

FAIR Training in Higher Education

FAIR (Findable, Accessible, Interoperable, Reusable)

Prof. Dr. habil. Prieß-Buchheit

Open Science - an inclusive paradigm that aims to make scientific knowledge accessible, available, and reusable for all, regardless of language barriers – including FAIR open research data (UNESCO Recommendation on Open Science, 2021)

FAIR – the European Code of Conduct for Research Integrity (ECoC, 2023) explicitly names the FAIR principles as a standard in data-driven research.



FAIR Training in Higher Education

Addressing two challenges of research integrity education

Prof. Dr. habil. Prieß-Buchheit

RCR, understood as focusing on research quality, is a bridge between OS and RRI

→ RCR, OS and RRI communities need to join forces

RCR education should be evidence-based

→ Research-based data should be collected and insight should be utilized in designing and evaluating training.

Hoven, M. v., Asaduzzaman, M., Evans, •. N., Ike, •. C., Kalichman, M., Kniffert, S., ... Priess-Buchheit, J. (2023, March 6). Seven challenges for research integrity education: current status and recommendations.,

<https://doi.org/10.31219/osf.io/5w9kg>



Key Findings: FAIR Training in Higher Education

Prof. Dr. habil. Prieß-Buchheit

1. Students found FAIR training very useful and satisfactory
2. Noticeable increase in students suggesting FAIR-aligned scientific actions post-training
3. FAIR training didn't significantly impact the justifications for FAIR actions
4. University legal framework's influence students' participation in voluntary FAIR training

Preprint and accepted for publication after changes: Prieß-Buchheit J, Hermeking N, Möbius TWD. Training to act FAIR: A pre-post study on teaching FAIR guiding principles to (future) researchers in higher education. Research Square; 2023. DOI: 10.21203/rs.3.rs-3409769/v1.



Pre-post study FAIR training: Hypotheses

Prof. Dr. habil. Prieß-Buchheit

Hypotheses:

1. FAIR training has a positive impact on both the suggested research action and the justification of the students;
2. a particular training that focuses explicitly on FAIR training is necessary to produce this shift (if present), and we should thus not be able to reproduce the former effect (if it is present) in the control group;



Pre-post study FAIR training: Hypotheses

Prof. Dr. habil. Prieß-Buchheit

Hypotheses:

3. students from universities with legal frameworks on FAIR guiding principles choose to attend voluntary FAIR training

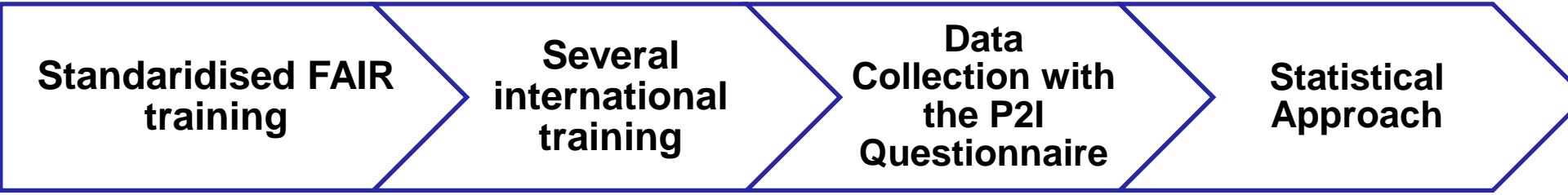
Explorative:

4. contrast the learning factors of the FAIR training with the help of the learners' feedback



Pre-post study FAIR training: Method

Prof. Dr. habil. Prieß-Buchheit



Path2Integrity

Researchers, research institutions and organisations ensure access to data as open as possible and as closed as necessary. (cf. EC&G 2017, p. 6)

Description and background

This learning unit:

- Introduces (future) researchers to norms of proper data management
- Builds the competency to explain and justify proper data management
- Challenges (future) researchers to choose practices that respects the rights of others as well as support their own work
- Emphasises the principles of findable, accessible, interoperable and re-usable (FAIR) data while describing their limitations

Learning objectives

- Be open, unbiased and accepting of ambiguity
- Explain and justify arguments for proper data management
- Compare and prioritise different handlings of proper data management
- Be ready to choose norms together with the dialogue group and for your target group

