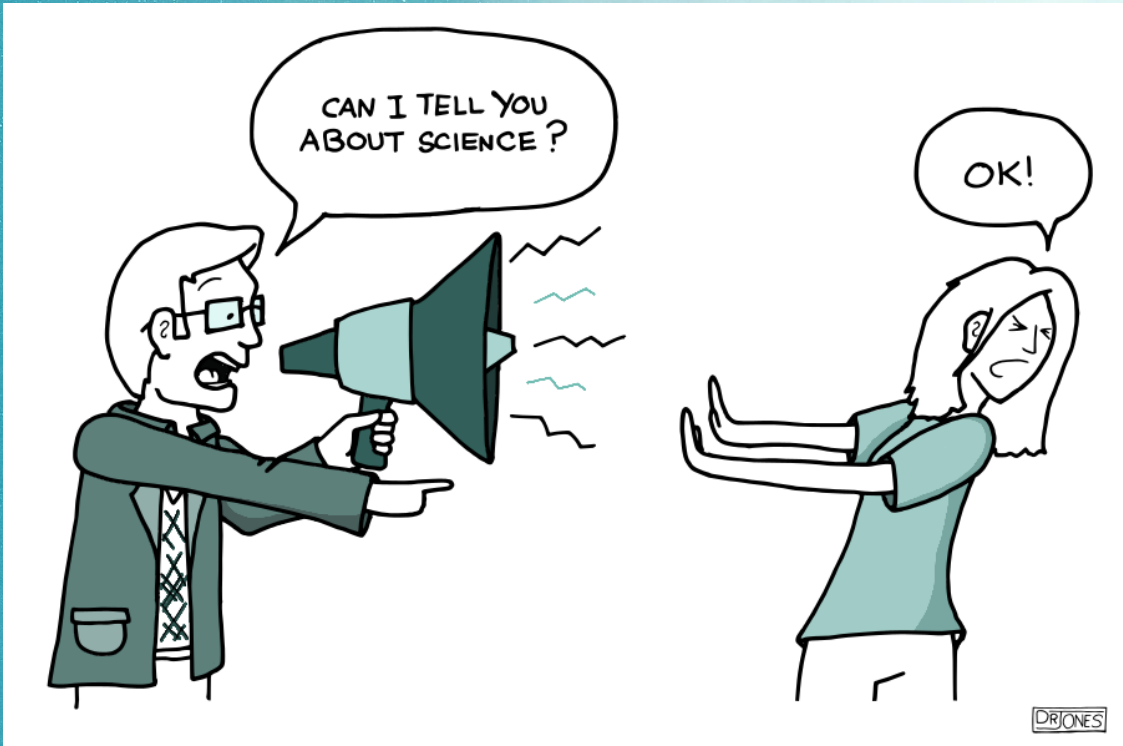
Science Communication

A wide range of activities that connect science and society



Samo Stanič, UNG

Importance of Science Communication

Bridging the Gap Between Science and Society

Makes complex scientific concepts understandable and relatable for the general public.

Enhances public trust in scientific research and its implications for everyday life.

Informed Decision-Making

Equips policymakers and stakeholders with clear, evidence-based information for making sound decisions.

Helps communities understand issues like public health, climate change, and technological advancements, enabling informed choices.

Promoting Public Engagement

Sparks curiosity and encourages active participation in scientific discussions.

Involves citizen science initiatives, allowing non-experts to contribute to research and innovation.

Fighting Misinformation

Provides accurate, well-explained content to counteract false or misleading information.

Empowers audiences to discern credible sources and understand scientific consensus.

Galileo explaining science to the Doge of Venice, by Giuseppe Bertini, Public Domain, 1858.

Importance of Science Communication

Fostering a Culture of Learning

Encourages lifelong learning and interest in STEM (science, technology, engineering, and mathematics) fields.

Inspires the next generation of scientists by showing the relevance and excitement of scientific discovery.

Highlighting the Relevance of Research

Demonstrates the practical impact of research on real-world challenges and solutions.

Justifies public funding for scientific projects by showcasing their value to society.

Enhancing Research Visibility

Amplifies the reach of research findings, allowing broader dissemination and increased collaboration.

Strengthens connections between researchers across different fields and geographical regions.

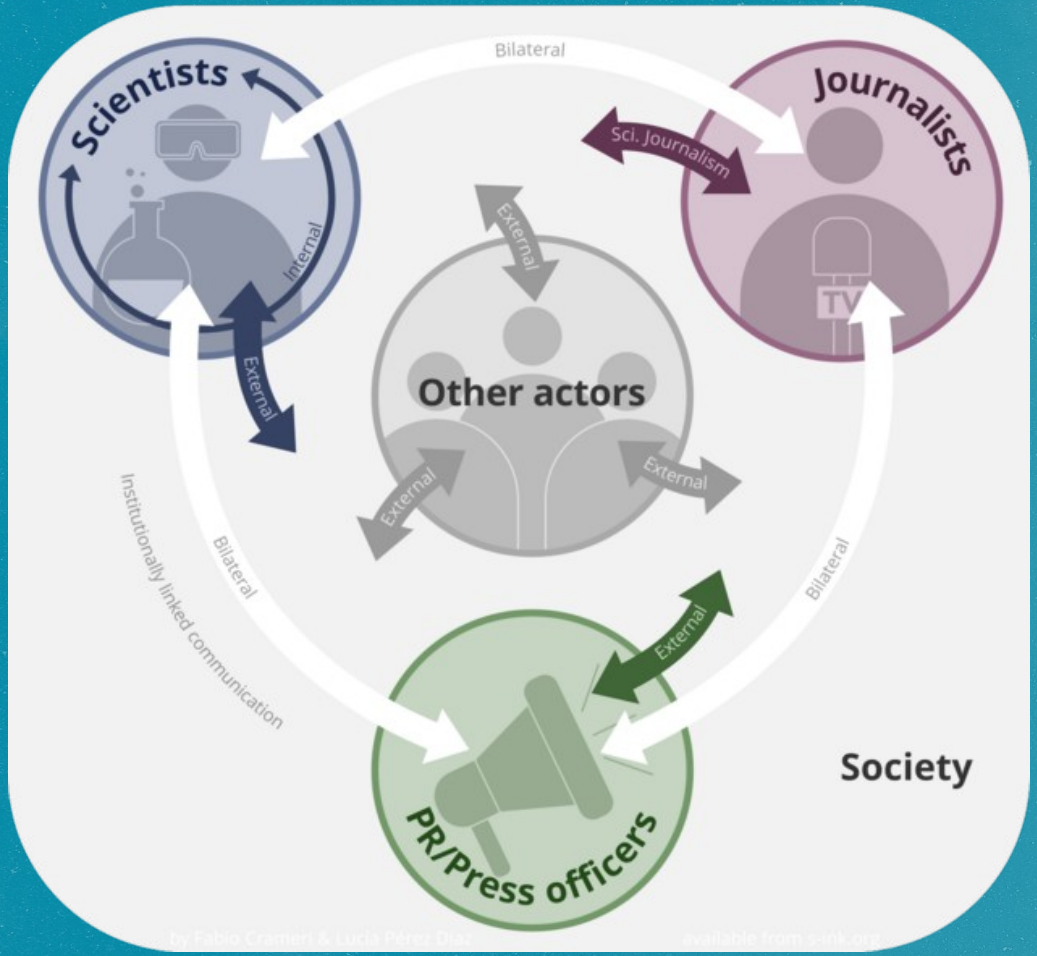
Improving Research Practices

Engaging with diverse audiences can provide new perspectives, feedback, and ideas that refine research approaches.

