Framework for
Open and
Reproducible
Research Training

FORRT

🏰 Introduction

The Problem

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*The teaching of **open scholarship (OS)** practices has received considerably **less attention**.*

As a result, it is still very common that graduates and undergraduates finish their studies without having heard about open scholarship.

FORRT
The need for integration

Question

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*If science is a **process** of knowledge production, then **is science education** best **expressed** as teaching students **the process** or as teaching them the **knowledge itself**?*

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The need for integration

An Answer

If we teach the **accumulated knowledge***, then we are* **not** *actually teaching students science. Rather, we are teaching them* **science's products***, and indeed we are* **misleading** *them by substituting the teaching of scientific facts,* **as if it were the teaching of science itself***.*

(Marks, 2009, p. 22)

What is FORRT?

- Established in 2018

- Ever-growing community of more than 260 scholars and educators in fields such as *Psychology, Neuroscience, Communication science, Linguistics, Economics, Medicine, Computer science, Philosophy, Political science* etc.

🏰 What are FORRT goals?

1. Build together with educators a pathway towards the *incremental adoption of open scholarship practices into higher education*

2. Generate a conversation about the *ethics and social impact of a higher-education pedagogy* that emphasizes openness, epistemic uncertainty and research credibility

3. Promote a reflection about the *perceived importance of different academic activities* and *advocate for greater recognition of educational resources*

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Open Educational Resources

*FORRT aims to help educators to <u>find existing initiatives</u> that may be helpful for them while also <u>developing teaching resources</u> to **aid** in the integration of OS into higher education.*
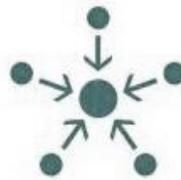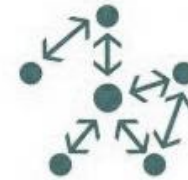
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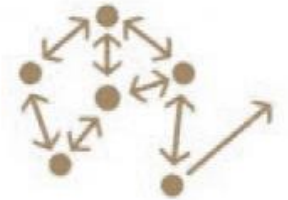
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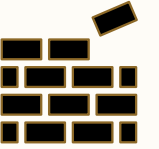
- *Dynamic*

- *Easy to incorporate*

- $F_{indability}A_{ccessibility}I_{nteroperability}R_{eusability}$

- *Meta-science*

- *Team-science*

- *Citizen-science*

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Prong 1: FORRT's Didactic Framework

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FORRT's Clusters

- *Embedding open scholarship tenets into teaching requires that educators are familiar with the current literature.*

- *Drawing on the know-how of experts in Open Scholarship, FORRT has identified **clusters of knowledge** that are central in this literature.*

- *Presenting information in a systematized way can help educators to identify major themes, as well as topics they would like to further explore.*

https://forrt.org/clusters/

Publication models

Reasons to share (e.g., for science, for one's own practice)

Repositories (e.g., OSF, FigShare, GitHub, GitLab, Zenodo)

Accessing or sharing others' data, code, and materials

Ethical considerations

Examples and consequences of accessing (un-)open data

History of the reproducibility crisis and credibility revolution

Exploratory and confirmatory analyses

Questionable research practices and their prevalence

Improve statistics, teaching, code sharing, preregistration, replication

Ongoing debates (e.g., incentives for/against open science)

Ethical considerations for improved practices

Logic of NHST, p-values, Type I and II errors (when/why they happen)

Benefits and limitations of NHST, Bayesian and likelihood approaches

Effect sizes, statistical power, confidence intervals

Research design, sampling methods, and their implications for inference

Questionable measurement practices (QMPs), validity, and reliability

Qualitative research

Reproducibility and replicability knowledge

Purpose of replications (e.g., what is a 'failed' replication?)

Large-scale replication attempts

Distinguishing between direct and conceptual replications

Doing replications: challenges, limitations, and comparisons

Registered Replication Reports (RRR)

Politics of replicating famous studies

Fair data and materials

Replication research

Academic life, ethics, and culture

Conceptual and statistical knowledge

Reproducible analyses

Pre-registration

Strengths of reproducible pipelines

Scripted analyses compared to GUI

Data wrangling

Programming reproducible data analyses

Open source and free software

Diagnostic tools

Diversity, equity, and inclusion

Citizen science

Team science

Adversarial collaboration

Structure and incentives in academia

Types of academic, non-academic, and alt-academic positions

Purpose of pre-registration

Pre-registration and registered reports: strengths and differences

When can you pre-register? Can you pre-register secondary data?