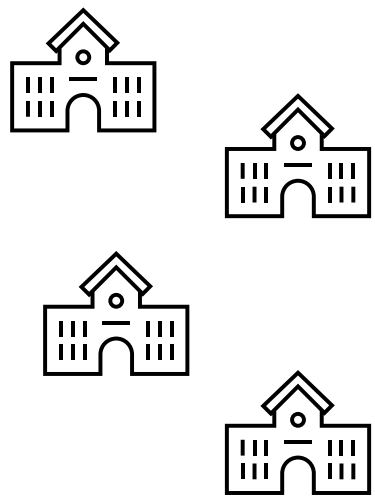
Learning stages

- Become familiar with the topic of ambiguity
- Choose an interesting challenge
- Engage in role play
- Explain and justify data management
- Evaluate different arguments, face dissent and achieve consensus

Keywords

Data management, FAIR, open science, informed consent

"Reliable data must first be collected, then processed accurately in order to draw reliable conclusions and present them fairly."
(Tymon Zieliński, an advocate for research integrity)



Path2Integrity Open Data Collection: n=2924
(see data collection 1 and 2 in the references)

Selection:	FAIR training (code: group code G2/G3/G5, course 1, questionnaire 2)	FAIR training; learning factors	no-FAIR training (code: group code ≠ G2/G3/G5, course ≠ 1, questionnaire 2)
Exclusion:	one group due to reported miserable teaching conditions (code P2I: ≠ G5)	one group due to reported miserable teaching conditions (code P2I: ≠ G5)	no exclusion of data
Data:	pre-test n = 96 (100%) (code P2I: longitude 1)	feedback n = 95	pre-test; n = 418 (100%) (code P2I: longitude 1)
	post-test n = 78 (81,25%) (code P2I: longitude 2)		post-test; n = 163 (38,9%) (code P2I: longitude 2)
	intervention group		control group

Chi-square test, with the null being that response behaviour is independent of pre-and post-testing.

A volcano plot displaying which learning factors students ranked as highly positive.

Pre-post study FAIR training: Results

Prof. Dr. habil. Prieß-Buchheit

"In his research project, Ali has collected a large amount of research data that he would like to make available open access in accordance with the FAIR guiding principles. To follow good research practices, Ali ensures that his data ..." (Please choose only one of the following:)

- A1: **are described with rich metadata to be machine-readable.**
- A2: are stored on FAIR foundation servers.
- A3: can be found in every database possible.
- A4: do not contain any information about sexual orientation.

group	longitude	A1	A2	A3	A4	sum
intervention	pre	18.89%	51.11%	21.11%	8.89%	100%
	post	46.67%	34.67%	12%	6.67%	100%
control	pre	18.25%	55.03%	18.52%	8.20%	100%
	post	22.58%	54.19%	15.48%	7.74%	100%

Pre-post study FAIR training: Results

Prof. Dr. habil. Prieß-Buchheit

Before FAIR training,

81.1% of students suggest scientific actions outside the FAIR guiding principles.

There is a **3.75-fold increase** in suggestions that adhere to these principles after the training.

The odds ratio to justify their scientific actions with a **legal framework** is **1.56 for students in voluntary FAIR training** compared to students in the control group. However, the effect is not statistically significant (a 99%-confidence interval for effect is (0.30, 1.17), p-value 0.0472).

Pre-post study FAIR training: Results

Prof. Dr. habil. Prieß-Buchheit

Ali's decision (above) is in line with good research practices because ..."
(Please choose only one of the following:)

- **B1: it ensures reliable research results.**
- B2: it ensures the equal treatment of all research data.
- B3: It is Ali's duty to follow this process.
- B4: the legal framework governing universities requires it.

		B1	B2	B3	B4	sum
intervention	pre	36.67%	21.11%	12.22%	30%	100%
	post	38.67%	33.33%	14.67%	13.33%	100%
control	pre	37.17%	29.41%	13.10%	20.32%	100%
	post	31.82%	29.22%	18.83%	20.13%	100%

Pre-post study FAIR training: Results

Prof. Dr. habil. Prieß-Buchheit

Interestingly, the training does not significantly impact how students justify FAIR actions.