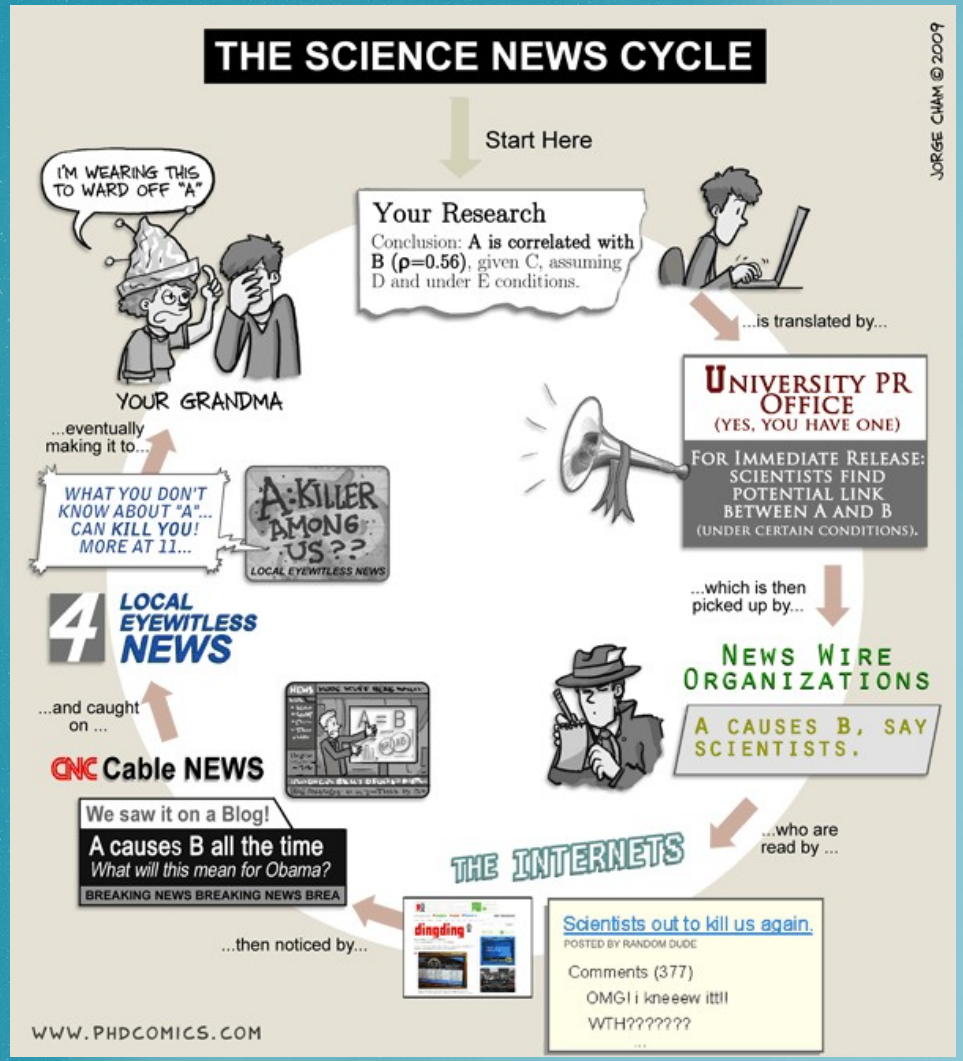
Facilitates interdisciplinary approaches by linking different areas of expertise through shared understanding.

Galileo explaining science to the Doge of Venice, by Giuseppe Bertini, Public Domain, 1858.

Science communication



This should not happen ⇒



It is up to **you** to learn how to communicate

With media	Between scientists
1. Purpose and Goals	
Aims to inform, educate, and engage the public by translating complex scientific concepts into accessible language. The goal is to raise awareness, spark interest, and foster public understanding and trust in science.	Focuses on disseminating detailed, technical findings to advance knowledge within the scientific community. The objective is to present original research, support validation, and contribute to ongoing scholarly discussions.
2. Language and Style	
Non-technical language, relatable examples, and storytelling techniques to make science engaging and understandable. It often emphasizes the broader implications and societal relevance of research.	Specialized terminology and follows a formal structure (abstract, introduction, methodology, results, discussion). Clarity and precision are prioritized to ensure scientific accuracy and reproducibility.
3. Format and Structure	
Articles, videos, podcasts, and infographics are common formats, focusing on concise and compelling narratives. The content may include interviews, visuals, and simplified explanations.	Typically follows a standardized format that includes detailed data, citations, and references. Peer review ensures rigor and credibility before publication.
4. Audience Engagement	
Seeks to create content that resonates with a broad audience, often prompting questions and discussions to foster interest and curiosity.	Primarily targets specialists in the field who seek detailed, nuanced information to inform their own research and understand new developments.
5. Role in the Scientific Ecosystem	
Plays a crucial role in science outreach, helping bridge the gap between researchers and the public, and promoting science literacy.	Serves as a cornerstone for scholarly communication, ensuring that research is shared in a validated, systematic manner that supports future scientific advancements.

Communication in Science – UNG Graduate Course

1. Technical Writing Skills

Clarity and Precision: The ability to write clearly and concisely, ensuring complex ideas are presented without ambiguity.
Structure and Organization: Familiarity with the standard format of scientific papers (abstract, introduction, methods, results, discussion, conclusion) to convey information logicall
Use of Appropriate Terminology: Mastery of domain-specific language that communicates ideas effectively within the field without unnecessary simplification.

2. Data Presentation Skills

Graphical Representation: Proficiency in creating and interpreting charts, graphs, and tables that clearly convey data.
Statistical Literacy: Understanding how to present statistical results accurately, with the ability to explain their significance and limitations.
Visual Communication: Using visual aids like diagrams and figures to enhance the comprehension of complex information.

