Promoting Excellence in Research

Learning about Research Integrity

Path 2 Integrity

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Content

Introduction

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With thanks to Lisa Häberlein and Oliver Claas

Lack of knowledge on how to produce reliable research results and how to manage breaches of integrity in the process of conducting research studies are the two reasons why research misconduct appears. In the last decades, the research community has encountered severe cases of both misconduct due to lack of knowledge and through breaches of integrity. These cases revealed that some researchers commit fraud by plagiarising texts, data and graphics; falsifying research materials; tampering with equipment; or fabricating research results. They may also fail to know specific research procedures, habits, or standards.

Furthermore, evidence indicates that research misconduct is a more widespread phenomenon than these severe cases would indicate[1]. "Failing to follow good research practices violates professional responsibilities. It damages the research processes, degrades relationships among researchers, undermines trust in and the credibility of research, wastes resources and may expose research subjects, users, society or the environment to unnecessary harm"[2].

Of course, there are various views about what research integrity stands for. For the purpose of starting a dialogue on what research integrity means within the research environment, the following characterisation can stimulate discussion: "Researchers with research integrity produce results that society can rely on. Researchers with research integrity are able to explain step by step how they arrived at their research results. Furthermore, the results should be reproducible by others … Researchers are both supported by and observed within their research environment. Some people specialise in observing and advising to keep research reliable and trustworthy. Their tasks are outlined in research ethics commissions policies, codes for good scientific practice, task descriptions of ombudspersons, declarations of data protection etc."[3]

[1] See Fanelli, D. (2009) How Many Scientists Fabricate and Falsify Research? A Systematic Review and Meta-Analysis of Survey Data. PLoS ONE 4.5, e4738, pp. 1–11.

[2] ALLEA – All European Academies (2017) The European Code of Conduct for Research Integrity, Revised Edition, Berlin, p.8.

[3] See Priess-Buchheit, Julia, & Haeberlein, Lisa. (2019, September). Learning Card For Research Integrity (S1) (Version 1). Zenodo. https://doi.org/10.5281/zenodo.3383671.

Why is Research Integrity important for you?

As pointed out by the Science Europe Working Group, there are seven reasons why you should emphasise research integrity[4]:

1. Research Integrity Safeguards the Foundations of Science and Scholarship

2. Research Integrity Maintains Public Confidence in Researchers and Research Evidence

3. Research Integrity Underpins Continued Public Investment in Research

4. Research Integrity Protects the Reputation and Careers of Researchers

5. Research Integrity Prevents Adverse Impacts on Patients and the Public

6. Research Integrity Promotes Economic Advancement

7. Research Integrity Prevents Avoidable Waste of Resources.

To cope with knowledge gaps and breaches of integrity, the research community has combined forces in prevention, education, awareness raising, and sanctioning, for example by developing and spreading learning materials and campaigns, involving ombudspersons, publishing codes of conduct and generating procedures for misconduct investigations. In the last decades the research community took over their responsibility to an increasing degree, fostering these and other actions (especially the ones tackling breaches of integrity) under the umbrella of Research Integrity, and emphasised the features of reliable research results, excellence, and trustworthiness. From an educational perspective these actions for research integrity set significant benchmarks.

In the following pages, as part of Path2Integrity (www.path2integrity.eu), authors outline some of the benchmarks of Research Integrity. What is Path2Integrity? – Path2Integrity is a European project, funded by the European Commission, that raises awareness about research integrity as well as providing education on how to argue in favour of responsible research and reliable research results. Path2Integrity offers two approaches supporting research integrity. Using Path2Integrity's learning cards, (future) researchers can develop competencies to avoid misconduct and to stand for excellent research practice themselves. Meanwhile, Path2Integrity's campaign materials can help research organisations raise awareness on research facts about research integrity and role models.

