

# Knowledge equity and Open Science: An attempt to outline the field from a feminist research perspective

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## Abstract

Knowledge equity is a broad concept. Although it is linked to the goals of Open Science, it is rarely discussed in the scientific community. The term refers to a variety of aspects such as epistemology, research methods, data analysis, inclusive education, equal representation, participation, and science communication. It is reflected on individual, institutional, and structural levels.

In this article, we attempt to outline the field theoretically against the background of a power-theoretical perspective and discuss what knowledge is in the first place. In a second step, we explore the question of what is hidden behind the terms equality and equity and to what extent these concepts can be linked to the underlying concept of knowledge. When can we speak of equity, why, and to what extent? Finally, the article links the overall social development of increasing sensitivity to diversity, which is discussed in conjunction with inclusive education and inclusion in general. Herein we refer to concepts of intersectional feminist research, the principles of Open Science, and a critical perspective on the concept of diversity.

For illustration, exemplary projects associated with the Open Science Fellow Program, which address the issue of marginalized groups in the research process, are described. Among others, these relate to the following focal points: Data collection of non-binary gender, awareness of adultism, collaborative interpretation with interviewees, queer narratives, diversity in editorial boards, research in the context of North-South relations, participatory science communication using art, and exclusion factors of science communication.

The overarching question we ask in this article is the extent to which knowledge equity is relevant to marginalized groups and exclusive dynamics in terms of an inclusive rationale

and how those dynamics can be identified by using critical perspectives and self-reflexive considerations.

## Keywords

feminism, inclusion, intersectionality, knowledge equity, Open Science

## An outline of knowledge equity in Open Science

Open Science (OS) is more than a practical or technical approach to make science transparent, reproducible, and accessible. The OS community is actively working on changing science, academia, and their practices. OS relates to a sociopolitical movement towards collaboration, fairness, and justice. As Pownall et al. (2021) state, OS is an aim to face and acknowledge biases. It is a shift towards a critical view on dominant norms and towards 'championing collaboration'. Herein we see many parallels to feminist perspectives. Both, feminism and OS embrace community, collegiality, and collaboration (Pownall et al. 2021). If we think this further from an intersectional view, consequently knowledge equity must be one major aim of OS. However, the term knowledge equity itself is vaguely used. Its concrete meanings are often diffused and rarely discussed in the community. For instance, within the Open Science Fellows Program (2022), which this special issue is dedicated to, only a few projects of the researchers associated with the program deliberately locate themselves under this category.

We, the authors, understand knowledge equity as a broad concept that refers to a variety of aspects such as epistemology, research methods, data analysis, inclusive education, equal representation, participation, and science communication. Equity – or rather inequity – is reflected on individual, institutional, and structural levels. In this article, we share general theoretical considerations on knowledge, power, equity, and inclusion. We address knowledge equity on various levels that can provide implications for the community. Hereby we discuss three exemplary areas in detail and illustrate them by particular examples associated with the Open Science Fellows Program (2022). These areas of implication are:

1. Feminist epistemology
2. Equal opportunities
3. Science communication

Being aware of the wide bandwidth of the topic, we make the following preliminary delimitations. First, this article is an attempt to define and describe the term knowledge equity with regard to its implications for OS beyond technical perspectives on OS principles (Open Methodology, Open Source, Open Data, Open Access, Open Peer Review, and Open Educational Resources). Second, instead our focus lies on a sociopolitical stand that refers to inclusivity, intersectionality, and a feminist perspective. So one overarching question is how research can deal with marginalization at different stages of research

processes and in terms of an inclusive rationale. Our feminist perspective refers to Crenshaw (1989) and her analytical framework of intersectionality. Intersectionality states that a person's social and political identities create different modes of privileges and discrimination. Marginalized groups and individuals coded to not belong to them are marked as 'others' and thus experience discrimination based on actual or perceived characteristics (Said 1978). Those identities refer to aspects of racialization, class, ability, sexual orientation, gender, religion, mental health, and other assigned characteristics. The framework describes the overlap and concurrency of more than one of these categories of discrimination, which results in more than one axis and thus leads to multiple discrimination. If several of these attributes apply to a person, they can be multiply-marginalized (Cho et al. 2013). Third, although we want to offer implications to think further, this is not a universal guideline on how to make science equitable. There is no one answer that fits all. The matter is far too complex and inequity is highly intertwined with our society. Fourth, practices widely differ between scientific disciplines. Therefore, we mainly refer to our field, social sciences. Nevertheless, the considerations are transferable to other fields of research, such as arts and humanities, law and politics, life and natural sciences. Fifth, this is an attempt to outline the field and share theoretical considerations. We do not claim to be exhaustive for the whole bandwidth of the concept.