3. Critical Thinking

Analysis and Interpretation: The ability to critically assess your results, understand their implications, and discuss their relevance within the context of existing literature.
Addressing Limitations: Transparently acknowledging the limitations of your study and suggesting areas for future research.

4. Presentation Skills

Oral Communication: Ability to present research findings at conferences or seminars, engaging the audience with a well-organized and confident delivery.
Adaptability: Being able to adjust the depth of information and style of presentation depending on the audience's level of expertise.

Communication in Science – UNG Graduate Course

5. Effective Use of References

Citing and Integrating Literature: The skill to cite relevant research accurately and incorporate it into your work to show the context and build a strong argument.
Avoiding Plagiarism: Ensuring originality and giving proper credit to prior work.

6. Collaboration and Networking

Peer Review Engagement: Ability to effectively communicate during the peer review process, responding constructively to feedback and suggesting improvements.
Scientific Discussions: Participating in academic conversations and discussions to exchange insights and build on shared knowledge.

7. Attention to Detail

Accuracy in Reporting: Ensuring all data, methodologies, and results are reported accurately, with a thorough check for errors or inconsistencies.
Consistency: Maintaining uniformity in terms, measurements, and descriptions throughout your work.

8. Critical Self-Review

Self-Editing: The ability to revise and refine your own writing to improve flow, coherence, and impact.
Peer Feedback Integration: Incorporating constructive feedback from colleagues to enhance the quality of your communication.

9. Understanding Journal Requirements

Compliance with Guidelines: Familiarity with the specific submission requirements, style guides, and ethical standards of different scientific journals.
Tailoring Content: Adapting the focus and scope of your paper to match the aims and readership of the targeted journal.

10. Ethical Communication

Transparency: Being clear about the methodology, funding, and potential conflicts of interest.
Objectivity: Maintaining neutrality and avoiding biased interpretations of your results.

Open Science

SLOVENSKA SKUPNOST ODPRTE ZNANOSTI

A movement to make **scientific research** (including publications, data, physical samples, and software) and its dissemination accessible **to all levels of society**, amateur or professional.

Goals of Open Science

1. Democratize knowledge
2. Accelerate discoveries
3. Ensure reproducibility and integrity

The **unifying focus across all disciplines** is the **adoption of new technologies and tools**, alongside the **ecosystem that supports the creation, distribution, and reception of knowledge** from a research-oriented perspective.

Scientific communication and open science are deeply interconnected

Scientific communication

serves as the channel through which the principles and outputs of **open science** reach their intended audiences, whether they are other researchers, policymakers, or the general public.

By working in tandem

Open science and scientific communication enhance the impact and reach of scientific discoveries, **ensuring that knowledge is not only open but also effectively shared and understood**.

Links between scientific communication and open science

1. Shared Goals of Accessibility and Transparency

Open Science seeks to make scientific research, data, and outputs freely available and reusable by anyone. Scientific communication is the process through which these outputs are conveyed to different audiences.

Both promote openness in research to ensure that findings are not limited to those with institutional access or specialized knowledge, fostering broader understanding and participation.

2. Enhancing Public Engagement and Trust

Effective scientific communication helps **demystify complex research for the public**, which aligns with open science's objective to make science more transparent and accountable.

When research is communicated clearly and made accessible, it builds trust in science and encourages informed public dialogue.

3. Collaboration and Knowledge Sharing

Open science thrives on sharing research tools, data, and findings across disciplines and borders. Scientific communication facilitates this sharing by providing the means to disseminate these outputs effectively, through publications, open-access platforms, and collaborative networks.

Both emphasize the importance of collaboration, with open science advocating for shared research efforts and scientific communication promoting dialogue among researchers and with the public.

4. Breaking Down Barriers to Knowledge

Open science eliminates barriers like paywalls and proprietary limitations, making research outputs available to a wider audience. Scientific communication ensures that this information is understandable and accessible, broadening its impact.

This synergy helps bridge the gap between professional researchers and non-specialists, democratizing knowledge and fostering inclusivity.

5. Facilitating Reproducibility and Validation

Open science supports reproducibility by providing open access to data, methodologies, and results. Scientific communication is essential for explaining these elements clearly so that other researchers can replicate and build upon the work.

Transparent communication in peer-reviewed journals and open data repositories enables critical evaluation and validation by the scientific community.

6. Driving Policy and Decision-Making

The principles of open science align with science communication aimed at informing policy, as open access to research allows for evidence-based decision-making.

Scientific communication helps distill complex findings into actionable insights for policymakers, aligning with the open science goal of contributing to societal progress.

7. Education and Capacity Building

Open science makes educational resources and data freely available, supporting learning and research at all levels. Scientific communication complements this by presenting these resources in formats that are understandable and engaging for different audiences, from students to educators.

Together, they contribute to capacity building in developing research skills and fostering a deeper appreciation for scientific inquiry.

8. Combating Misinformation

Open science ensures that verified and peer-reviewed research is available to counteract misinformation. Scientific communication plays a critical role in relaying this credible information to the public, helping to debunk myths and support scientific literacy.

Open Science: fulfilling the human right to share in scientific advancement and its benefits

UNESCO Recommendation on Open Science by Member States during the 76th Session of the United Nations General Assembly, on 28 September 2021

European Commission funded research migrating to Open Science, including

- a repository for research digital objects, **European Open Science Cloud** (EOSC)
- metrics for evaluating quality and impact.

Understanding open science following UNESCO Recommendation on Open Science. UNESCO - CC BY-SA 4.0

Open Science in Slovenia

SLOVENSKA SKUPNOST ODPRTE ZNANOSTI

1. **Scientific Research and Innovation Strategy of Slovenia (ZRISS 2030) in 2022**

   Open Science Action plan for the implementation of ZRISS Open Science measures

2. **Slovenian Open Science Community in 2022,** https://odprtaznanost.si/

   - an initiative for the national open science cloud, follows OS Action Plan
   - Participates in preparation of strategic documents for Slovenia and in running the network of Competence Centers