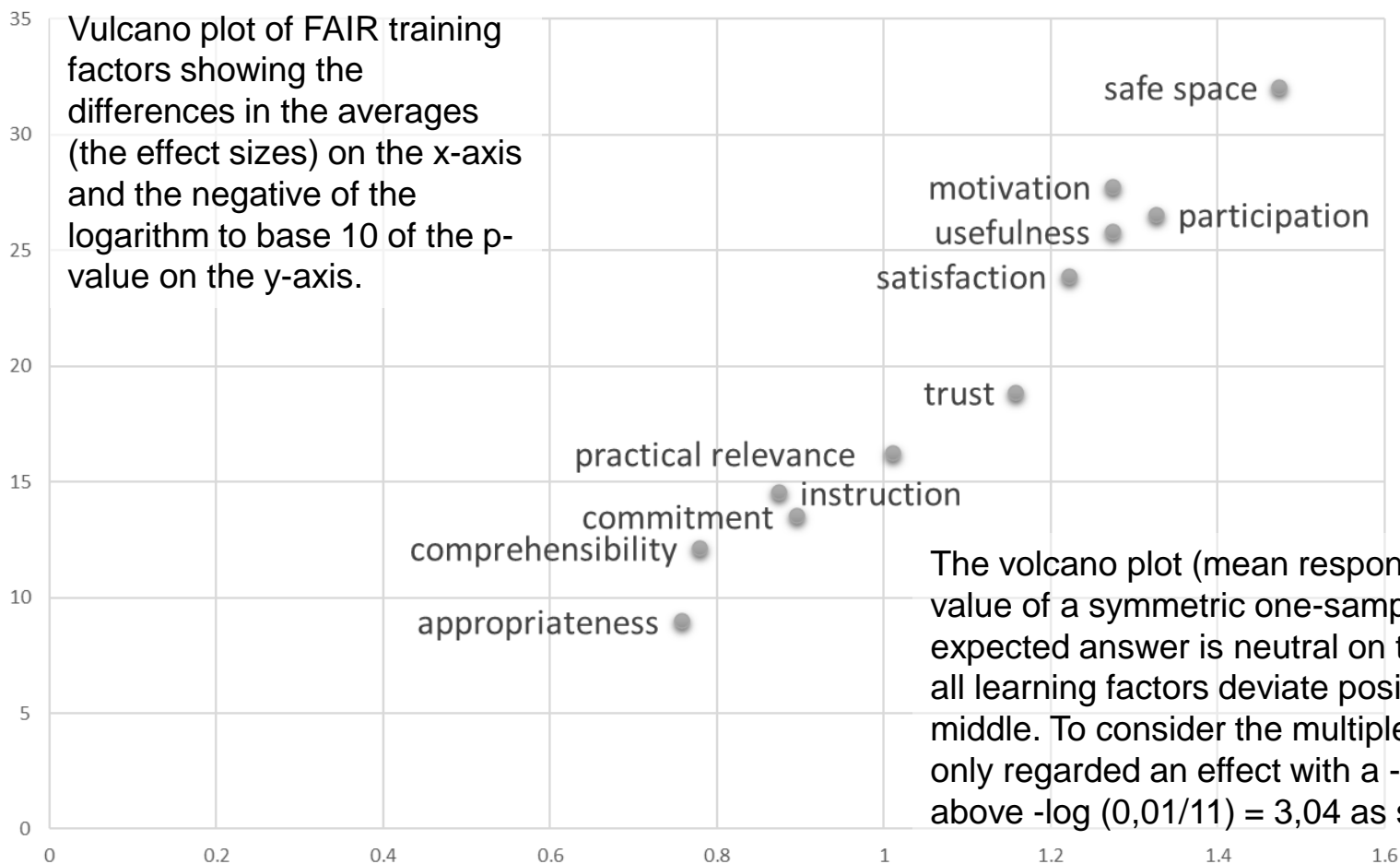
Unexpected increase in answer B2, "it ensures **the equal treatment** of all research data."

Maybe capturing the Zeitgeist ...

Also, role-play is a method to encourage cooperative learning, thus fostering perspectives from different people (D-diversity), fair treatment, access, opportunity, and advancement for all learners (E-equity), and inclusive decision-making processes (I-inclusion). → Students may have transferred the learning process from "how" they learned to "what" they learned.

