SCHILLER & MERTENS

SCIENTISTS NEED MORE

Good Scientific Practice

In public, "good scientific practice" is often connected with cases of plagiarism when it comes to dissertations. However, the important topic covers a substantially wider spectrum of scientific conduct: Dealing with data (including checking, recording, ownership and storage), the publishing process and authorship, responsible supervision, academic cooperation, conflicts of interest and dealing with conflicts. Inappropriate academic behaviour includes inventing or faking data, violating intellectual property (theft of ideas or plagiarism), and sabotaging the research of others. More subtle topics, such as skepticism, critical thinking, reproducibility, handling creativity, the danger of axiomatic assumptions and confirmation bias represent the “heart of good scientific practice”. Every Ph.D. student should have a professional understanding of all mentioned topics.

❖ Codes and values of good scientific practice

- Systematic skepticism: openness to doubt, even about one's own results and about the results of one's own group.
- Reproducibility: The more surprising or the more hoped-for a result, the more important it is – within the bounds of reasonable cost and effort – to independently reproduce the means of achieving the result within the research group before communicating it externally
- Realization of tacit, axiomatic assumptions (awareness of own assumptions)
- "Wishful thinking" motivated by self-interest or morals
- Confirmation bias in planning, pursuing and analyzing experiments
- Systematic alertness to any possible misinterpretations as a consequence of the methodically limited ascertain ability of the object of research (over-generalization)
- Criteria of evidence in interdisciplinary research
- Critical and creative thinking: pitfalls in the creativity process, genealogy of ideas, inspiration versus theft of ideas (Austin Kleon: “Steal like an artist”)

❖ Collaboration between supervisors, colleagues and junior researchers

- Tasks of leadership, monitoring, conflict resolution, quality control
- Active promotion of junior scientists' scientific qualifications (mentoring, thesis committee, etc.)
- Openness to criticism and doubt expressed by other scientists and team colleagues
- Giving and receiving feedback
- Hindrance of the scientific work of others

❖ Handling of data

- Precise observance of discipline-specific rules for acquiring, selecting and processing data
- Reliable securing and storage of primary data for 10 years; clear and comprehensible documentation of the methods employed (e.g. lab book) and all important results

❖ Publishing

- Publication on principle of research results (principle of the public availability of the results of research)
- Fair evaluation and citation of any literature used
- Honesty in the recognition of the contributions of colleagues when writing reviews
- Careful, altruistic and impartial appraisal of colleagues
- Appropriate correction of published mistakes
- Making research results, achieved with public funds, freely available wherever possible
- "Honory authorship", delaying of reviews, performance of biased appraisals, performance of an appraisal where there is a suspected or actual conflict of interests

❖ Conflicts of interest

- Conflicts with colleagues, group leaders, collaborations, companies, spin-offs, publishing companies, funding agencies

❖ Definition of scientific misconduct

- Definitions of good scientific practice and scientific misconduct
- Degrees and extent of scientific misconduct
- Examples for responsible and irresponsible conduct of research

❖ Dealing with (alleged) scientific misconduct

- Conflict management
- Guidelines from DFG