## **Knowledge and the power of its use**

First of all we want to underline, that knowledge itself is highly normative and therefore can not claim objectivity or universal validity. This point is of high interest, when it comes to the question of equity in terms of resources, liberty and social as well as political inclusion of marginalized groups, what will be justified in detail in the following.

Knowledge is more than the sheer accumulation of findings. Sir Francis Bacon, author of the idiom of 'knowledge itself is power' (Bacon 1597), stated that knowledge is more than that because findings are always already embedded in power relations. To understand knowledge as a mere accumulation of information thus fails to recognize the responsibility that comes with it. At the latest with the beginning of the Enlightenment, the power-based concept of knowledge can be seen as an instrument for the critique of domination, since the bourgeoisie saw its own rise closely linked to the use of and access to knowledge. The access to knowledge thus crystallized into one of the themes of the labour movement, which highlighted participation in knowledge, ergo in power, as an elementary drive of modernity. Faulstich (2011) combined this new understanding of liberation with the following insights and challenges:

'Knowledge is power, but it quickly leads to the shock that knowledge can become unrestricted and uncontrollable, forces us to realize that all access to knowledge remains bound up in power relations, and results in the realization that all results that present themselves as seemingly secure knowledge must be relativized and reflected upon in terms of their references to power.' (Faulstich 2011, p. 15)

What we conclude from this quotation is firstly, that knowledge can be understood as an instrument of liberation on the one hand, but an instrument of domination on the other. It turns out that knowledge is power, but power also forms knowledge at the same time. In this way, a tension opens up between reason and domination, which establishes critical perspectives on the processes of knowledge production, appropriation, and use and thus provides important implications for reflection (ibid.).

'Knowledge is under the lock and key of the rulers, inaccessible to the ruled, except in the sort of prepared and falsified form that suits the rulers' (Liebknecht 1872). What Liebknecht makes clear in this quotation is that access to and dealing with knowledge is subject to limitation. He justifies this with existing power relations that can specifically color the access to and handling of knowledge. It is thus suggested that knowledge is limited by individuals in power. In contrast, Michel Foucault – founder of discourse analysis based on power and knowledge theory – established a different understanding of knowledge and power (see Foucault 1971, Foucault 1972). His theory locates the limitation of knowledge less with power-holding individuals than with power structures: 'The structures of power determine the hegemony in discourse and filter what can be considered accepted knowledge' (Faulstich 2011 p. 21). What both theories have in common is that they reveal an impact that is capable of creating freedom and oppression at the same time. Knowledge thus represents an instrument of power, which inherently requires responsible handling. The production, implementation, and dissemination of knowledge has to be analyzed against the background of normative claims, which, as in this article, can include thematization and production of knowledge equity (see also Berger and Luckmann 1966).

We summarize that knowledge can never be regarded as static, universal, or even neutral. Instead we are regarding it as an unfinished entity in terms of history, perspectives, and interests. Furthermore, knowledge must be reflected and discussed against the background of exclusionary power relations and processes of hierarchisation and discrimination in favor of marginalized groups. A responsible use has therefore to be a constant part of the treatment and negotiation of knowledge. This aspect should be evident, for example, in the context of scientific research when research ethics are considered.

## **A theoretical approach to concepts of equality and equity**

Even though the concepts of equity and equality differ fundamentally, the terms are often used synonymously. As equality means the distribution of the same amount of resources or opportunities to each individual or group, equity focusses on individual circumstances. Equity therefore aims to recognize that each person has different capabilities, is located in different circumstances, and seeks to allocate the resources and opportunities that are needed to reach an equal outcome. So wherein equality stands for the equal amount of resources, equity is aiming to distribute different amounts of resources. We, the authors as part of the OS movement, stick to the idea of equity since it is highlighting a more applicable, critical perspective towards exclusion and marginalization. Thus we understand

equity – or social equity in particular – as both, a wish and a claim. We consider it a ethically justified basic human need and a political issue.