Pre-post study FAIR training: Results

Prof. Dr. habil. Prieß-Buchheit



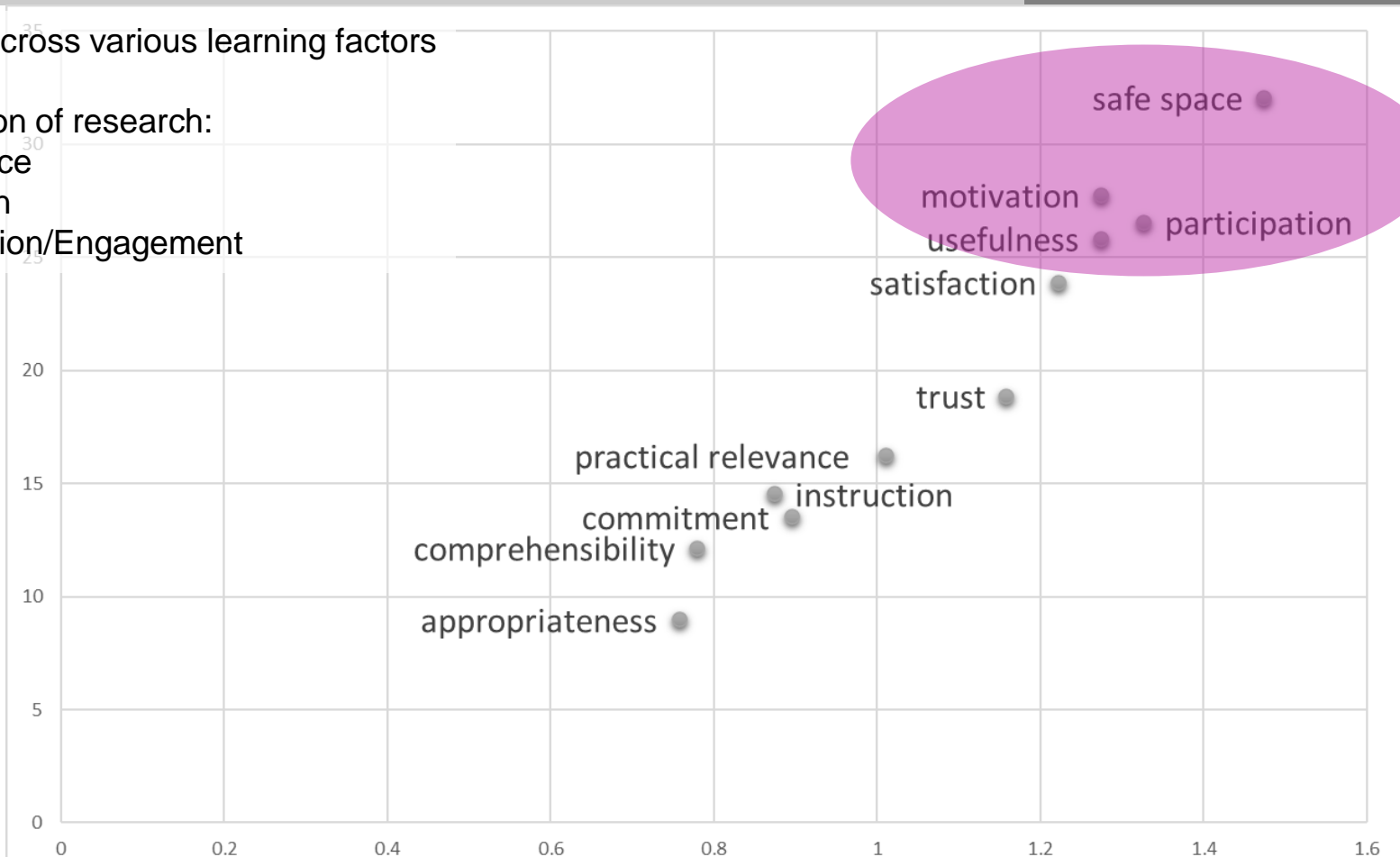
Pre-post study FAIR training: Results

Prof. Dr. habil. Prieß-Buchheit

High ratings across various learning factors

Future direction of research:

1. Safe Space
2. Motivation
3. Participation/Engagement



Key Findings: FAIR Training in Higher Education

Prof. Dr. habil. Prieß-Buchheit

1. Students found FAIR training very useful and satisfactory
2. Noticeable increase in students suggesting FAIR-aligned scientific actions post-training
3. FAIR training didn't significantly impact the justifications for FAIR actions
4. University legal framework's influence students' participation in voluntary FAIR training

Preprint and accepted for publication after changes: Prieß-Buchheit J, Hermeking N, Möbius TWD. Training to act FAIR: A pre-post study on teaching FAIR guiding principles to (future) researchers in higher education. Research Square; 2023. DOI: 10.21203/rs.3.rs-3409769/v1.



Pre-post study FAIR training: Results

Prof. Dr. habil. Prieß-Buchheit

There are several limitations in this study ...
... so further research is needed....

Thank you!
Julia Priess-Buchheit
buchheit@paedagogik.uni-kiel.de

Pre-post study FAIR training

Prof. Dr. habil. Prieß-Buchheit

ALLEA. (2024, February 6). The European Code of Conduct for Research Integrity - ALLEA. Version 3 2023 <https://allea.org/code-of-conduct/> (Version 2, 2017: <https://allea.org/european-code-of-conduct-2017/>); Boeckhout, M., Zielhuis, G. A., & Bredenoord, A. L. (2018). The FAIR guiding principles for data stewardship: fair enough? *European Journal of Human Genetics*, 26(7), 931–936. <https://doi.org/10.1038/s41431-018-0160-0>; CESSDA - Consortium of European Social Science Data Archives. (n.d.). <https://www.cessda.eu/>; Council of the European Union. (2022). Marseille Declaration on International Cooperation in Research and Innovation [Press release]. Retrieved February 22, 2024, from <https://presidence-francaise.consilium.europa.eu/media/xi1kxqzq/marseille-declaration.pdf>; Data Citation Synthesis Group. (2014). Joint Declaration of Data citation principles. <https://doi.org/10.25490/a97f-egyk>. Retrieved February 22, 2024, from <http://cedadocs.ceda.ac.uk/1171/>; FORRT - Framework for Open and Reproducible Research Training. (n.d.). FORRT - Framework for Open and Reproducible Research Training. <https://forrt.org/>; Fuentes, M. A., Zelaya, D. G., & Madsen, J. W. (2020). Rethinking the course syllabus: Considerations for promoting equity, diversity, and inclusion. *Teaching of Psychology*, 48(1), 69–79. <https://doi.org/10.1177/0098628320959979>; Goddixsen, M. P., & Gjerris, M. (2022). Teaching phronesis in a research integrity course. *Facets*, 7, 139–152. <https://doi.org/10.1139/facets-2021-0064>; Hermeking, N., & Prieß-Buchheit, J. (2022). What's integrity got to do with it? Second-year experiences of the Path2Integrity e-learning programme. *Facets*, 7, 110–125. <https://doi.org/10.1139/facets-2021-0047>; van den Hoven, M., Lindemann, T., Zollitsch, L., Prieß-Buchheit, J. (2023) A Taxonomy for Research Integrity Training: Design, Conduct, and Improvements in Research Integrity Courses. *Science and Engineering Ethics*. DOI: 10.1007/s11948-022-00425-x.; Id. (n.d.). Hong Kong Principles - WCRIF - The World Conferences on Research Integrity Foundation. <https://wcrif.org/guidance/hong-kong-principles>; Koterwas, A., Dwojak-Matras, A., & Kalinowska, K. (2021). Dialogical teaching of research integrity: an overview of selected methods. *Facets*, 6, 2138–2154. <https://doi.org/10.1139/facets-2021-0045>; Lindemann, T. and Prieß-Buchheit, J. (2021) Learning Card For Research Integrity (M8). Zenodo. <https://doi.org/10.5281/zenodo.3965693>; Niesel, D., Vilter, N., Zollitsch, L. and Wilder, N. (2021). Path2Integrity feedback sheet (1.0.0). Zenodo. <https://doi.org/10.5281/zenodo.5763478>; Munafò, M. R., Chambers, C., Collins, A., Fortunato, L., & Macleod, M. (2022). The reproducibility debate is an opportunity, not a crisis. *BMC Research Notes*, 15(1). <https://doi.org/10.1186/s13104-022-05942-3>; Nosek, B. A., Alter, G., Banks, G. C., Borsboom, D., Bowman, S., Breckler, S. J., Buck, S., Chambers, C., Chin, G., Christensen, C., Conroy, M., DeFino, A., Fish, E., Frazier, L., Glasser, B., Greenberg, D., Greenberg, D., Heise, B. W.,