[4] Headlines from: Seven Reasons to Care about Integrity in Research, from the Science Europe Working Group on Research Integrity (2015) Online resource: https://www.scienceeurope.org/media/42sphgqt/20150617_seven-reasons_web2_final.pdf. (accessed 28 November 2019)

What are researchers' obligations in research integrity?

While the broader research environment has significant influence on whether research is conducted in a reliable manner, it is also very much in the hands of researchers throughout the span of their career. In large research systems comprised of researchers, scientific journals, government, regulatory agencies, funding agencies, and more, every stakeholder has an influence on whether research is conducted responsibly.

Researchers' obligations can be manifold here. This booklet emphasises the following two contexts, because they are at the core of Path2Integrity's project:

1. Both early career researchers and experienced researchers conduct their research in a responsible manner to achieve reliable results;

2. In a research community, experienced researchers and early career researchers are both role models for others, especially for students, and lead them with integrity.

The following quote from the European Code of Conduct gives early career researchers orientation and reminds experienced researchers which fundamental principles guide good research practice:

▶ "Reliability in ensuring the quality of research, reflected in the design, the methodology, the analysis and the use of resources.

▶ Honesty in developing, undertaking, reviewing, reporting and communicating research in a transparent, fair, full and unbiased way.

▶ Respect for colleagues, research participants, society, ecosystems, cultural heritage and the environment.

▶ Accountability for the research from idea to publication, for its management and organisation, for training, supervision and mentoring, and for its wider impacts"[5].

So, what are researchers' obligations in ensuring research integrity? How do researchers actively tackle breaches of integrity, such as fabrication, falsification and plagiarism, as well as lack of knowledge in practice? They tackle both breaches of integrity and lack of knowledge by teaching future researchers, mentoring their employees, carefully reviewing data sets and articles, adequately responding to accusations, and much more. All these different approaches foster reliable research results.

With this booklet we actively want to tackle breaches of integrity by inviting both early career researchers and experienced researchers to explicitly argue in favour of responsible research conduct and reliable research results. Let us start to foster a culture of research integrity.

[5] ALLEA – All European Academies (2017) The European Code of Conduct for Research Integrity, Revised Edition, Berlin, p. 4.

What is research integrity and why is it important?

Arja R Aro, based on ALLEA: The European Code of Conduct for Research Integrity, revised edition.

What is research?

Research can be understood as a systematic and transparent way to gain knowledge. Knowledge is needed to understand our world, develop technology such as robots, treatments for diseases, or ways to protect the environment. Thus, research is very important to society. Research needs to be trustworthy and carried out transparently. Research knowledge is not only about technology and science; it also needs to consider individual, community, and cultural values. New technology based on research (e.g. self-driving cars) needs to be carefully evaluated to decide if, where and how it could be used to serve humankind instead of causing additional harm.

Different stakeholders of research

Researchers are not fully independent in their work. Those who finance research (e.g. industry, ministries giving money) have the power to decide which research topics are studied. Research can be done in humans, animals, or the environment; integrity means that they all need to be treated with respect and harm should be avoided. Further, researchers need to act inclusively and respect each other. Most societies have established research integrity or research ethics committees to safeguard research quality.

[1] The European Code of Conduct for Research Integrity https://ec.europa.eu/research/participants/data/ref/h2020/other/hi/h2020-ethics_code_of_conduct_en.pdf

Principles of research integrity

The central principles of research integrity are reliability, honesty, respect, and accountability[1]. Reliability means that the research is done well, with a proper research design, relevant methods, good data analysis, and rational use of resources. Honesty means that research is planned and done, evaluated and communicated transparently, fairly, and without biases. Respect covers colleagues, research participants, the society, ecosystem, culture and environment. Accountability (=responsibility) covers the research process from conception to publication, management and organisation, training, supervision and mentoring juniors, and managing the wider impact of research.