Horn and Scarano (2013) approach the concept of equity on three conceptually distinguishable levels: First, the institutional ethical issues, i.e., where equity is negotiated, second the areas that apply the term equity, i.e., who or what negotiates equity, as well as third, theories of equity that pursue the question 'How can questions of equity be negotiated'. Since the first and the third are of particular interest for the approach of this article, they will be examined in more detail below.

According to Rawls (1971), equity is to be understood as 'the first virtue of social institutions'. Consequently, seven institutional ethical themes are distinguished by Horn and Scarano (2013) (p. 9):

1. Political equity: Adequate distribution of rights, freedoms, opportunities, etc.
2. Social and economic equity: Distribution of material goods and resources
3. Gender equity
4. Equity towards marginalized groups
5. Intergenerational equity
6. Punitive equity
7. International equity

We highlight that a demarcation of the individual issues is neither given nor would it be purposeful. Rather, we assume a reciprocal, dynamic influence, which renders the question of equity exceedingly complex. Nonetheless, the theoretical approach via the institutional ethical topics cited by us offers orientation and a simplified understanding of the context in which we pose the question of equity. So what can knowledge equity mean if we continue these theoretical considerations on knowledge and power?

## **Knowledge equity**

We understand knowledge equity as a multidimensional interplay of 'place' (in which framework does equity manifest itself?) and 'actor' (who or what is affected by equity?) against the background of temporal developments and on the basis of power relations. This multidimensional interplay is dynamic. The elements change over time and produce new inequity continuously. The dynamic nature has implications for the negotiation of the lack of knowledge equity: It is never completed, since the question must always be posed anew. Both, the conditions of the framework in which knowledge equity is constituted and the actors who experience inequity change over time and are continuously reconstituted against the backdrop of changing power relations. In consequence, the question of knowledge equity is not a finite one. It is rather to be posed continuously anew,

since places, actors, and power are changing over time and thus lead to new marginalization processes. We therefore need to continuously ask the following:

Who is included and who is left behind? Who is benefiting and who is not? Whose voices are being heard and whose are silenced? Who dominates theoretical discourses? Which epistemologies and hierarchisation construction is knowledge based on? And the overall question: Why? (see Derrida 1981; Spivak 1988).

Moreover it is important to ask who possesses which knowledge and what knowledge hierarchies can be identified. Why and to what extent does inequity come to the surface and how is it ultimately produced? For us it becomes apparent that the question of knowledge equity can be posed on three different levels: Firstly, the production of knowledge, secondly, the distribution of knowledge, and thirdly, access to knowledge. These levels are interdependent and require the analysis of personal, epistemic, systemic, and structural barriers (see also Wikimedia Germany 2022). The question is how data, processes, and materials have to be prepared, published, and designed in order to connect to a heterogeneous group of addressees (see also Steinhardt and Kruschick 2022).

We conclude three consequences: Firstly, the question of knowledge equity is a highly normative one and understanding varies. Secondly, the question of knowledge equity is rather a site of encounter of different perspectives. This opens up a space for reflection and generates access to different options for action (Wikimedia Germany 2022). Thirdly, the thematization and reflection of knowledge equity cannot claim that justice has been achieved at a certain point in time, because it is not designed to do so. Thematization rather theoretically opens up diverse, contradictory responses to social coexistence and problem situations and thus moves them to the center of further investigation and analysis.

However, the topic of marginalization dynamics in society and its goods is not new. The concept of inclusion and exclusion has always sought to describe dynamic including and excluding processes, both, descriptively and normatively, to make them analyzable from a theoretical perspective. Inclusive education in particular faces the challenge of making knowledge and education equally accessible to all and both exposing and overcoming marginalization. It is strongly concerned with analyzing constructions of difference such as class, race, gender, disability, which can lead to systematic exclusion in the context of knowledge and education. We constitute the question of knowledge equity against the backdrop of inclusive concepts as an important element on the way to an inclusive society. We see it compatible with the development policy premises of the 2030 Agenda, which is equally situated with the inclusive self-image *Leave no one behind* (LNOB; United Nations Sustainable Development Group 2022).