3. **Scientific Research and Innovation Activities Act (ZzrID) in 2023**

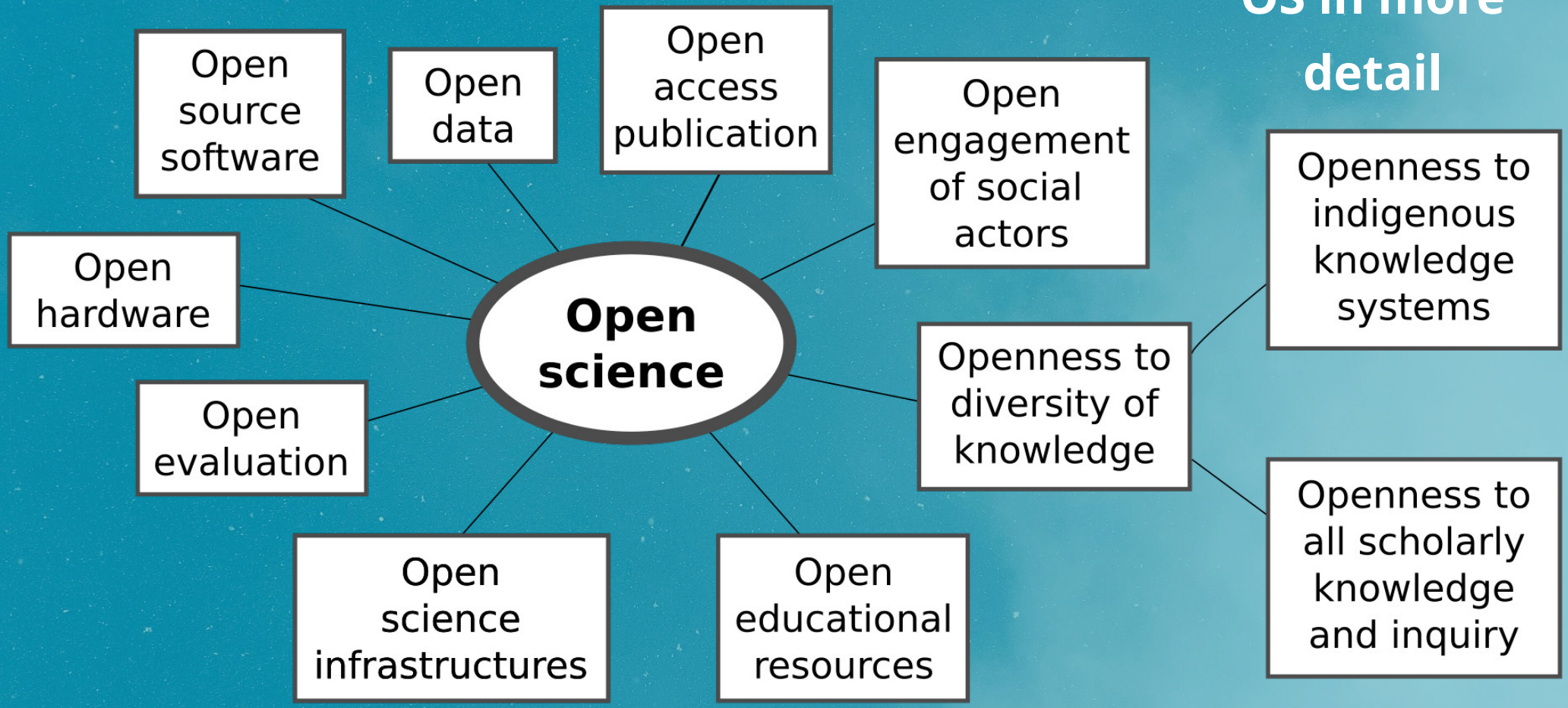
   Governmental Decree on the implementation of scientific research work in accordance with the principles of Open Science (Decree on Open Science)

Publicly funded research capacities in Slovenia

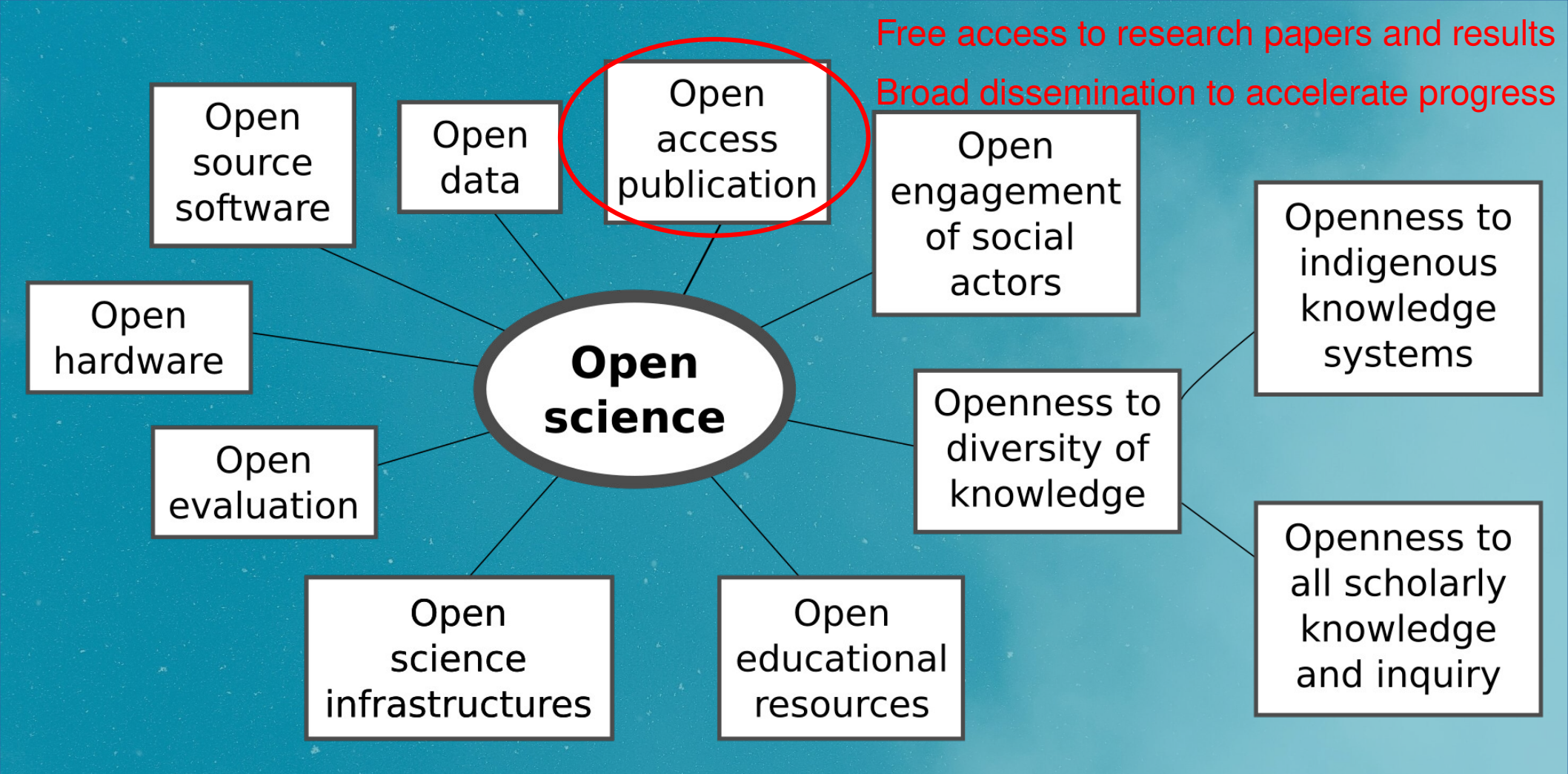
SLOVENSKA SKUPNOST ODPRTE ZNANOSTI

- **4 Universities** (5000 researchers, 47 libraries)
- **16 Research institutes** (2000 researchers, 16 libraries)
- **2 Infrastructure Institutes**
  - IZUM / Library and Research Information system Institute
  - ARNES / Academic and Research Network Institute

