Open Science: Knowledge for the people, by the people, and with the people

Tanvir C Turin ✉ iD | Mohammad M H Raihan | Nashit A Chowdhury iD |

Department of Family Medicine, Cumming School of Medicine, University of Calgary, Calgary, Alberta, Canada

Shifting from siloed research to engaged research

Historically, research has been conducted in silos, with academics positioned as the primary proprietors of knowledge creation. Academics in universities and research institutions often operated in isolation. Under this practice, the dissemination of research findings primarily targeted knowledge-users such as policymakers and service providers. The academics (researchers and scholars/educators), service providers/practitioners (those who implement research findings in practice), and policymakers (who use research to inform decisions) constituted the traditional scientific community [1]. While this practice aimed to influence policy decisions and improve service delivery, it largely excluded the communities at the heart of the research. Such exclusion diminished the relevance and accessibility of findings for those most affected. Recognizing the limitations of siloed research, cross-sectoral collaboration gained prominence. This practice emphasizes partnerships between researchers, policymakers, and practitioners, aiming to bridge the gap between knowledge generation and practical implementation [1].

Over recent decades, community-engaged research has emerged as a paradigm prioritizing equity and inclusivity. Approaches like community-based participatory research or participatory action research focus on co-creation and shared decision-making, actively involving community members as collaborators rather than passive subjects [2]. This shift toward inclusive research [3] reflects a growing recognition of the value of lived experience and community expertise in shaping research questions and interventions. The conceptualization of communities as rights holders of the research conducted in the community represents a progressive shift. This perspective aligns with global movements to decolonize research, challenging traditional power dynamics and advocating for community ownership of data and research outcomes. Decolonizing research emphasizes dismantling extractive practices while promoting equitable and empowered partnerships, [4] fostering a more democratization of research ecosystem [5]. This evolution in research practices aligns with global frameworks such as the Sustainable Development Goals, which emphasize participatory decision-making (goal 16) and equitable access to resources [6]. UNESCO's Free and Open Science initiative [7]. further supports this shift by advocating for open access to research findings and inclusion of underrepresented groups in knowledge creation.

Open Science

Open Science is a movement aimed at making scientific research and its dissemination accessible to all levels of society [7]. The principles and practices of Open Science strive towards not only making scientific knowledge available for everyone but also that its creation is equitable, inclusive, and sustainable. It emphasises making the scientific process more transparent and democratic.

Open Science values

Based on the UNESCO recommendation on Open Science, [7] the core values of Open Science are given in Figure 1:

Key messages

Open Science treats scientific knowledge as a global public resource, ensuring equitable access for all, regardless of socioeconomic status. It promotes cross-boundary collaboration and includes marginalized communities, enhancing the relevance of research in addressing societal challenges. Open Science also shifts research from competition to collaboration, prioritizing transparency and democratizing knowledge sharing to build trust and drive innovation.
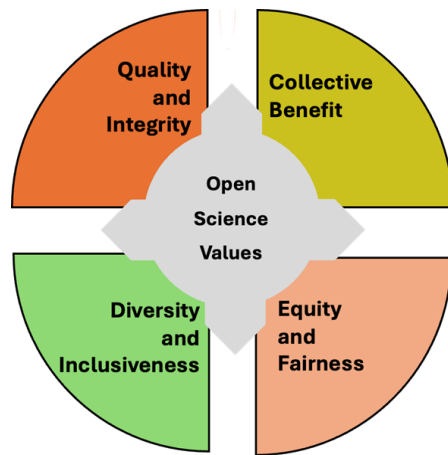
Figure 1 Open Science values

Quality and integrity

Open Science should ensure high-quality research that respects academic freedom and human rights. It emphasizes transparency in the evaluation processes and supports rigorous scrutiny of research methods and outputs by integrating multiple sources of knowledge.

Collective benefit

Recognizing science as a global public good, Open Science aims to benefit humanity as a whole. This value promotes the idea that scientific knowledge should be openly available and its benefits universally shared, ensuring that scientific practices are inclusive, sustainable, and equitable.