Good research practices

The research environment should value integrity and deal with violations to good research practice. When research material and management are well organised, research can be reproduced. Training, supervision, and mentoring should aim at good and rigorous research process and methods, relevant integrity and ethics regulations and codes, and it should involve researchers, leaders, supervisors and mentors.

Research procedures need to be based on what is known about the topic already. Careful research process uses resources reasonably, publishes results with correct interpretations, respects the confidentiality of the information, and follows relevant reporting guidelines[2].

Safeguards cover relevant regulations and codes and deals with research subjects (human, animal, cultural, biological, environmental, physical) with respect and care; considers the health, safety and welfare of the community and collaborators; and is sensitive to age, gender, culture, religion, ethnic origin, and social class.

Data practices and management need to ensure transparency and access to data 'as open as possible, as closed as necessary' and be FAIR (Findable, Accessible, Interoperable, Re-usable) as well as to respect the intellectual property rights (IPR) of research outputs. In Europe, new regulations have been produced for data protection[3].

Collaborative working means that all partners take responsibility for research integrity, agreeing on the goals and the need for open communication; on following codes, laws and regulations; and on handling conflicts. All partners are informed and consulted about submitting the research report for publication.

Publication and dissemination: All authors are fully responsible for the content of research publications (unless otherwise stated). Author order is agreed together; authorship needs to based on significant contributions to the design, data collection, analysis, and interpretation of results.

Generally, results should also be openly communicated to the general public both in traditional and social media. All collaborators, funders, and assistants need to be acknowledged; conflicts of interest need to be declared. Negative results (meaning e.g. that the intervention studied did not work) are as valid as positive ones.

Reviewing, evaluating and editing: Researchers take seriously their commitment in refereeing, reviewing, and evaluating research manuscripts, funding or job applications, promotions, and rewards; they carry out these tasks transparently and justifiably, declaring a conflict of interest when relevant.

Violations of research integrity

Failing research integrity and good practices means renouncing one's professional responsibilities; it damages the research process, degrades relationships between researchers, undermines the trust and credibility of research among people and society, wastes resources, and may also bring danger or even harm to research participants, users, the society, or the environment.

Research misconduct and unacceptable practices

Misconduct can happen in writing a research plan, doing research, reviewing it, or reporting it. Fabrication means making up results and presenting them as real. Falsification is manipulating research material, equipment, or the process, or changing, leaving out data or results without justification. Plagiarism happens when someone uses other people's work and ideas without giving proper credit (=referencing) to the original sources, thus violating the IPR of the original authors.

[2] Reporting guidelines: example: Enhancing Quality and Transparency of Health Research https://www.equator-network.org/about-us/what-is-a-reporting-guideline/

[3] General Data Protection Regulation (GDPR) https://gdpr-info.eu/

Dealing with violations and allegations of misconduct

Violations need to be dealt with transparently and consistently, considering integrity and fairness. Integrity means that investigations of suspected misconduct are fair, confidential, comprehensive and quick. Investigations should be accurate, objective and thorough. Conflicts of interest need to be declared; conclusions should be reached; and whistle blowers need to be protected. Further, the procedures for dealing with violations need to be publicly available and accessible to ensure their transparency and uniformity.

Fairness means that the process is fair to all parties; those accused of misconduct are given full details of the allegations and allowed a fair process for responding to allegations and presenting evidence. Action to those shown to have participated in misconduct has to be proportionate to the severity of the violation. Appropriate restorative action is taken when researchers are freed from suspected misconduct. It needs to be remembered that anyone accused of research misconduct is presumed innocent until proven otherwise.

Dealing with misconduct and unacceptable practices. The researchers' perspective

Nicole Föger

It might happen that a researcher observes a behaviour that doesn't seem to be in line with good research practice. This might happen in the same institute or in a project with partners from other institutions and/or even other countries.