OS in more detail



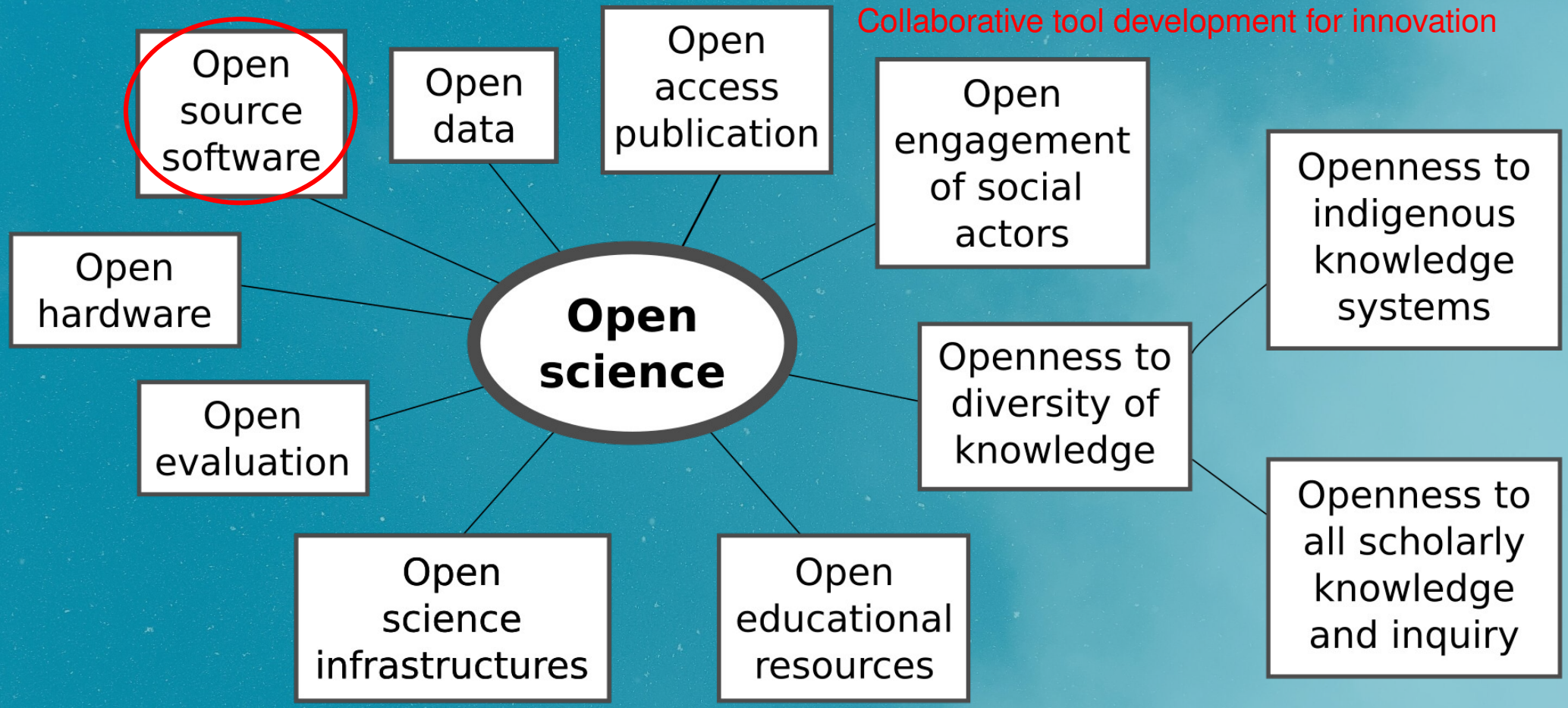
Open science elements based on UNESCO presentation of 17 February 2021. By Robbie Ian Morrison - CC BY 4.0



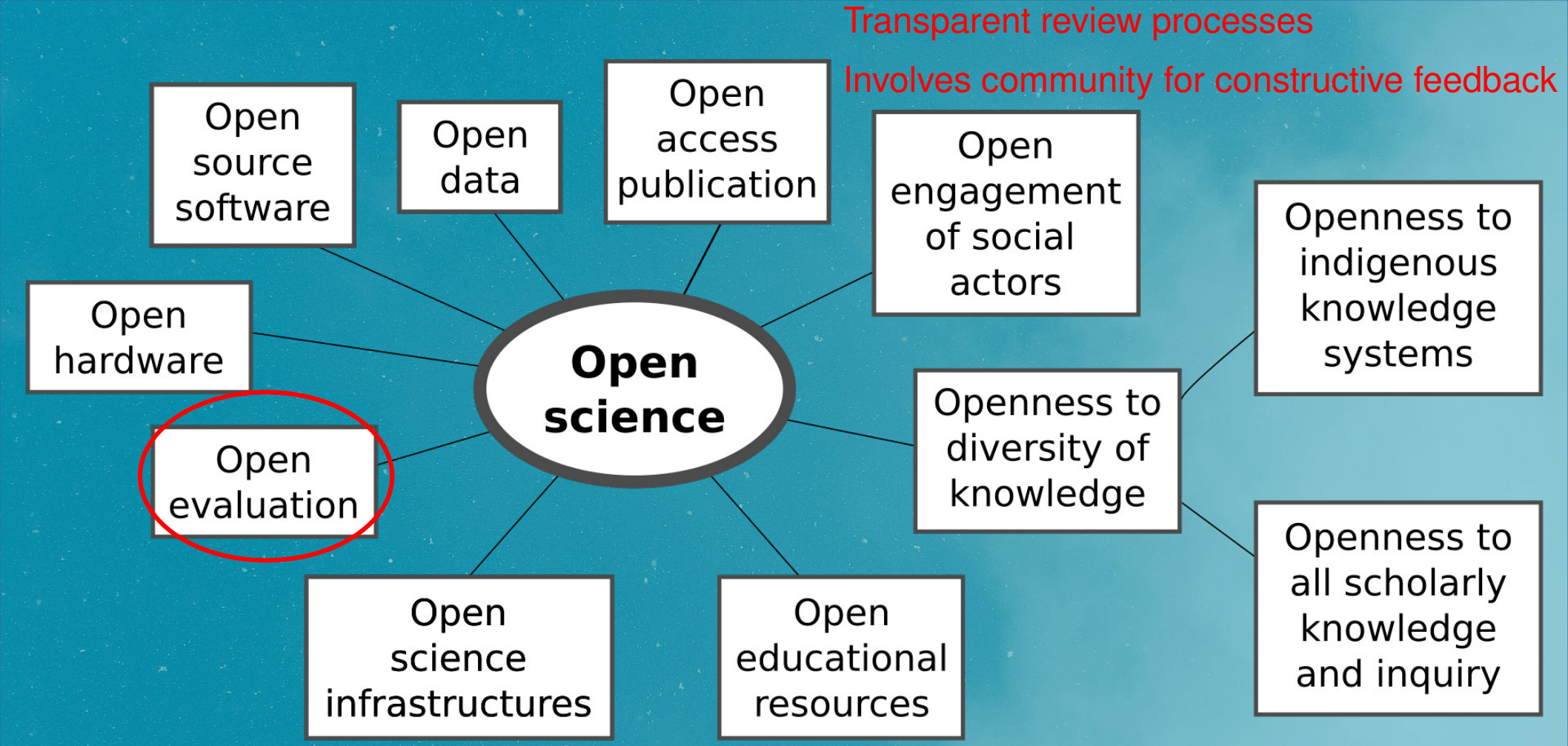
Open science elements based on UNESCO presentation of 17 February 2021. By Robbie Ian Morrison - CC BY 4.0