Equity and fairness

Open Science seeks to provide equitable access to scientific knowledge for all individuals, regardless of their location, nationality, race, age, gender, income, socio-economic status, career stage, discipline, language, religion, disability, ethnicity, or migratory status. This value emphasizes fair and reciprocal sharing of scientific inputs and outputs.

Diversity and inclusiveness

Open Science embraces a diversity of knowledge systems, practices, workflows, languages, research outputs, and topics. It champions the inclusion of various research communities and engages the wider public and knowledge holders beyond the traditional scientific community, including indigenous peoples and local communities.

Open Science principles

The UNESCO Recommendation on Open Science outlines several key principles that guide the implementation and practice of Open Science [7]. These principles, shown in Figure 2, aim to promote transparency, inclusivity, and collaboration in scientific research.

Transparency, scrutiny, critique, and reproducibility

This principle emphasizes the importance of open processes in scientific research to reinforce the rigor of scientific results. It encourages scrutiny and critique to enhance the positive impact of science on society and improve the ability to solve complex problems.

Equality of opportunities

Open Science aims to ensure that all individuals interested in science have equal access to participate in and benefit from scientific endeavors, regardless of their background or circumstances.

Responsibility, respect, and accountability

Researchers are encouraged to be aware of their public accountability and potential conflicts of interest. This principle highlights the importance of intellectual integrity and understanding the social or ecological consequences of research activities.

Collaboration, participation, and inclusion

This principle promotes scientific collaborations that transcend geographical, linguistic, and resource boundaries. It emphasizes the inclusion of knowledge from marginalized communities to address significant social issues.

Flexibility

Recognizing that there is no one-size-fits-all approach to Open Science, this principle encourages diverse methods and pathways for practicing Open Science while upholding its core values.

Sustainability

Open Science should be efficient and impactful by building on long-term practices, services, infrastructures, and funding models that ensure participation from scientists in less-privileged contexts.

Open Science pillars

According to UNESCO's recommendation on Open Science, [7] the four pillars of Open Science are essential for understanding how this movement seeks to enhance the quality and impact of research while addressing societal needs. The four pillars are given in Figure 3:
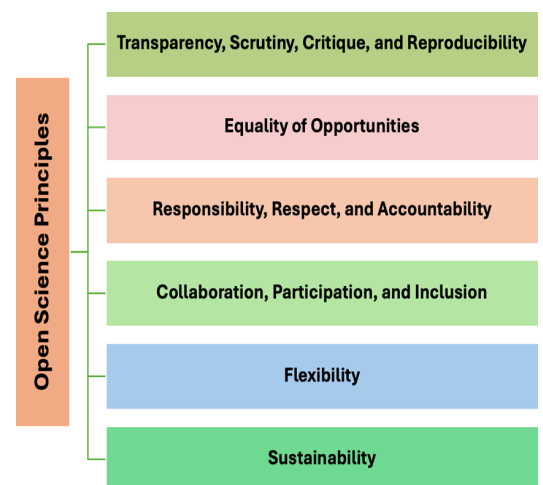

Figure 2 Open Science principles

Open scientific knowledge

This pillar includes the sharing of scientific publications, open research data, open educational resources, open-source software and source code, and open hardware. It emphasizes the importance of making scientific knowledge freely accessible to enhance collaboration and innovation.
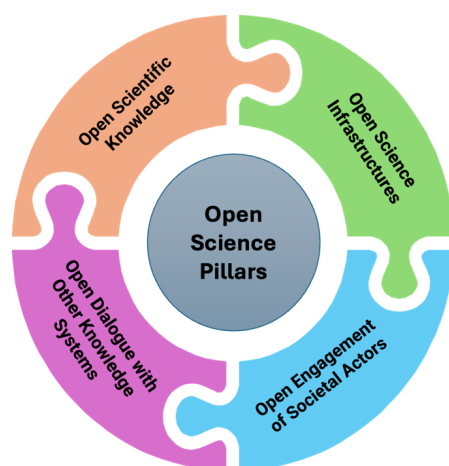
Figure 3 Open Science pillars

Open Science infrastructures

This refers to both virtual and physical infrastructures that support Open Science practices. These infrastructures facilitate access to research outputs, data repositories, and collaborative platforms that enable researchers to share their work effectively.

