



## Open Science Sprouts: Transforming Research for Global Progress and Collaboration

“

Open science serves as a catalyst, helping to establish the foundations of a healthy scientific environment. Much like nutrient-rich soil sustains a diverse and thriving forest, open science provides the essential elements for scientific progress to flourish. In nature, diverse species interact, sharing resources, knowledge, and support. Just as the well-being of an ecosystem relies on this harmonious exchange of resources and information, scientific advancements succeed when the research findings are freely shared, leading to a more robust and collaborative scientific community.

”

Open science is a collaborative and transparent approach to scientific research that promotes accessibility, reproducibility, and openness. This article provides an in-depth exploration of open science, highlighting its significance, advantages, dimensions, challenges, existing regulations, and opportunities for developing countries like Sri Lanka. It also takes a closer look at the latest efforts and initiatives happening at the University of Moratuwa in its dedicated pursuit of open science.

### Open Science and its key contributions

Open Science is a movement aimed at making different aspects and products of the scientific research lifecycle openly available to the global community [1]. It offers several advantages to the scientific community. It enhances reproducibility by enabling the replication and verification of research findings, reinforcing the reliability of scientific outcomes. By encouraging data sharing and reuse, open science maximizes the utility and impact of collected information. It also facilitates innovation by providing researchers with access to diverse datasets and methodologies, fostering creativity and the generation of new ideas. Open science also provides universal access to scientific knowledge, regardless of geographical or financial constraints. It fosters the exchange of ideas and knowledge across different scientific disciplines, promoting interdisciplinary collaborations. Further, openly accessible publications in open science tend to receive higher citation rates, improving the visibility and impact of research. Not only that, but open science also encourages the involvement of citizen scientists and the public in research projects, fostering greater public engagement and understanding of science [2].

### Dimensions of Open Science

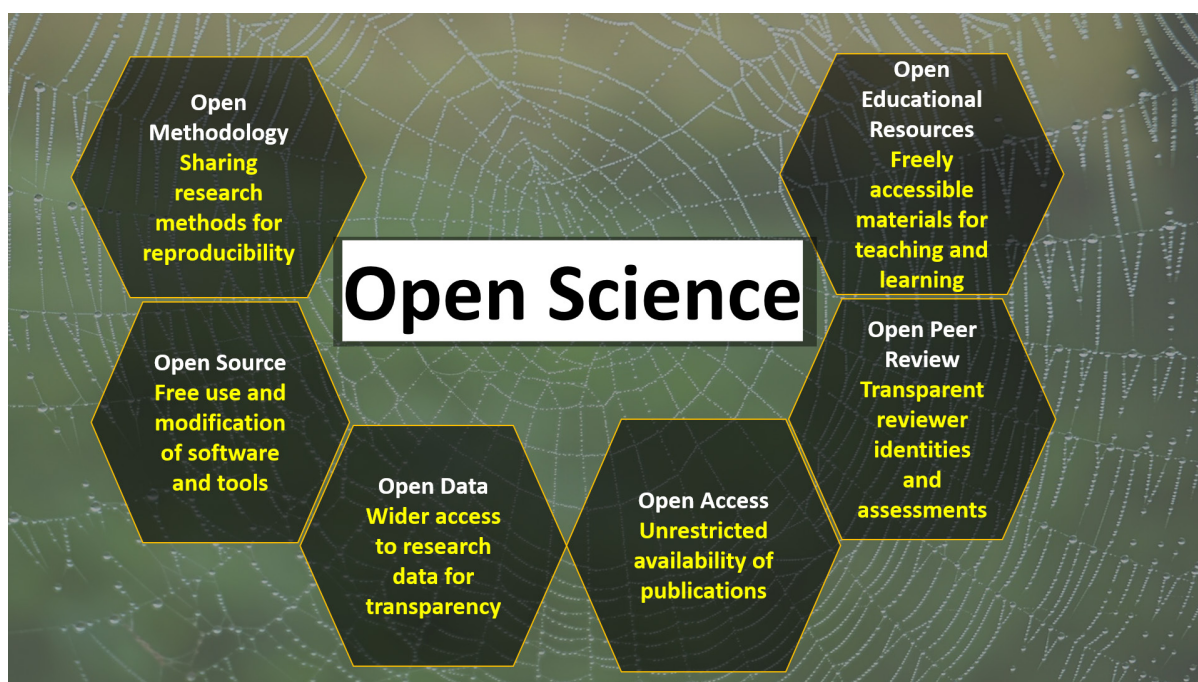


Figure 1: The six core principles of Open Science [3]

The principles of open science, as outlined by Gallagher et al. (2020), include open methodology, open source, open data, open access, open peer review, and open educational resources (Figure 1). Open methodology encourages the sharing of research methods, fostering reproducibility. Open source promotes the free use and modification of software and tools. Open data enables wider access to research data, promoting transparency and collaboration. Open access ensures the unrestricted availability of scholarly publications, democratizing knowledge. Open peer review enhances transparency by disclosing reviewers' identities and

assessments. Open educational resources provide freely accessible materials for teaching and learning. These dimensions collectively aim to foster collaboration, transparency, and accessibility, advancing scientific knowledge and societal progress.