Open-source tools and software for transparency

Collaborative tool development for innovation



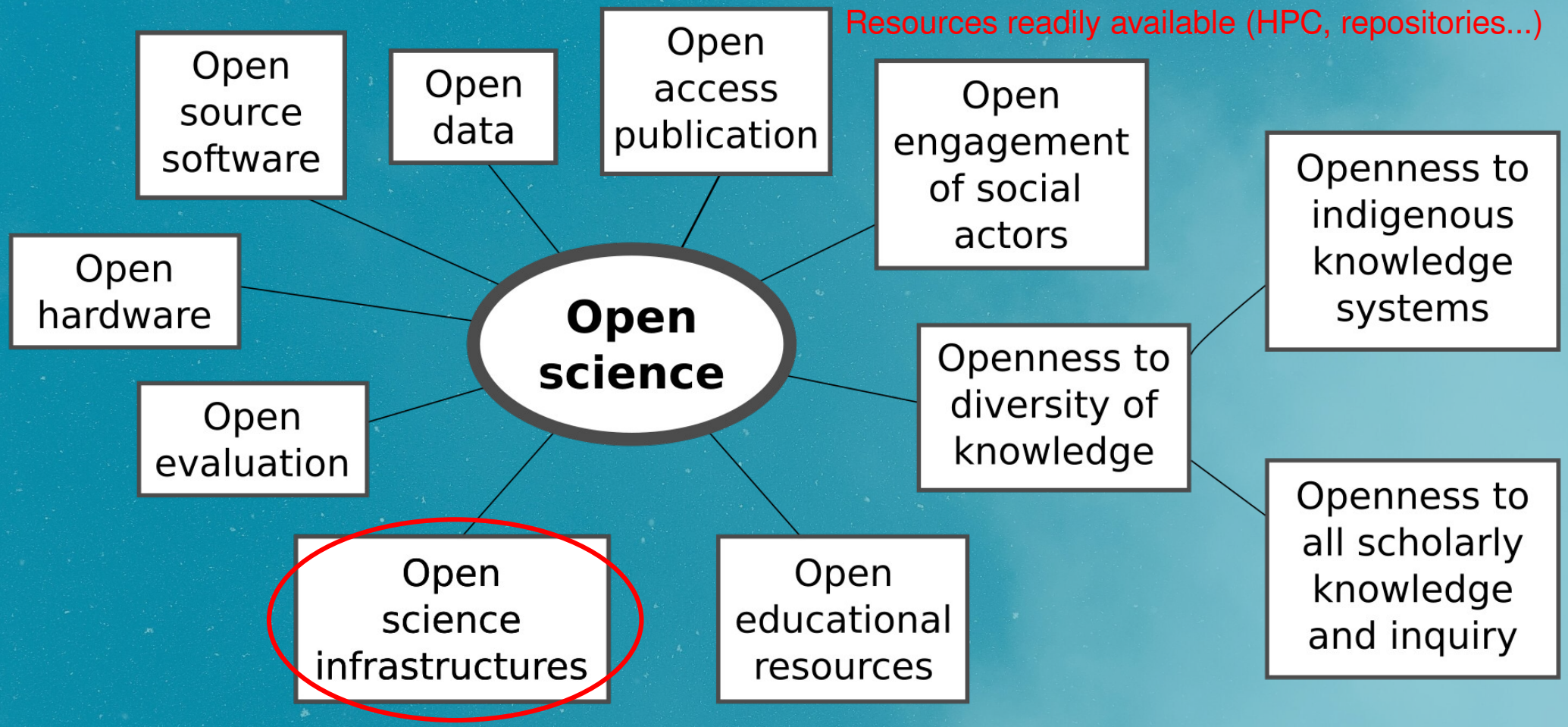
Open science elements based on UNESCO presentation of 17 February 2021. By Robbie Ian Morrison - CC BY 4.0



Open science elements based on UNESCO presentation of 17 February 2021. By Robbie Ian Morrison - CC BY 4.0