Open engagement of societal actors

This pillar highlights the importance of involving various societal stakeholders in the research process. It includes practices such as crowdfunding, crowdsourcing, scientific volunteering, citizen science, and participatory research, which enhance public engagement and ensure that research addresses societal needs.

Open dialogue with other knowledge systems

This pillar promotes the inclusion of diverse knowledge systems in scientific discourse. It encourages dialogue with local communities, marginalized community scholars, and vulnerable groups to enrich scientific understanding and ensure that multiple perspectives are considered in research.

Conclusion

Open Science is not merely a method; it represents a philosophical approach to conducting research that prioritizes transparency, collaboration, and inclusivity. We need to keep in mind that there is a difference between Open Science and Creative Common initiative [8.] Both these initiatives aim at promoting accessibility and collaboration, but they focus on different aspects of knowledge sharing. The aim of Creative Common initiative is to facilitate the distribution of content while protecting the rights of creators. On the other hand, the primary goal of Open Science is to enhance the rigor, accountability, and reproducibility of research while fostering inclusion and equity in scientific endeavors. For many researchers, however, the very commitment to Open Science reflects a paradigm shift concerning how they do their research activities. There is a culture where knowledge is freely shared, competition is replaced by collaboration, the public is engaged, and quality in the science is improved. Not only are the individual researchers affected, but the commitment also enriches the broader scientific community and society by encouraging openness, inclusiveness, and collective progress in acquiring knowledge.

Author contributions

Conception or design of the work; or the acquisition, analysis, or interpretation of data for the work: TCT. *Drafting the work or reviewing it critically for important intellectual content:* TCT, MMHR, NC. *Final approval of the version to be published:* TCT, MMHR, NC. *Accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved:* TCT, MMHR, NC.

Conflict of interest

We do not have any conflict of interest.

Data availability statement

Not applicable

Supplementary file

None

References

1. Turin TC, Chowdhury N, Haque S, Rumana N, Rahman N, Lasker MAA. Involving im/migrant community members for knowledge co-creation: the greater the desired involvement, the greater the need for capacity building. BMJ Glob Health. 2021 Dec;6(12):e007602. DOI: https://doi.org/10.1136/bmjgh-2021-007602
2. Jull J, Giles A, Graham ID. Community-based participaory research and integrated knowledge translation: advancing the co-creation of knowledge. Implement Sci. 2017 Dec 19;12(1):150. DOI: https://doi.org/10.1186/s13012-017-0696-3
3. Nind M. The practical wisdom of inclusive research. Qualitative research 2017;17:278–288. DOI: https://doi.org/10.1177/1468794117708123
4. Igwe PA, Madichie NO, Rugara DG. Decolonising research approaches towards non-extractive research. Qual Mark Res 2022;25(4):453-468. DOI: https://doi.org/10.1108/QMR-11-2021-0135
5. Kurtulmuş F. The democratization of science. In: Ludwig D, Koskinen I, Mncube Z, Poliseli L, Reyes-Galindo L, editors. Global Epistemologies and Philosophies of Science. 1st ed. London: Routledge; 2021. p. 145-154. DOI: https://doi.org/10.4324/9781003027140
6. United Nations (UN). Transforming our world: the 2030 Agenda for Sustainable Development | Department of Economic and Social Affairs. United Nation's Department of Economic and Social Affairs, Sustainable Development. Accessed on 29 November 2024. Available at: https://sdgs.un.org/2030agenda
7. United Nations Educational, Scientific and Cultural Organization (UNESCO). UNESCO Recommendation on Open Science. United Nations Educational, Scientific and Cultural Organization 2022; 1-36. Accessed on 29 November 2024. Available at https://unesdoc.unesco.org/ark:/48223/pf0000383771
8. Creative Commons (CC). Better sharing, brighter future. Creative Commons. Accessed on 8 January 2025. Available at: https://creativecommons.org/