Understanding pre-registration types and writing one

Comparing a pre-registration to final study manuscript

Conducting a pre-registered study

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FORRT's Self-Assessment tool

- *Learning tool to help educators assess the degree to which open scholarship is incorporated in their own teaching and mentoring.*

- *For each cluster, educators reflect on the extent to which students are:*

  *(i) **exposed** to literature and content on the topic*

  *(ii) required to **engage** with the content on the topic*

- *Educators can also receive suggestions of literature related to each cluster.*

https://forrt.org/self-assessment/

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Prong 2: FORRT's Pedagogical Tools

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FORRT's Curated Resources

- To increase findability and accessibility of educational resources on open scholarship, FORRT has a **database of curated online materials**.

- Each educational material receives tags and **metadata** to help educators sort through materials.

https://forrt.org/resources/

Curated resources

There are more than 700 resources submitted so far in our database. We are currently curating a new and improved version that is compliant with OER Commons for greater findability, accessibility, interoperability, and reusability (FAIR) of these resources.

If you notice there is an educational resource, research article or pedagocial tool missing in our database, please consider adding it here on FORRT's resource submission form or via the direct link.

Enter keywords below to find relevant resources for you or use the filters below:

Enter search text

No items found.

All	Reproducible Analyses	Open Data and Materials	Reproducibility and Replicability Knowledge

Replication Research	Conceptual and Statistical Knowledge	Preregistration

HAIL THE IMPOSSIBLE: P-VALUES, EVIDENCE, AND LIKELIHOOD.

Significance testing based on p-values is standard in psychological research and teaching. Typically, research articles and textbooks …

Author(s): Johansson, T.

Type of resources: Primary Source, Reading, Paper

Primary user(s): Student

Subject area(s): Math & Statistics

Tag(s):

Link to resource

1,500 SCIENTISTS LIFT THE LID ON REPRODUCIBILITY

Survey sheds light on the 'crisis' rocking research.

Author(s): Monya Baker

Type of resources: Primary Source, Reading, Paper

Primary user(s): Student

Subject area(s): Applied Science, Social Science

Tag(s): Reproducibility Crisis and Credibility Revolution, Open Science

Link to resource

A 21 WORD SOLUTION.

One year after publishing "False-Positive Psychology," we propose a simple implementation of disclosure that requires but …

Author(s): Simmons, Joseph P. and Nelson, Leif D. and Simonsohn, Uri, A

Type of resources: Primary Source, Reading, Paper

Primary user(s): Student

Subject area(s): Applied Science, Social Science

Tag(s): Reproducibility Crisis and Credibility Revolution, Open Science

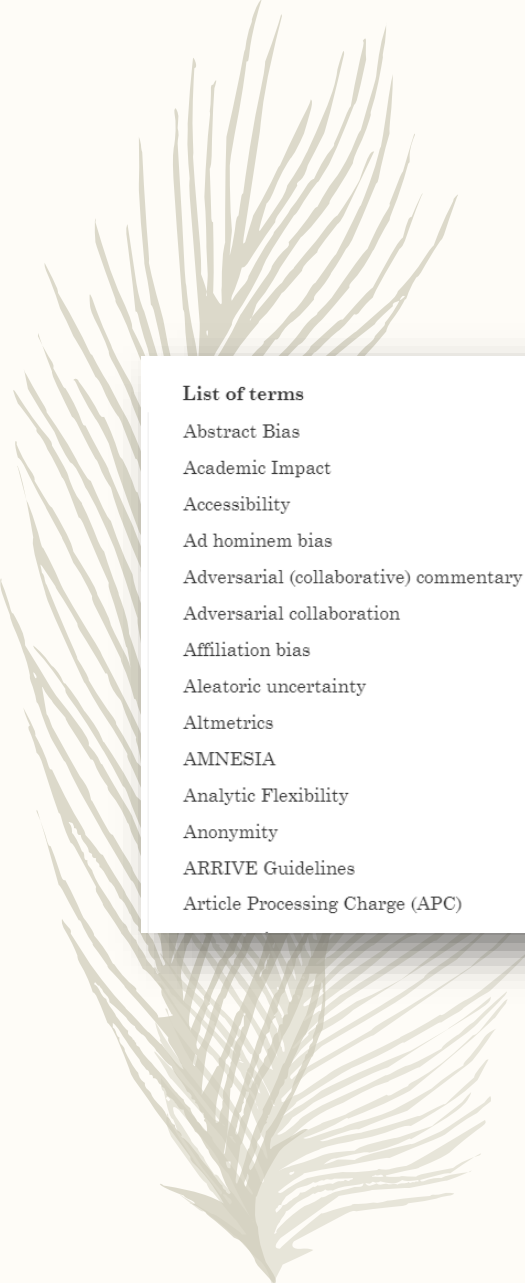| Link to resource |
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FORRT's Glossary