## **What constitutes knowledge equity as an important issue?**

## **...against the background of an international legal framework**

'Everyone has the right freely to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits.' (Universal Declaration of Human Rights. Article 27; United Nations 2022)

The Universal Declaration of Human Rights adopted by the United Nations General Assembly in 1948 is considered a milestone in the history of human rights, as it is proclaimed for the first time as a common standard 'for all peoples and all nations' (United Nations 2022). Article 27 emphasizes the right to participate freely in cultural and social life and further specifies that everyone has the inherent right to participate in science and its achievements. In 1948, the issue of access to and participation in knowledge was addressed for the first time at an international level.

'We envisage a world of universal respect for human rights and human dignity, the rule of law, justice, equality and non-discrimination; of respect for race, ethnicity and cultural diversity... A just, equitable, tolerant, open and socially inclusive world in which the needs of the most vulnerable are met.' (2030 Agenda: Universal Values; United Nations Department of Economic and Social Affairs 2022)

With the adoption of the 2030 Agenda in 2015, the vision of a just, non-discriminatory, and appreciative world entered international development policy. The agenda formulates 17 Sustainable Development Goals (SDGs; United Nations Department of Economic and Social Affairs 2022) that address states, civil society, business, and academia, as well as each and every individual. 'LNOB' (ibid.) is one of the three principles for achieving the goals. In addition to the principles of the Human Rights-Based Approach, Gender Equality, and Women's Empowerment, the statement 'LNOB' takes up the idea of inclusion and seeks to consider marginalized groups and individuals both as beneficiaries and as active participants. The 2030 Agenda thus sees itself as an inclusive agenda that deliberately focuses on marginalization processes. It seeks to address them with the goal of equal participation and full involvement in social life. These marginalization processes are reflected in SDG 10, for example. Herein, the reduction of inequalities within and between states is granted an independent development goal, which is concretized in sub-goal 10.2 as follows: 'By 2030, empower and promote the social, economic, and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion, economic, or other status' (SDG 10).

The minimization of inequalities is to be made realizable, among other things, through inclusive education (SDG 4) and global partnerships (SDG 17). In terms of inclusive education, this is primarily about equal access to knowledge and education, the development of safe, non-violent, inclusive learning environments, and the transfer of necessary knowledge and skills to promote sustainable development. These should ensure 'a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity' (SDG 4. Target 4.7).

The exchange of and access to knowledge remains one of the main criteria for building global partnerships (cf. SDG 17. Target 17.16) and should thus contribute to reducing inequalities and marginalization dynamics. SDG 17 therefore plays a significant role when speaking about knowledge equity, as this goal is particularly focusing on promoting through sharing knowledge and enhancing through assisting with knowledge. Especially SDG 17.6 is summarizing this idea very well, because it is highlighting 'international cooperation on and access to science, technology and innovation' (Goal 17: United Nations Regional Information Centre for Western Europe 2018) as well as 'enhance knowledge sharing on mutually agreed terms' (ibid.). Knowledge gained through science is therefore to be meant to be shared with different stakeholders, as this is part of the Agenda 2030 vision towards an open and socially inclusive world.

In summary, the question of knowledge equity opens up against the background of central guiding principles of the 2030 Agenda and thus opens up concrete areas for reflection and action on how to achieve or at least strive for knowledge equity.

### **...against the background of Open Science**

'Imagine a world where all of humanity's knowledge is freely available to everyone' (Wikimedia Germany Blog 2018). With this vision, the Wikimedia movement began working towards OS in 2001. The idea of OS encompasses different levels, which, in addition to the publication of results and research processes, also includes methods, interim results, and theories. In this way, insights into the implementation modalities are already given during the research processes, which has a positive effect on intersubjective comprehensibility and increases the potential for reflection. The provision of data, literature, or learning materials, as implemented in the classic OS movements of Open Source, Open Data, or Open Educational Resources, opens up new options for action for both researchers and teachers. Being able to fall back on what already exists and to tie in with work that someone has already produced and published generates freedom for other work that is important in the context of research and teaching.

Even if OS is providing important implications for reflections on exclusionary dynamics and therefore leading to a greater understanding of knowledge equity in a certain way, for us it is however clear that it is not sufficiently when aiming to equal livelihoods. We take the position that OS does not automatically lead to knowledge equity per se, because justice usually does not come by itself. Historically speaking in most cases it has been fought for by the marginalized. OS has so far been narrowed in the direction of access to knowledge, in which the question of knowledge equity has played a marginal role. It is rather addressed as an incidental side effect of OS, but not declared as a specific goal. We are OS advocates ourselves. We consider it as a useful basis for the equity of knowledge (access, distribution, and production). In the following, three exemplary fields of feminist research practices will illustrate how such considerations towards more knowledge equity might look like based of the OS idea.