Promotes long-term sustainability and scalability

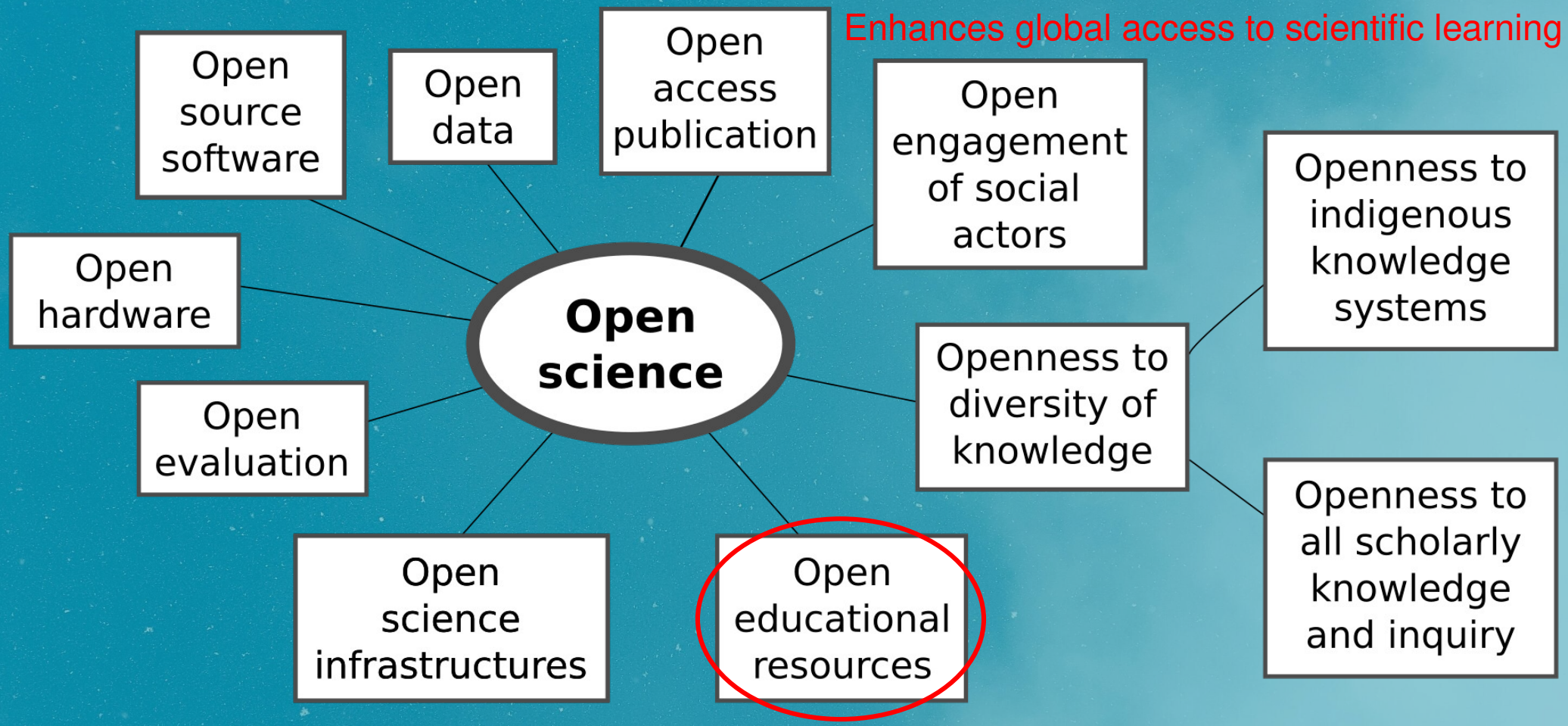
Resources readily available (HPC, repositories...)



Open science elements based on UNESCO presentation of 17 February 2021. By Robbie Ian Morrison - CC BY 4.0

Shared educational materials for teaching

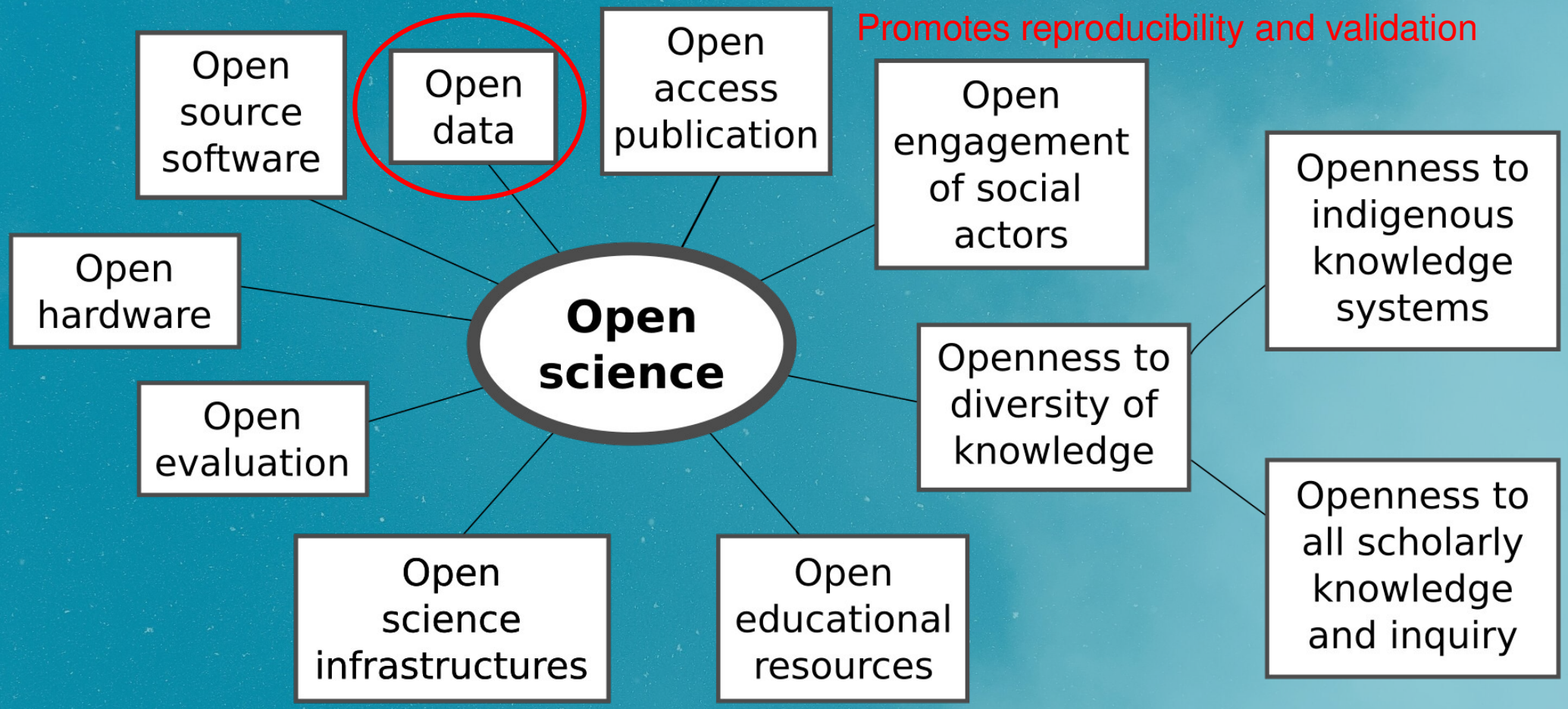
Enhances global access to scientific learning



Open science elements based on UNESCO presentation of 17 February 2021. By Robbie Ian Morrison - CC BY 4.0