- *Devised to be an **access point** for those wishing to learn about OS*

- *Aims to provide **concise definitions** of the most important OS terms and clarify terminologies*

- ***110 contributors** from the academic community have defined more than **250 open scholarship terms***

- *Each term is presented together with a brief definition and appropriate references. Whenever is the case, we also present potentially competing definitions for a term.*

https://forrt.org/glossary/

CARKing

Last updated on Jul 14, 2021

Definition: Critiquing After the Results are Known (CARKing) refers to presenting a criticism of a design as one that you would have made in advance of the results being known. It usually forms a reaction or criticism to unwelcome or unfavourable results, results whether the critic is conscious of this fact or not.

Related terms: HARKing, Preregistration, Registered Report

References: Bardsley (2018), & Nosek and Lakens (2014)

Drafted and Reviewed by: Mahmoud Elsherif, Ali H. Al-Hoorie, Ashley Blake, Adrien Fillon, Charlotte R. Pennington

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FORRT's Summaries

- ***Reduce the burden** on educators wishing to get familiar and stay up-to-date with the OS literature*

- *Over **200 summaries** of academic articles related to OS*

- *Main **take-aways** and **suggestions** of articles on similar topics*

- *Peer-review process*

https://forrt.org/summaries/

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FORRT's Reversals & Replications

- *Replications of previous work are at the core of Open Scholarship*

- *It can be challenging to keep up to date with replication efforts*

- ***Collate** replication efforts and reversals across different fields*

- ***32 contributors** from the academic community, **~150 entries** across **20 different fields***

https://forrt.org/reversals/

Reversals (*organized per field*)

Social Psychology

No good evidence for many forms of priming, automatic behaviour change from 'related' (often only metaphorically related) stimuli. Semantic priming is still solid, but the effect lasts only seconds.

Elderly priming, that hearing about old age makes people walk slower. The p-curve alone argues against the first 20 years of studies.

Statistics

No good evidence for **Money priming**, that "images or phrases related to money cause increased faith in capitalism, and the belief that victims deserve their fate".

Statistics

Questionable evidence for **Commitment priming (recall)**, participants exposed to a high-commitment prime would exhibit greater forgiveness.

Statistics

Hostility priming (unscrambled sentences), exposing participants to more hostility-related stimuli caused them subsequently to interpret ambiguous behaviors as more hostile.

Statistics

Intelligence priming (contemplation), participants primed with a category associated with intelligence (e.g. "professor") performed 13% better on a trivia test than participants primed with a category associated with a lack of intelligence ("soccer hooligans").

Statistics

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FORRT's Lesson Plans

- *Devised to **support** educators who wish to integrate OS into their teaching*

- *Draws on the expertise of the community of researchers and educators*

- ***9** evidence-based, high-quality **lesson plans** and almost **60 class activities** that can be incorporated into taught courses*

- *Each lesson plan was **categorized** based on theme, learning outcome, activity length and method of delivery*

https://forrt.org/lesson-plans/

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FORRT's Syllabus

- *To provide educators with an example of how they can use FORRT's resources on their teaching*

- *Seminar series building on FORRT's clusters framework – 9 weeks of teaching*

- *Suggestions of core and additional readings, assignments and activities*

https://forrt.org/syllabus/

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Prong 3: Recognizing and commending excellent teaching and mentoring

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Pedagogies

- *Collection of exemplary instances of **principled education***

- *Aims to:*

  -Inspire other educators in the creation of their own pedagogies

  -Give visibility to educators and their educational method

  -Encourage the dissemination and re-purposefulness of educational resources

https://forrt.org/pedagogies/

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Educators' corner

- *Aims to provide a space for **exchange** between educators of different disciplines about their experiences, successes and hardships when integrating open scholarship into teaching*