## Feminist research practices

As outlined, this section focuses on three main exemplary areas of knowledge equity: A feminist epistemology, equal opportunities, and science communication. For an illustration of these, we introduce projects and research associated with the Open Science Fellows Program (2022). They refer to particular levels of knowledge equity and address marginalized groups in terms of research process and beyond.

### Intersectional feminist epistemology

The first and fundamental area is epistemology. It refers to knowledge in terms of claims, attributions, conditions for its possibility, the nature of truth, and justification. From an intersectional feminist perspective this means to rethink subjectivity along with an analysis of social and contextual aspects on justification (Longino 2017). This poses questions of who defines knowledge. What is considered to be knowledge? Whose knowledge is considered relevant and whose is marginalized? Whose knowledge is considered to be scientific? Who is a researcher and who is the subject? Whose data is considered relevant when claiming universality? We want to look at these questions exemplary by considering different characteristics based on which groups are marginalized, such as racification, gender, or age.

Cultural forms, such as thinking, art, science, and anthropology, once were the product and an alibi of an imperial and colonial power. Due to dominant structures, they became one and the same with thinking, art, science, and anthropology in general. Largely they are still understood as culture itself. In consequence, for example a *white* gaze claims universality for something that is not universal (Grant and Price 2020; note: *white* is italicized to emphasize that it is a social construct and part of a racist ideology). Due to these colonial continuities, patriarchal structures, classism, and ableism science is historically dominated by Eurocentrism and a dominance society.

Precisely speaking, its gaze on the world is predominantly *white*, endo cis male, hetero, able-bodied, middle class, and Christian socialized. One exemplary consequence of this is that the world is widely perceived as a *white* construct, in which *white* experience is generalized to humankind. Empirical studies on visual perception, justice, value systems, logic, or intelligence collect data of *white* people living in *white* countries with *white* conditions (Sequeira Fernandes 2015). Another example are binary gender norms and heteronormativity which both are deeply linked to patriarchy, colonial continuities, and a *white* Christian concept. As a result of these biased standards, people with different experiences often are found to be deficient (Sequeira Fernandes 2015). The same counts for other groups that are marginalized based on heterosexism, classism, ableism, adultism, and other forms of discrimination. The standards represented in the majority of social science make up only a few percent of the world's population. This is not only unjust. It is a severe lack of diverse and universal perspectives and therefore a contradiction to the claim of generality of science. Going further, a biased epistemology results in biased hypotheses,

rationales, study designs, data, and results. Consequently, our science to date is fundamentally biased and exclusive.

In contrast, an intersectional feminist epistemology can result in more inclusive research processes, data, and results. One example for more diversity and representativity of data collection are inclusive gender measures beyond the binary, as Samoilova (2019) and colleagues present in their work by using a queerfeminist and inclusive approach for gender identification in film research. Also, a growing number of researchers reflect critically on hierarchies in research processes. As an example, there are approaches that refer to adultism and provide sensibility towards children's rights and generational hierarchies in research methods. According to them, childhood research should be conducted with or by children in order to make their perspectives heard in accordance with power-critical research. In such, children can be participants who express opinions or can be researchers who collect data, co-create, and co-research themselves (Richter Nunes and Schäfer 2021, Schäfer 2021, Schulze et al. 2020). Another example for a participatory data analysis is collaborative online interpretation. As described by Steinhardt (Steinhardt 2018b, Steinhardt 2018a, Steinhardt 2020), interviews are qualitatively and collaboratively interpreted by using a digital tool. This allows for more transparency and includes interviewees in the research process by incorporating their interpretation of their data. Practices like this reflect critically on the relationship between researcher and subject with its potential hierarchies and an alleged sovereignty of interpretation. Moreover, research should include marginalized knowledge that is not yet considered to be scientific, e.g., grey data. An example project to gather such data is *Queer narratives, mapped* (From gay to queer 2022). It is dealing with questions of memories and the retelling of queer traces in the urban context. In the current project *Intersections & Constellations* (Intersections + Constellations 2022) traces of queer places and events, memories of political struggles, the development of subcultural forms of expression, and various approaches to queer self-organization are collected. From these sources, a digital map and a publication is created in a collaborative and open process. The mappings are an attempt to make spatial, temporal, and contextual references visible.