### Challenges of Open Science

Open science faces various challenges. To ensure its success, proper data management practices must be implemented to address concerns related to privacy, confidentiality, and intellectual property. Further, developing mechanisms for funding and sustainability is essential to support the costs associated with data storage, infrastructure, and publication. Establishing standards and frameworks for quality assurance is also vital to assessing the reliability and integrity of open scientific outputs. Balancing the need for openness with the protection of intellectual property rights and commercial interests is also a complex challenge that needs further attention. Further, overcoming traditional norms and resistance within the scientific community towards openness and sharing is also important for the successful implementation of open scientific initiatives.

### Rules and Regulations

Various national and international organizations, including research funding agencies and scholarly publishers, have implemented policies and guidelines to promote open science practices and enhance the dissemination and accessibility of scientific research. These regulations provide a framework for various aspects of open science. Some funding agencies now require researchers to make their research outputs openly accessible, including research articles, data, and other outputs, as a condition for receiving grants. Many funding agencies and institutions have also established data sharing policies, mandating researchers to make their research data available for reuse, verification, and further analysis. In this aspect, the FAIR principles (Findable, Accessible, Interoperable, and Reusable) guide researchers in making research data more open and usable [2]. Scholarly publishers are increasingly embracing open access publishing models, making research articles freely available to the public. Open science also promotes the use of open licenses, such as Creative Commons licenses, to achieve a compromise between protecting intellectual property rights while allowing others to access, reuse, and build on scientific material. Researchers and institutions can contribute to the open science movement by adhering to these laws and regulations, which promote the accessibility and transparency of scientific research.

### Opportunities for Developing Countries like Sri Lanka

Open science provides developing countries like Sri Lanka with unique opportunities to overcome barriers and enhance their scientific capabilities. It can help bridge the knowledge gap by granting free access to the global scientific knowledge pool, reducing research disparities between developed and developing nations. It will also allow Sri Lankan researchers to learn from and collaborate with international peers, staying updated with the latest advancements in their fields. Moreover, open data and open access publishing can allow Sri Lanka to utilize research outputs for developing solutions, attracting investment, and stimulating economic progress. Open collaboration and access to scientific knowledge further support evidence-based decision-making and the development of locally relevant solutions. Embracing open science practices can also promote the global visibility of local researchers, enabling them to showcase their work worldwide and fostering recognition and collaboration opportunities with international peers.

Our commitment to open science at the University of Moratuwa is making waves through a ground-breaking project called RETINA (Revolutionizing Monitoring Systems and Techniques in the Information Age). This research initiative is funded by the Organization for Women in Science for the Developing World (OWSD), a program unit of the United Nations Educational, Scientific, and Cultural Organization (UNESCO). Through RETINA, we have undertaken a range of initiatives with one core goal in mind: to advance transparency,

collaboration, and accessibility in research. Our commitment to open science is evident in our open seminars and workshops, where researchers and students both locally and intentionally come together to explore open-source software tools and foster hands-on learning and collaboration. Moreover, we actively develop open-source software tools based on the methodologies and analytical frameworks we have refined through our research endeavors. These steps not only ensure the reproducibility of our research work but also enhance the credibility of our research results. Further, we also maintain a diverse range of open educational resources that cover various aspects of scientific research. By embracing these open science practices, we not only improve the visibility of our research community but also foster national and international collaboration that might not have been possible otherwise.

### References

- [1] E. D. Foster and A. Deardorff, "Open science framework (OSF)," *Journal of the Medical Library Association: JMLA*, vol. 105, no. 2, p. 203, 2017.
- [2] R. V. Gallagher et al., "Open Science principles for accelerating trait-based science across the Tree of Life," *Nature Ecology & Evolution*, vol. 4, no. 3, pp. 294-303, 2020. *Nature Ecology & Evolution*, vol. 4, no. 3, pp. 294-303, 2020.
- [3] E. C. McKiernan et al., "How open science helps researchers succeed," *eLife*, vol. 5, p. e16800, 2016. *eLife*, vol. 5, p. e16800, 2016.
- [4] M. D. Wilkinson et al., "The FAIR Guiding Principles for scientific data management and stewardship," *Scientific Data*, vol. 3, no. 1, pp. 1-9, 2016. *Scientific Data*, vol. 3, no. 1, pp. 1-9, 2016.

### Article by

Priyanga Talagala

Department of Computational Mathematics, Faculty of Information Technology, University of Moratuwa, Sri Lanka