Sharing raw data for verification and reuse

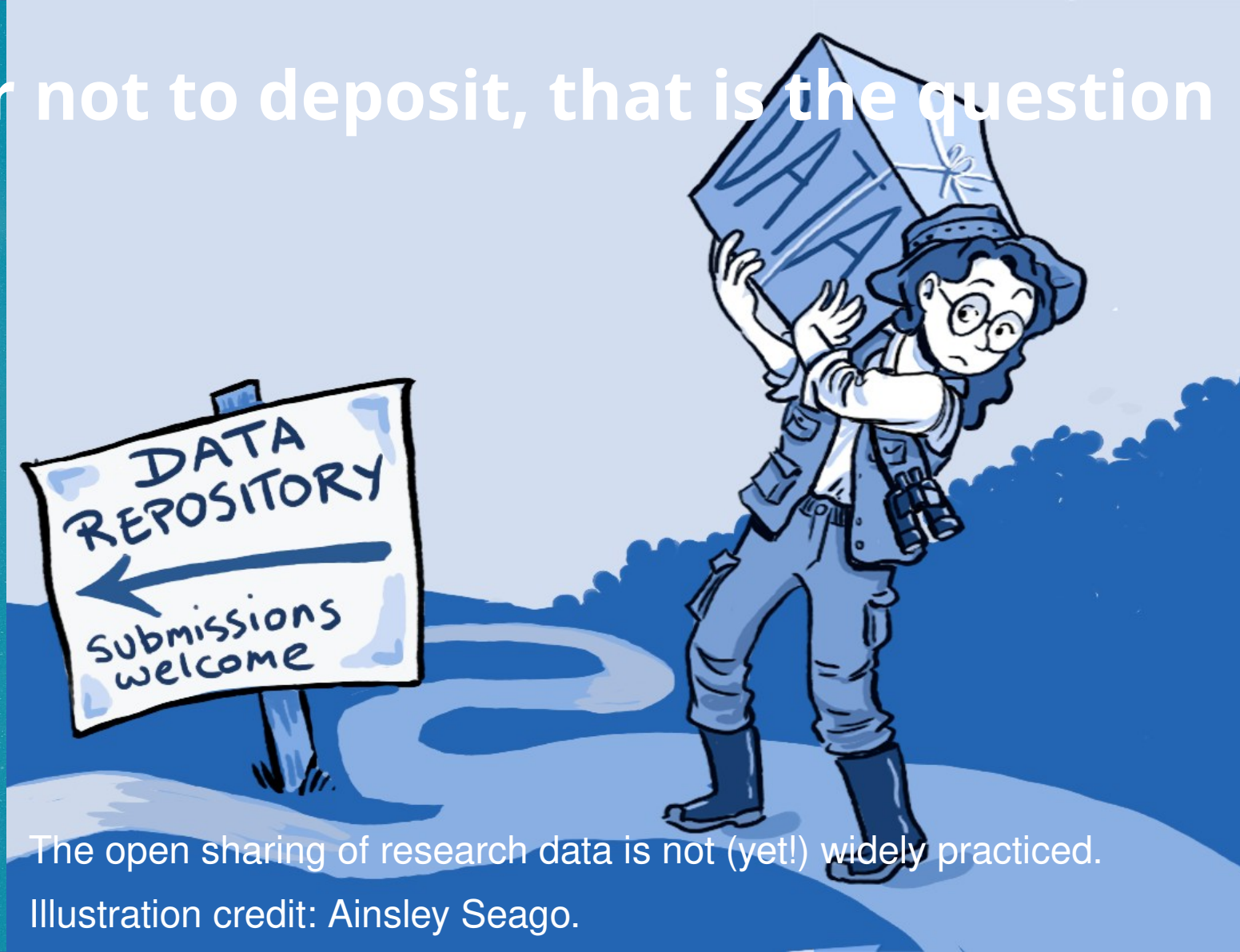
Promotes reproducibility and validation



Open science elements based on UNESCO presentation of 17 February 2021. By Robbie Ian Morrison - CC BY 4.0

To deposit or not to deposit, that is the question

Researchers **reluctant to share** their data publicly because of real and/or perceived individual costs.



The open sharing of research data is not (yet!) widely practiced.

Illustration credit: Ainsley Seago.

doi:10.1371/journal.pbio.1001779.g001

eosc

https://odprtaznanost.si/

mesec znanosti

REPUBLIKA SLOVENIJA
MINISTRSTVO ZA VISOKO ŠOLSTVO, ZNANOST IN INOVACIJE

SLOVENSKA SKUPNOST ODPRTE ZNANOSTI

Dan³ odprte znanosti 2024

3. in 4. december 2024

Four Points by Sheraton Ljubljana (Mons)

arnes
povezujemo znanje

mreža znanja

Univerza v Mariboru
Univerzitetna knjižnica Maribor

http://mrezaznanja.si/

ACTIVITIES INFORMATION REGISTRATION

WHEN?

3–5 December 2024

- WHERE?

Four Points by Sheraton Ljubljana Mons

PROGRAMME

The »Knowledge Network« Conference is dedicated to digitalization of research, education and culture

Open Science Day and National EOSC Tripartite Event

3 December | 9.00 – 18.00

Plečnik 1-3

SHOW ACTIVITIES LOGIN

Open Science Day - Day 2

4 December | 9.00 – 16.30

Plečnik 4

SHOW ACTIVITIES LOGIN

Workshop: Open Science Infrastructure - State, Challenges and Opportunities

5 December | 9.00 – 13.30

The Ravnikar

REGISTRATION

Slovenian Supercomputing Network Day (International)

4. december | 9.00–16.30

The plenary session will be held in English and present topics, such as: NCC collaboration, SMASH postdoctoral program, EuroHPC Vega supercomputer, SLING service portfolio, and a panel discussion about Women in HPC.

Šubic 1+2

PRIKAŽI AKTIVNOSTI PRIJAVA

Dan slovenskega superračunalniškega omrežja

5. december | 9.00–13.30

Plenarna predavanja na Dnevu slovenskega superračunalniškega omrežja bodo pokrivala tematike od nevroznanosti in velikih jezikovnih modelov pa vse do digitalne humanistike in hekatonov.

Plečnik 4

PRIKAŽI AKTIVNOSTI PRIJAVA

Superračunalništvo za industrijo

5. december | 9.00–18.00

Vas zanima več o uporabi superračunalnika v vašem podjetju in kako lahko pri tem uporabljate SLING infrastrukturo? Predstavili vam bomo superračunalnik VEGA, primere dobre rabe v industriji, ter možnosti sodelovanja in rabe nacionalne in mednarodne infrastrukture.

Plečnik 5

PRIKAŽI AKTIVNOSTI PRIJAVA