## Equal opportunities

Our second exemplary area refers to patriarchal structures and equal opportunities in academia. Starting early with inclusive education we address the question of who has access to education and higher education? Who is privileged enough to become a researcher? Who gets tenure positions and hereby shapes scientific practices and paradigms? Marginalized groups are under-represented in academia relative to their proportion in the general population, which is critical regarding the openness and universality of science. This fact is often referred to as *leaky pipeline*, where individuals either progress through the series of academic stages or leave academia altogether (Shaw and Stanton 2012).

As an example for more transparency regarding editors as 'gatekeepers of knowledge' (McGinty 1999) *Open Editors* (Nishikawa-Pacher 2022) collects data about academic

journal editors. Using a webscraping procedure the resulting dataset allows research evaluation and meta-scientific investigations on the landscape of scholarly publications in social sciences. Hereby it allows for critical inquiries regarding the representation of diversity and inclusivity across academia (Nishikawa-Pacher et al. 2022).

Although knowledge and academic staff urgently needs to be diversified, we share a critical view on a performative concept of diversity that is currently being appropriated by capitalist and neoliberal structures within and beyond academia. Achieving diversity does not necessarily create inclusivity since representation does not automatically lead to structural equality. Parallels can be drawn to OS, which does not automatically create knowledge equity. The mere addition of researchers from marginalized groups does not mean that science becomes equal. One counter-example are *white* middle class able-bodied cis women in leadership positions, who reinforce existing power dynamics. We and many other feminist scientists believe that to achieve actual equality, the whole system needs a sustainable change in its structures. Equal opportunities need to tackle classism, racism, sexism, ableism, and other forms of discrimination from the very start in terms of inclusive education. This change must start far before higher education with equal opportunities from early childhood on.

Research on inclusive education in the context of the North-South divide provides us with critical considerations regarding this. 'From West to the Rest' (Grech 2011) – this is how we describe the negotiation of inclusive education in North-South relations under a postcolonial perspective. According to Haskell S. H. (1998), inclusive education can be seen as a form of 'western' cultural imperialism. Looking behind the façade of the global inclusive education movement (Artiles and Dyson 2005), it becomes clear that, firstly, while inclusive education enjoys a certain international popularity, the concept produces an asymmetry in the negotiation of North-South relations, which, secondly, again raises the question of knowledge inequity. The concept of inclusive education has emerged from reforms and experiences made in the global North (Werning et al. 2016). There is no universal understanding because conceptions on disability (Singal 2013) or inclusion (Booth 1995) vary from context to context. Nevertheless, on a global scale often a 'western' understanding of inclusion and inclusive education dominates the international discourse and finds communicative, structural, and systematic integration in contexts with quite different experiences. What these aspects have in common is an asymmetrical relationship in research. Both, its basis – the inclusion and disability concept behind it – and the negotiation – theoretical and practical are problematic.

Inclusive education is a concept that – under a normative perspective – should ask the questions of who is left behind, why they are left behind, and how to minimize marginalization. It contains a problematic potential, when it is being analyzed in North-South relations. The North-South negotiation of the concept resonates with an exclusive character, since understandings of disability and inclusion other than one's own are not perceived as such. In this way, both theoretically and practically, a vicious circle is manifested that unilaterally produces and affirms interpretive and scientific sovereignty. So when it comes to research on inclusive education in the context of the North-South divide we have to underline that equal opportunities represent no more than an illusion. Research

on inclusive education does not mean that the research itself is inclusive. Rather, exclusive moments can be identified at different points in the research process that need to be addressed in order to achieve equal opportunities (see also Steinhardt and Kruschick (2022)).

## Science communication

The third exemplary area we discuss is concerned with the addressees of scientific knowledge. Who is addressed by science? Who understands the scientific method? Who can benefit from scientific knowledge? Communicating scientific knowledge and methods to a broader audience aims to enable informed decision making and participation of citizens in society and political discourse (Humm and Schrögel 2020;Humm et al. (2020)).