Pre-post study FAIR training

Prof. Dr. habil. Prieß-Buchheit

UNESCO. <https://www.unesco.org/en/natural-sciences/open-science>; Pownall, M., Azevedo, F., König, L. M., Slack, H. R., Evans, T. R., Flack, Z. M., Grinschgl, S., Elsherif, M. M., Gilligan-Lee, K. A., Oliveira, C. M. F., Gjoneska, B., Kalandadze, T., Button, K. S., Ashcroft-Jones, S., Terry, J., Albayrak-Aydemir, N., Děchtěrenko, F., Alzahawi, S., Baker, B. J., . . . Sadhwani, S. (2023). Teaching open and reproducible scholarship: a critical review of the evidence base for current pedagogical methods and their outcomes. *Royal Society Open Science*, 10(5). <https://doi.org/10.1098/rsos.221255>; Priess-Buchheit, J. (2021). Path2Integrity Learning Cards: First Year Experiences of an Educational Programme to Foster Research Integrity.; Prieß-Buchheit, J., Häberlein, L., & Lindemann, T. (2021). Path2Integrity Learning Cards; Handbook for trainers and lecturers: M-Series. Arpha Preprints. <https://doi.org/10.3897/arphapreprints.e66719>; Prieß-Buchheit, J., Aro, A.R., Demirova, I., Lanzerath, D., Stoev, P., Wilder, N. (2020) Rotatory role-playing and role-models to enhance the research integrity culture. *Research Ideas and Outcomes* 6: e53921.; PRIM&R - Responsible Conduct of Research: Concepts and cases. (n.d.). <https://primr.org/short-courses/responsible-conduct-of-research>; Science, E. O. G. (2024, February 22). Browse data: Guide - The Embassy of Good Science. The Embassy of Good Science. <https://embassy.science/wiki/Special:BrowseData/Guide>; Sefcik, L., Striepe, M., & Yorke, J. (2019). Mapping the landscape of academic integrity education programs: what approaches are effective? *Assessment & Evaluation in Higher Education*, 45(1), 30–43. <https://doi.org/10.1080/02602938.2019.1604942>; Shanahan, H. P., Hoebelheinrich, N., & Why e, A. (2021). Progress toward a comprehensive teaching approach to the FAIR data principles. *Patterns*, 2(10), 100324. <https://doi.org/10.1016/j.patter.2021.100324>; Sira, N., Decker, M., Lemke, C. et al. (2024) Teaching Scientific Integrity in Academia: What and How Students Want to Learn?. *Journal of Academic Ethics*. <https://doi.org/10.1007/s10805-024-09527-6>; Toribio-Flórez, D., Anneser, L., deOliveira-Lopes, F. N., Pallandt, M., Tunn, I., & Windel, H. (2021). Where do early career researchers stand on open science practices? A survey within the Max Planck Society. *Frontiers in Research Metrics and Analytics*, 5. <https://doi.org/10.3389/frma.2020.586992>; Training. (n.d.). FAIRsFAIR. <https://www.fairsfair.eu/events/training%20/>; Trinity College Dublin. (2017, July 10). The FAIR Principles – Parthenos training. <https://training.parthenos-project.eu/sample-page/manage-improve-and-open-up-your-research-and-data/introduction-to-research-data-management/the-fair-principles/>; UK Data Service. (2023, July 12). Research data management - UK Data Service. <https://ukdataservice.ac.uk/learning-hub/research-data-management/> UK Government Web Archive. (n.d.). <https://web.archive.org/web/20230901115250/https://www.ukri.org/funding/guidance-for-applicants/research>