- *Aims to increase the visibility of educators and their efforts towards principled education*

https://forrt.org/educators-corner/

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Impact on students' attitudes

- *Review evidence of the **impact of teaching open scholarship** on students' attitudes, outcome and engagement*

- *Aims to raise awareness to the benefits of integrating open scholarship into higher education*

- *Team of +80 researchers*

https://forrt.org/impact/

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Prong 4: Social Justice in Academia

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Towards Social Justice in Academia

- *FORRT's Open Office Hours*

- *FORRT's Remote Mentorship Program*

- *FORRT's Support for Underrepresented and Underprivileged ECRs*

https://forrt.org/dei/

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Neurodiversity

- Neurodiversity is the non-pathological variation in the human brain regarding sociability, learning, attention, mood and other mental functions (Singer, 2017).

- Neurodiversity has received little or no attention within open scholarship discussions.

- Aims to **raise awareness to diversity** in academia, **build community** and **increase the visibility** of the work produced by neurodivergent scholars and educators.
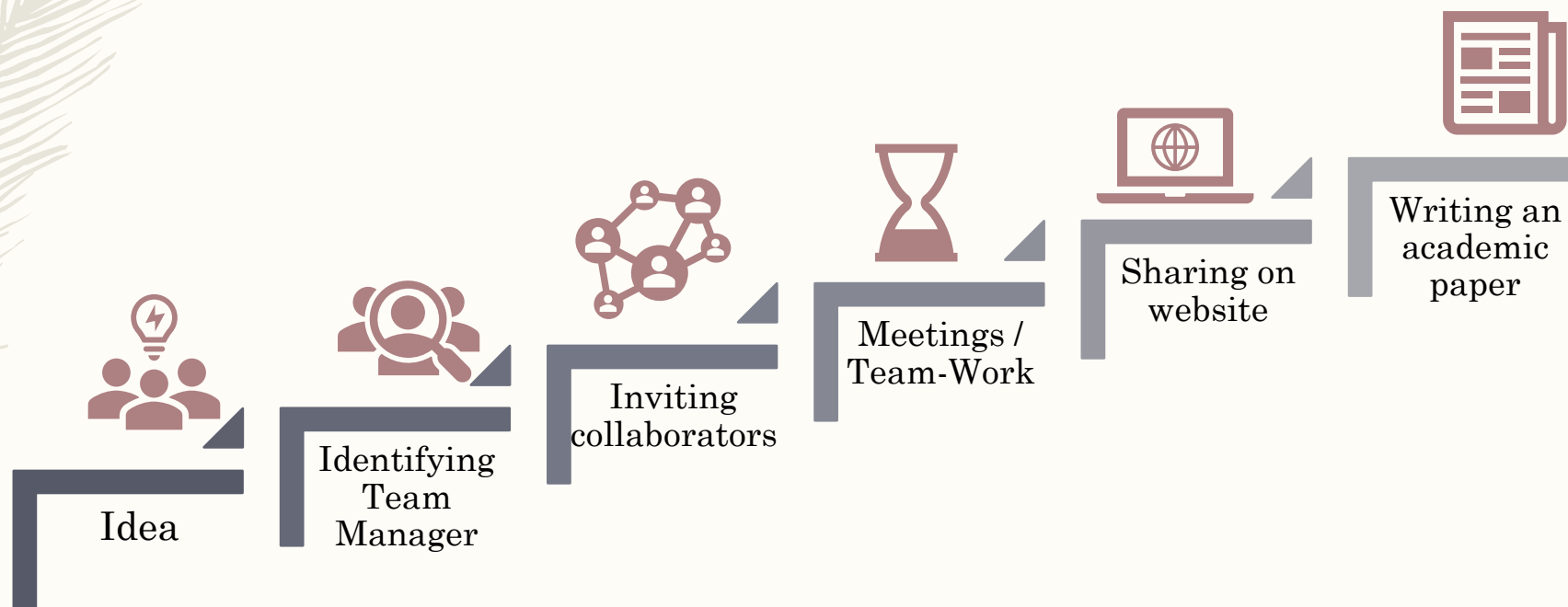
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From idea to reality

Why focus on publications?

