemán, M. W., Tomko, M. E., Linsey, J. S., & Nagel, R. L. (2022). How do you play that makerspace game? An ethnographic exploration of the habitus of engineering makerspaces. *Research in engineering design*, *33*(4), 351-366. https://doi.org/10.1007/s00163-022-00393-0

Andrews, M. E., Borrego, M., & Boklage, A. (2021). Self-efficacy and belonging: the impact of a university makerspace. *International Journal of STEM Education*, *8*(1), 1-18. https://doi.org/10.1186/s40594-021-00285-0

Barajas-López, F., & Bang, M. (2018). Indigenous Making and Sharing: Claywork in an Indigenous STEAM Program. *Equity & Excellence in Education*, *51*(1), 7-20. https://doi.org/10.1080/10665684.2018.1437847

Barton, A. C., Tan, E., & Greenberg, D. (2017). The Makerspace Movement: Sites of Possibilities for Equitable Opportunities to Engage Underrepresented Youth in STEM. *Teachers College record (1970)*, *119*(6), 1-44. https://doi.org/10.1177/016146811711900608

Becker, S. (2016). Developing Pedagogy for the Creation of a School Makerspace: Building on Constructionism, Design Thinking, and the Reggio Emilia Approach. *Journal of educational thought*, *49*(2), 192-209.

Bialik, M., Fadel, C., Trilling, B., Nilsson, P., & Groff, J. (2015). Skills for the 21st Century: What Should Students Learn?

Bosse, I. K., & Pelka, B. (2020). Peer production by persons with disabilities – opening 3D-printing aids to everybody in an inclusive MakerSpace. *Journal of enabling technologies*, *14*(1), 41-53. https://doi.org/10.1108/JET-07-2019-0037

Boys, J. (2011). Where is the Theory? In A. Boddington & J. Boys (Eds.), *Re-shaping Learning: A Critical Reader* (pp. 49-66). Sense.

Boys, J. (2016). Finding the Spaces In-Between. Learning as a Social Material Practice. In L. Carvalho, P. Goodyear, & M. d. Laat (Eds.), *Place-Based Spaces for Networked Learning* (pp. 59-72). Taylor & Francis Group. https://ebookcentral.proquest.com/lib/ed/detail.action?docID=4579047.

Brooke, H. (2012). *The Revolution will be Digitised: Dispatches from the Information War*. Windmill Books.

Browder, R. E., Aldrich, H. E., & Bradley, S. W. (2019). The emergence of the maker movement: Implications for entrepreneurship research. *Journal of business venturing*, *34*(3), 459-476. https://doi.org/10.1016/j.jbusvent.2019.01.005

Cao, F., Wu, S., & Stvilia, B. (2020). Library makerspaces in China: A comparison of public, academic, and school libraries. *Journal of Librarianship and Information Science*, *52*(4), 1209-1223. https://doi.org/10.1177/0961000620908657

Capel, T., Ploderer, B., Brereton, M., & O'Connor Solly, M. (2021). The Making of Women: Creating Trajectories for Women's Participation in Makerspaces. *Proceedings of the ACM on human-computer interaction*, *5*(CSCW1), 1-38. https://doi.org/10.1145/3449109

Dawson, E. (2017). Social justice and out-of-school science learning: Exploring equity in science television, science clubs and maker spaces. *Science education (Salem, Mass.)*, *101*(4), 539-547. https://doi.org/10.1002/sce.21288

Dougherty, D. (2011). *We are makers*. TED. Retrieved 7 December 2022 from https://www.ted.com/talks/dale_dougherty_we_are_makers/transcript

Downey, R. J., Youmans, K., Idalis Villanueva, A., Nadelson, L., & Bouwma-Gearhart, J. (2022). Building Knowledge Structures in Context: An Exploration of How Constructionism Principles Influence Engineering Student Learning Experiences in Academic Making Spaces. *Education sciences*, *12*(11), 733. https://doi.org/10.3390/educsci12110733

Eaves, S., & Harwood, S. (2018). The Emergence of Makerspaces, Hackerspaces and Fab Labs: Dewey's Democratic Communities of the Twenty-first Century? In R. Heilbronn, C. Doddington, & R. Higham (Eds.), *Dewey and Education in the 21st Century : Fighting Back*