Usually this is the first time the researcher has to look for existing guidelines on research integrity and the processes for dealing with research misconduct at their own institution. How do they know if research misconduct or unacceptable practices occurred? Is there a national code

of conduct or are there any specific research integrity guidelines at the researcher's institute? If so, do these guidelines state that the observed misbehaviour falls under the definition of research misconduct or unacceptable research practices? Do they also state where one has to go and report it?

In a collaboration with project partners from other institutions or even other countries, it is highly recommendable to establish written agreements for how to deal with joint results and findings, but also what to do when there is a breach against the rules of good scientific practice: which guidelines on research integrity to follow (e.g. the European Code of Conduct) and who is responsible for dealing with cases of research misconduct. In large consortia the establishment of an ombudsperson or confidential person for conflicts could be considered as well.

If there is an ombudsperson or other designated official at their institution, the researcher can talk to them confidentially to seek preliminary advice and discuss what to do and how to deal with the situation. The ombudsperson is usually not the person that investigates allegations. On the other hand, in research funding organisations research integrity issues are often dealt with in the legal department.

If a researcher needs to make a formal allegation at the committee that handles cases of research misconduct, then a written statement is often needed. Usually information about the precise processes and procedures are part of the corresponding website. For instance, are anonymous complaints accepted? What are the complainant's further responsibilities and duties? Is there any protection from possible retaliation

What can a researcher do?

▸ Take a course about good research practice and let all your staff members attend such courses.

▸ Have regular working meetings discussing results and challenges in an open culture; let staff members talk about errors and mistakes. Offer support and advice and do not spread fear amongst them.

▸ Always check raw data before publishing manuscripts and submitting projects proposals.

offered? Will the accused know the name of the complainant? What about confidentiality during and after the investigation?

By all means, make use of all support you can get, but be careful about confidentiality and do not try to solve this difficult situation alone!

Finally, senior researchers as leaders have a special responsibility in creating and fostering an open culture of research integrity. Not only are they role models, but they also have responsibilities to train early career researchers in all matters of good scientific practice. Senior researchers should facilitate open discussion about challenges in daily research work and the opportunity to speak freely about mistakes and failures someone faced.

Promoting research integrity. Best practices for individual researchers

Dick Bourgeois-Doyle

Though statements on the promotion of research integrity often focus on the administrative and policy structures, most acknowledge that success ultimately rests on the attitudes and day-to-day actions of individual researchers[1]. UNESCO's statement on appropriate scientific practice (The UNESCO Recommendation on Science and Scientific Researchers)[2] was, for example, revised and renamed in 2017 to stress equally the obligations and rights of the individuals who pursue science as well as national systems and the larger scientific enterprise.

[1] The Mutual Learning Exercise on Research Integrity (2019) https://rio.jrc.ec.europa.eu/en/policy-support-facility/mle-research-integrity

[2] The UNESCO Recommendation on Science and Scientific Researchers (2017) https://en.unesco.org/themes/ethics-science-and-technology/recommendation_science

Researchers at all levels thus have a recognised responsibility to contribute to building a research workplace that is healthy, open, and honest.

Senior researchers provide guidance, direct others, and set an example that frames a laboratory's tone and attitudes. Junior researchers should not use inexperience as an excuse for lapses; they have a special responsibility to learn institutional expectations and accepted standards.

Sampling of best practices for individual researchers

▸ **Understanding and modelling institutional expectations**

Individual researchers have a duty to be familiar with their institution and research system's research integrity expectations, to follow these requirements in their own work, and to reference policies and processes whenever appropriate when collaborating with others. This obligation means more than merely taking institutional training as required; it also urges individuals to seek out other opportunities to learn through literature and voluntary workshops and to access resources online[3]. Researchers should also recognise that integrity in research extends beyond prescribed ethical standards and also requires knowledge of and adherence to rigorous methods in the maintenance of research records and data analysis. In conjunction with reference to such prescribed expectations, all research activities should be imbued with a general attitude of openness and honesty.