1. Encourage other academics to read and know about the initiatives.

2. Recognition of open educational resources as academic output

3. Recognition and reward for the members of our community

Thank you!

https://forrt.org

info@forrt.org

@FORRTproject

https://forrt.org/publications/

Additional Slides

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Introduction

- Renewed attention to *research integrity and transparency*
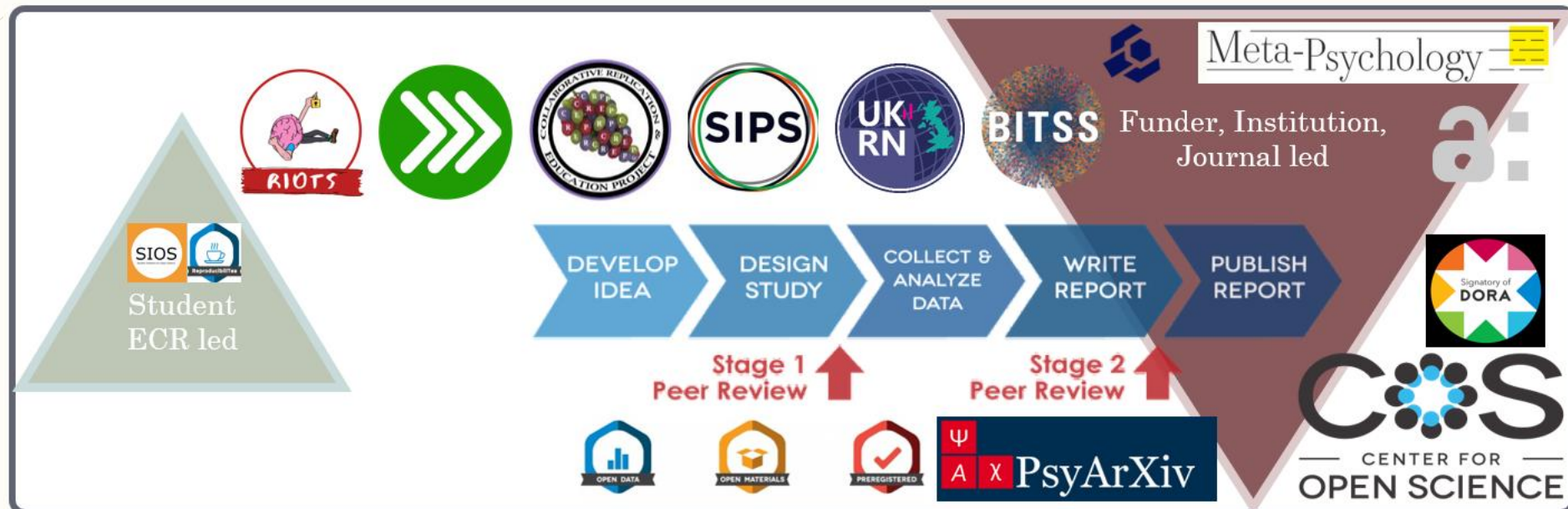
🏰 Introduction

The Center for Open Science (COS) Pillars

- opening scientific communication

- restructuring incentives to promote better scientific practices

- crowdsourcing science to promote large-scale collaboration and accelerate scientific progress.

♜ FORRT

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1. The **need** to integrate OS into higher education

2. The **benefits** of open and reproducible research training

3. The **barriers** for the integration of OS into education

4. FORRT's Open Educational Resources

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Principled education in a nutshell

"Principled teaching and mentoring are based on the idea that we should

teach the facts of science relative to the process by which those
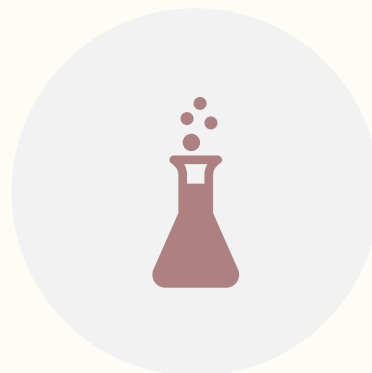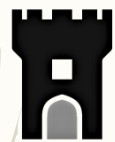
facts were acquired*."*

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The benefits of "ORRT"

Science

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The benefits of "ORRT"

Consumers of Science

Science

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Common barriers and challenges

1. *The lack of top-down incentives*

2. *The lack of infra-structure*