Good Scientific Practice in mathematics

Ulrich Görtz

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GSP – what does that mean in practice?

… “don’t copy and paste from work of others”

but more than that: …

GSP – what does that mean in practice?

- research (e.g., how to deal with result you want to use but do not have time to check in detail, or do not understand? How to deal with mistakes?)
- writing (proper attribution, how/when to write down ‘known results’, …)
- publishing (authorship, predatory journals, …)
- applying for a job (being honest in one’s CV, publication list)
- resolution of conflicts
- other aspects (less prominent today; e.g., refereeing, reviewing, advising students, hiring, conflicts of interest)

Workshop, not a lecture

We will go through some of the relevant topics. I want to mention some points and questions.

Often, these questions do not have a clear answer. What one should do:

- Try to identify possible issues, and make a conscious, informed decision,
- do not simply choose the solution that’s easiest / comes with the least work for you.
- Talk to others (your advisor, peers, mentors).

Research, scientific honesty

Goals of research

- advance the field of mathematics
- understand an open question yourself
- get a degree / a job

Scientific standards

- obtain correct results with complete proofs
- obtain new/‘original’ results
- obtain ‘interesting’/‘relevant’ results
- keep up with others’ work, acknowledge/reference properly
- publish your results in understandable/accessible form

Documenting the research process

Why and how should you document your research? – goals, requirements?

Some aspects:

- General requirement of scientific method: ‘reproducibility of results’ – clearly, mathematics is different from (natural) science here.
- It sometimes (often?) does require an effort to document things in a way so that (at least) oneself is able to understand them when coming back to the files after several months. At least when you write a text you want to publish, then that effort should be made.
- In most cases, in theoretical mathematics, a paper (or thesis) should contain the ‘complete’ documentation of the proofs of its results.

Choice of research topics

… in relation to other people working on the same subject.

When is it (not) OK to work on a problem that someone else is working on?

- Surely OK: Work on the Birch/Swinnerton-Dyer conjecture
- not OK: ‘work out’ an idea someone else told you about as her/his current project

Risks for yourself? (PhD thesis must contain ‘new contribution’)

(Ideally (and usually), for PhD projects the advisor will take care of this.)

Overlap in topics

What to do if you notice overlap with your research and someone else's?

Strategies for resolution

- Work together
- Discuss with the other party how each of you could focus on different aspects
- Ignore it and try to be the first to 'prove the theorem' (risky …)
- Switch the topic (could be frustrating; but could come back later)

Controversies around originality of work

… and how to protect yourself.

- Let people know what you are working on.
- Keep your eyes open what others are doing.
- Acknowledge work by others.

While not in all cases, mostly such controversies are handled ‘on a benevolent basis’, and that should be your first aim.

Writing

What should be your goals when writing a thesis/a paper?

- documenting research results for oneself (quality assurance; archiving thoughts for coming back later)
- documenting one’s research results for others, advancing mathematics
- submit one’s work to a peer review process
- get a degree, add items to one’s list of publications (… to find a job)

Writing well/accessibly

(Only indirectly related to Good Scientific Practice. We will probably have an RTG-workshop on “mathematical writing” at a later point.)

Slogans:

- Keep in mind your prospective readers.
- If in doubt, an additional effort should be made by the author, rather than putting it on the reader.

Writing - plagiarism

Copying of another person's ideas, text or other creative work, and presenting it as one's own.

Types of plagiarism:

- Copying word-by-word (never do this in math texts, even with a reference)
- Translating word-by-word (never do this in math texts, even with a reference)
- Structural plagiarism
- also: Self-plagiarism, present previous work as new

Slogan

If your text could not have been written in the way it is written without a certain source, you must make this clear to the reader.

Plagiarism – other aspects

Can I use a figure/illustration from another paper?
(scanning vs. redoing it …)

Delineation of *good scientific practice* vs. *legal constraints* (intellectual property, copyright …)

References

Why/when give references?

Generally: attribution for work of others.

- supply parts of the proofs that you do not do yourself,
- preliminaries/known results that you include in your manuscript,
- acknowledge work by others on the same topic,
- put your own work into context,
- delineate your work from work of others (e.g., different conventions).

Slogan

In a (PhD) thesis/paper, there is an implicit claim that everything that is not attributed to a different source, is original work by yourself.

Best practices

Do not postpone ‘adding references’, but do this from the beginning; use LaTeX/bibtex

Separate *learning* from *writing down* known results

- learn the topic, typically from different sources,
- later (not on the same day), write down *your own account*, with all books closed,
- spend time in particular on those things that you found difficult.