▸ **Creating an environment for dialogue and communication**

Open dialogue and supportive work environments are critical ingredients to any effort to foster integrity in research, and these are areas in which all researchers

have a role to play. Again, this effort can be founded upon awareness of processes and expectations. Though these administrative requirements and policy provisions can seem abstract in isolation, they offer useful tools for discussing and resolving difficult issues in the laboratory. If, for example, an institution or programme has set out clearly defined requirements around authorship and attribution, the rules can defuse difficult discussions and make the process of publication more efficient. A source of expertise in research integrity issues and processes can be a useful resource within a research group and the basis for constructive mentoring. Researchers should thus consider maintaining awareness of relevant trends and issues within their disciplines.

▸ **Supporting investigation of research misconduct**

Research integrity policies are by necessity coupled with provisions for the formal investigation of allegations of research misconduct and other breaches of these policies. This process typically calls for creating investigation committees and mechanisms for appeals and involving peers in processes that strive to respect the

rights of all parties. Individual researchers, not involved directly in cases, may therefore be called upon to contribute expertise and possibly serve on investigation and review committees; they should do so, recognising the critical importance of expert involvement in a fair and competent resolution of these issues. All research staff also have a responsibility to address and communicate likely breaches of research integrity to authorities as appropriate and to cooperate with relevant journal and government inquiries as well as institutional procedures.

▸ **Continuous improvement**

Because incidents of research misconduct and even minor breaches of policy can affect the reputation of institutions as well as the individuals involved, a strong impulse to minimise communication and discussion of incidents (both during investigations and in the aftermath) can be expected in many organisations. However, a best practice, founded upon the desire to learn and improve, is to review lessons learned with all stakeholders and, in fact, to formally communicate the findings of investigations to key parties, such as journals that may need to retract or correct publications. Other individual researchers (not only co-authors and laboratory collaborators) may be

affected by these measures and thus have an active interest in any efforts to rehabilitate reputations. In fact, researchers should seek opportunities to discuss experiences with peers and learn while respecting privacy and legal considerations. Should a researcher's institutional policies and processes lack clarity, researchers should raise their concerns with appropriate authorities and volunteer for policy working groups or other exercises aimed at improvement. Equally, researchers should not only participate actively in training programmes, but provide feedback on the format and content to benefit other colleagues and to help foster a research integrity culture in their organisations.

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³ U.S. Office of Research Integrity – The Lab – training tutorials https://ori.hhs.gov/thelab

The distrust of science and research: how to communicate the thorny issues

Raül Toran

Without science there is no progress[1]. Countries do not research because they are rich; they are rich because they have invested money to do research[2]. Advances in science and technology make us advance and allow social, cultural, economic and health improvements of the population. Research, development and innovation (R&D+I) allow improvements in production processes and citizens' life. Advances in science have allowed us to live longer. Globally, life expectancy has increased in just two centuries from less than 30 years to over 70

[1] Sin ciencia no ha progreso. Juan Ignacio Pérez https://culturacientifica.com/2012/05/02/sin-ciencia-no-hay-progreso/

[2] Los países no investigan porque son ricos, son ricos porque investigan. Bernardo Herradón. Madri+D. 02/01/2012. https://www.madrimasd.org/blogs/quimicaysociedad/2012/01/02/133011

years (80 in the case of Japan, Italy and Spain), and according to some trends, it will reach 100 years by the end of this century[3]. All this is thanks to social and medical (scientific) advances. Despite the advantages of R&D+I, there are certain fields that do not inspire confidence among the population[4], such as neuroscience, artificial intelligence, robotics, and genetic engineering. On the one hand, because they are far from citizens and on the other, because of the impacts and risks that they can have on health, employment or society itself.