For example, the *Pop-up Institute* (Pop-up Institute 2022) communicates science by means of Creative Arts Therapies with the aim to reduce sanism – the discrimination of and societal stigma towards people who experience mental illnesses. Herein artists, creative arts therapists, and experts in experiencing schizophrenia collaboratively developed the art festival *Mental – a festival about schizophrenia* that addressed young people. The format participatively provided inherent knowledge by marginalized groups that goes beyond external textbook descriptions of symptomatics. It aimed to inform the youth, reduce othering processes, foster empathy, and work towards more sensitivity to discrimination.

However, although science communication is increasingly becoming a standard in the last few years, it does not automatically reach all people at the same level. Humm et al. (2020) identify two categories that contribute to audiences feeling left out. One are aspects of material exclusion (e.g., infrastructure, finances, and language). The other are emotional aspects of 'fear, habitual distance, and self- as well as outside-perception'. According to these findings science communication should not only focus on practical aspects but also on addressing emotions of marginalized groups feeling left out. Feeling left out directly refers to aspects of knowledge equity. In the other hand, providing access to knowledge for groups that up to now have been remote from science fosters knowledge equity and a fairer society.

Science communicators need to be aware and develop strategies of how to reach marginalized groups in particular that are often left out. *Science for All* (Humm and Schrögel 2020, Humm et al. 2020, Schrögel et al. 2020) systematically investigates which population groups have so far not or hardly been reached by science communication, why they are not reached, and how this can be changed. A scientific literature review identifies intersecting exclusion factors in three layers: individual factors, social factors, and structural conditions. Furthermore, the project engages three exemplary societal groups. With each, a communication format is developed and implemented in a participatory process: Residents in socially disadvantaged neighborhoods by a research rally for young and old, vocational school students by a pub quiz *Science meets Crafts*, and Muslim youth with a migration history by a *Science & Poetry Slam*.

## Towards an equitable Open Science

We agree with Ackerly and True (2008) who lay out the overarching feminist perspective as 'a commitment to inquiry about how we inquire'. According to them, this refers to the following aspects. First, the power of knowledge, second, epistemology, third, boundaries, marginalization, and silences, fourth, relationships and their power differentials, and fifth, our own situatedness as researchers. Researchers such as Bennett (2021) express justified concern that feminist and qualitative methods of research (e.g., voice-centered methods, participatory action projects, and arts-based inquiry) are at risk of being undermined in the OS movement and the values it prioritizes, e.g., a focus on quantitative methods and reproducibility of data. Indeed, currently the OS movement predominantly consists of quantitative research. Taking the Open Science Fellows Program (2022) as an example, only few fellows and mentors originate from the arts and humanities. Furthermore, Pownall et al. (2021) refer to unique barriers that especially feminist early career researchers have to face in OS, e.g., academic precarity or being confronted with a *white* cis male able-bodied middle-class dominated community that prefers perspectives that acknowledge the status quo over power-critical perspectives. It is an unwritten law that system-changing views are often perceived as uncomfortable by those who currently hold the power.

When it comes to recommendations on how to do Open Science more inclusive there is not one answer that fits all. Since fields of research, infrastructure, and marginalization experiences differ widely between researchers and institutions, approaches towards knowledge equity need to be differentiated and specific. Institutions as well as researchers must make an effort to educate themselves, reflect on knowledge equity in their area of responsibility, and actively work towards a more equitable academia and science. Furthermore, the question of equity in the context of knowledge is not a finite one. The question is rather to be posed continuously anew, since marginalization dynamics are also changing over time. We therefore need to continuously ask the following:

Who is included and who is left behind? Who is benefiting and who is not? Whose voices are being heard and whose are silenced? Who dominates theoretical discourses? Which epistemologies and hierarchisation construction is knowledge based on? And the overall question: Why?

However, we belong to a growing number of early career feminist researchers who claim the OS movement in social sciences. We believe that the movement and its community provide a certain level of openness, ideology, and impact for changes in academia and science. We consider it as potentially fertile soil for a further implementation of intersectional feminism and knowledge equity. In summary, we believe that research and researchers must commit to self-reflection on their privileges and fill the blank spaces when it comes to epistemology, equal opportunities, and communicating science. We call for an active allocation of resources and space for marginalized colleagues, voices, and knowledge. Feminism and Open Science are a powerful collaboration Pownall et al. (2021)

, when it comes to challenging the predominant *white*, endo cis male, hetero, able-bodied, middle class, and Christian socialized gaze and challenging the predominant norms for more knowledge equity.

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## Conflicts of interest

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