(pp. 37-59). Emerald Publishing Limited. http://ebookcentral.proquest.com/lib/ed/detail.action?docID=5217791
Fox, S. (2014). Third Wave Do-It-Yourself (DIY): Potential for prosumption, innovation, and entrepreneurship by local populations in regions without industrial manufacturing infrastructure. *Technology in Society*, *39*, 18-30. https://doi.org/https://doi.org/10.1016/j.techsoc.2014.07.001
Hodgkinson-Williams, C. A., & Trotter, H. (2018). A Social Justice Framework for Understanding Open Educational Resources and Practices in the Global South. *Journal of Learning for Development*, *5*(3), 204-224.
Honma, T. (2017). Advancing Alternative Pathways to Science: Community Partnership, Do-It-Yourself (DIY)/Do-It-Together (DIT) Collaboration, and STEM Learning "from Below". *Transformations (Wayne, N.J.)*, *27*(1), 41-50. https://doi.org/10.1353/tnf.2017.0004
Lock, J., Redmond, P., Orwin, L., Powell, A., Becker, S., Hollohan, P., & Johnson, C. (2020). Bridging distance: Practical and pedagogical implications of virtual Makerspaces. *Journal of computer assisted learning*, *36*(6), 957-968. https://doi.org/10.1111/jcal.12452
Make. (2022). *The Maker Movement*. Make Community LLC. Retrieved 7 Dec 2022 from https://makerfaire.com/maker-movement/
Make/Intel. (2012). *Maker market study and media report: an in-depth profile of makers at the forefront of hardware innovation.* https://cdn.makezine.com/make/sales/Maker-Market-Study.pdf
Menichinelli, M., & Schmidt, A. G. S. (2020). First Exploratory Geographical and Social Maps of the Maker Movement. *European Journal of Creative Practices in Cities and Landscapes*, *2*(2), 35-62. https://doi.org/10.6092/issn.2612-0496/9640
Moorefield-Lang, H. M. (2015). When makerspaces go mobile: case studies of transportable maker locations. *Library hi tech*, *33*(4), 462-471. https://doi.org/10.1108/LHT-06-2015-0061
Mulcahy, D. (2018). Assembling Spaces of Learning 'In' Museums and Schools: A Practice-Based Sociomaterial Perspective. In (pp. 13-29). Springer Singapore. https://doi.org/10.1007/978-981-10-7155-3_2
Mulcahy, D., Cleveland, B., & Aberton, H. (2015). Learning spaces and pedagogic change: envisioned, enacted and experienced. *Pedagogy, culture & society*, *23*(4), 575-595. https://doi.org/10.1080/14681366.2015.1055128
Nadelson, L. S. (2021). Makerspaces for rethinking teaching and learning in K–12 education: Introduction to research on makerspaces in K–12 education special issue. *The Journal of Educational Research*, *114*(2), 105-107. https://doi.org/10.1080/00220671.2021.1914937
Obama, B. (2014). *Remarks by the President at the White House Maker Faire*. White House Archives. Retrieved 7 December 2022 from https://obamawhitehouse.archives.gov/the-press-office/2014/06/18/remarks-president-white-house-maker-faire
Ogunsola, L. A., & Aboyade, W. A. (2005). Information and Communication Technology in Nigeria: Revolution or Evolution. *Journal of Social Sciences*, *11*(1), 7-14. https://doi.org/10.1080/09718923.2005.11892487
Papert, S. (1986). *Constructionism: A new opportunity for elementary science education.*
Rayna, T., & Striukova, L. (2021). Fostering skills for the 21st century: The role of Fab labs and makerspaces. *Technological Forecasting and Social Change*, *164*, 120391. https://doi.org/https://doi.org/10.1016/j.techfore.2020.120391
Rodríguez, B. C. P., Armellini, A., & Traxler, J. (2021). The Forgotten Ones: How Rural Teachers in Mexico are Facing the COVID-19 Pandemic The Forgotten Ones: How Rural Teachers in Mexico are Facing the COVID-19 Pandemic. *Online Learning Journal*(1). https://doi.org/10.24059/olj.v25i1.2453
Salisbury, K., & Nichols, T. P. (2020). School makerspaces: Beyond the hype. *Phi Delta Kappan*, *101*(8), 49-53. https://doi.org/10.1177/0031721720923792

Selwyn, N. (2017). *Education and technology : key issues and debates / Neil Selwyn* (Second edition. ed.). Bloomsbury Academic, an imprint of Bloomsbury Publishing Plc.

Selwyn, N. (2021). Ed-Tech Within Limits: Anticipating educational technology in times of environmental crisis. *E-learning and digital media*, *18*(5), 496-510. https://doi.org/10.1177/20427530211022951

Singh, J. (2022). The Sustainability Potential of Upcycling. *Sustainability (Basel, Switzerland)*, *14*(10), 5989. https://doi.org/10.3390/su14105989

Singh, J. B., Sharma, S. K., & Gupta, P. (2021). Physical learning environment challenges in the digital divide: How to design effective instruction during covid-19? *Communications of the Association for Information Systems*, *48*(Article 18), 133-139. https://doi.org/10.17705/1cais.04818

Tammi, L. (2020). Across the great divide: The impact of digital inequality on Scotland's Gypsy/Traveller children and young people during the COVID-19 emergency. *International Journal of Roma Studies*(2), 52-65. https://doi.org/10.17583/ijrs.2020.6301

Valdivieso, C. (2019). *Where is 3D Printing in Gartner's Hype Cycle?* Retrieved 7 December 2022 from https://www.3dnatives.com/en/gartner-hype-cycle-3dprintingpredictions-150120194/

Wong, A., & Partridge, H. (2016). Making as Learning: Makerspaces in Universities. *Australian academic and research libraries*, *47*(3), 143-159. https://doi.org/10.1080/00048623.2016.1228163

Worsley, T. E. D., & Roby, R. S. (2021). Fostering Spaces for Black Joy in STEM-Rich Making and Beyond. *Journal of effective teaching in higher education*, *4*(2), 118-134. https://doi.org/10.36021/jethe.v4i2.166

Wu, Y., Lu, C., Yan, J., Chu, X., Wu, M., & Yang, Z. (2021). Rounded or angular? How the physical work environment in makerspaces influences makers' creativity. *Journal of environmental psychology*, *73*, 101546. https://doi.org/10.1016/j.jenvp.2020.101546

Wuschitz, S. (2022). A feminist hacklab's resilience towards anti-democratic forces. *Feminist theory*, *23*(2), 150-170. https://doi.org/10.1177/14647001221082298

Young, I. M. (1990). *Justice and the Politics of Difference*. Princeton University Press.