According to Eurobarometer results from April 2019, almost half of the European public (48%) believes that vaccines can produce serious side effects, 38% think they can cause the diseases against which they protect, and 31% are convinced that they can weaken the immune system. These figures are also the result of an increased spread of disinformation about the benefits and risks of vaccines through digital and social media[5]. All this shows distrust in traditional medicine and reflects the great confusion between science and pseudoscience. Regarding the degree of confidence in childhood vaccines, 79% of people agree that vaccines are safe, and 84% agree that they are effective, according to the Welcome Global Monitor on how people around the world think about science and major health challenges[6].

How to deal with the perception of the risks of research

Science and research can bring advantages for society but also certain risks. For example, the development of artificial intelligence (AI) may give rise to the development of autonomous weapons or the manipulation of society

through fake news. This happened with the case of Brexit, where AI was used together with personal data and algorithms to manipulate information in order to change voters' intentions in a referendum. AI, like other technologies, can be a risk if we misuse it, but these technologies provide a great opportunity for economic and social development if we know how to make good use of them[7]. A fake article that related the triple viral vaccine with autism generated significant mistrust in vaccines. But several studies, the most recent of which was published in March 2019, studying more than 600,000 children in Denmark, have proved that this relationship is false[8]. Vaccines are safe and have prevented many deaths. The current distrust in vaccines has led to an increase in measles cases in Europe.

It is possible to deal with the perception of the risks of science through good communication of science and engagement with the public.

Citizens finance most science and research works through national budgets or grants, therefore their findings – whatever they might be – have to be communicated to the public in an objective and understandable way so that they are able to extract conclusions and judge the impact in their lives. Having an informed citizenship contributes to gaining more trust and avoiding misinterpretations[9].

[3] Viviremos 100 años, pero ¿cómo? Cristina Galindo. El País. 12/08/2018. https://elpais.com/elpais/2018/08/10/ciencia/1533911822_785860.html

[4] Los beneficios y riesgos de la ciencia, tecnología e innovación. Clara Inés Pardo Martínez. Portafolio. https://www.portafolio.co/los-beneficios-y-riesgos-de-la-ciencia-tecnologia-e-innovacion-516414

[5] https://www.who.int/news-room/detail/12-09-2019-vaccination-european-commission-and-world-health-organization-join-forces-to-promote-the-benefits-of-vaccines

[6] https://wellcome.org/what-we-do/our-work/public-views-science-and-health

[7] Is Artificial Intelligence Dangerous? 6 AI Risks Everyone Should Know About? Forbes. Bernard Marr. 19/11/2018. https://www.forbes.com/sites/bernardmarr/2018/11/19/is-artificial-intelligence-dangerous-6-ai-risks-everyone-should-know-about/#5a69fb752404

[8] https://elpais.com/elpais/2019/03/05/mamas_papas/1551783023_370147.html

[9] Young Scientists Code of Ethics. World Economic Forum. January 2018. https://widgets.weforum.org/coe/

Tips for good communication

If you want to communicate well about controversial issues, keep in mind these tips[10]:

▸ Make sure your main message is clear.

▸ Be objective about the topic.

▸ Be fully aware of all sides of the issue.

▸ Keep it cool and conflict-free.

▸ Be comfortable with your position and with yourself.

▸ Establish yourself as an expert source.

▸ Be careful when communicating risks or benefits identified in your research in order not to create false expectations.

▸ Do not use personal attacks: they may cause the public to question your motives and objectivity.

▸ Provide science education and engage with the public, participating in events like science fairs, parliamentary scientific committees, and science and research dissemination programmes with schools.

▸ If possible, contact your press or media officer in your institution to get help in the research process for disseminating the results.

It is very important to remember that communication and engagement with the public is a great opportunity to make your research visible and to communicate directly with citizen groups to discuss the implications of your work. Explaining what is currently known reinforces the transparency of research and fosters trust[11].

[10] Martha Filipic (Ohio State University). Tips for Communicating Controversial Issues - https://communications.cfaes.ohio-state.edu/resources/marketing-and-brand-strategy/tips-communicating-controversial-issues

[11] http://www.sirc.org/messenger/

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