Good/bad references

Problematic:

- omitting relevant references
- superfluous references to make your work seem more important; exceedingly long lists of references
- references to one's own papers to increase number of citations
- imprecise references to long works (but when would this be legitimate?)
- references that 'hide gaps' in your papers (references to statements of results without proofs)

Where should references point?

- usually: first occurrence – give credit to the person who proved the result,

  if appropriate/necessary add further references (*see also …*) for more accessible sources
- for ‘standard’ results: look for a standard reference (in algebraic geometry, e.g., EGA, SGA, Stacks project).
- if possible, prefer *well-known, easily accessible, trusted* over *obscure, hard to find, many typos/small mistakes*.

Be careful with references to unpublished work, private communication.

What are examples when no reference is needed? (‘Classical’ results that go by a common name, e.g. the theorem of Riemann-Roch)

Do I have to check all references?

Specifically: Can I (/when can I) use results whose proof I do not understand?

- depends on the situation, and should be avoided if possible; but sometimes is ‘necessary’
- at least try to get some intuition, learn a few examples, etc.,
- sometimes a fact you need can be taken as an ‘axiom’

What about results that have not yet been published in a journal / as a preprint?

Known results

When to write down ‘known results’ (thesis vs. journal publication)

…and ‘obvious’ generalizations

- Can serve to make your text self-contained (service to the reader).
- Allows to give a ‘nice’ summary, improving on the original exposition.
- Allows adapting things to your setup/notation conventions.
- Who takes the responsibility for the correctness?
- What is the proportion of ‘known material’ vs. ‘new results’ in your manuscript?
- Is it (or is it not) in your interest to make your paper/thesis longer? (and should this play a role?)

Known results – slogans

- *Copy and paste* is never appropriate.

  Almost always, you will want to use your own notation, add some comments, emphasize points that will become important later in your paper, etc.; if none of this applies, then a citation might be enough.
- Especially in a thesis, giving your own detailed account of some ‘known results’ in more detail can be a good idea.

Claiming results without giving a proof

Why can this be problematic; when is it OK?

‘Gatekeeping’, possibly diminishing others’ future work

Related: “… we will come back to this in later work”

Acknowledgments

People and institutions that have supported you ‘mathematically’ in writing the text at hand.

Thesis: your advisor.

Publication coming out of a thesis: your advisor, the institution.

Publications, in general:

- people (discussions, pointers to the literature, …, if ‘substantial’)
- formal: third party support, host institutions of visits (or possibly conferences, if relevant to the publication); (typically not the institution where you are employed)

Dealing with mistakes

What do you do, if you

… find a serious mistake in papers by others?
(usually: get in touch with the author; before that, you may first want to think about whether you can fix the problem).

… find a serious mistake in your own papers?
(try to fix it …, maybe: notify referees, publish an erratum)

Delineation:

- honest error,
- negligent error,
- misconduct.

Authorship

Who should be named as an author of a publication?

- ‘fame’ vs. ‘responsibility’
- As a rule, authors are listed in alphabetical order. There are very few exceptions to this.
- Sometimes: Appendices, can have their own authors

What could be a scenario when the advisor of a thesis should be a coauthor of a paper resulting from the thesis?

The way this is actually handled depends very much on the subject area…

Choice of journal

- reputation of the journal
- general audience vs. specialized
- editor who will (probably) handle the paper (and select referees)
- have similar papers (topic, length, ‘quality’) appeared in the journal?
- publisher
  (commercial, semi-commercial, non-commercial, predatory journals)
- open-access
- typesetting quality
- time until decision/publication, “backlog”
- the copy-editing process

The process of submitting a paper

1. (if applicable) Discuss the ‘final’ manuscript with your advisor
2. (optionally) Send the new version of the ‘final’ manuscript to a few people to get feedback
3. Put your manuscript on the arXiv server (and maybe wait another two weeks for feedback)
4. Submit your paper to a journal (but to ONLY ONE journal at a time)
5. (make sure to get a confirmation your manuscript was received)
6. … wait…
7. After 6 – 9 months, it is legitimate to inquire when you can expect a report
8. If your paper is rejected, hopefully you got some feedback that you should take into account, revising the paper. Then jump back to step 4.

Do not get frustrated!

The process of submitting a paper, continued

9. If your paper is (provisionally) accepted, submit a revised version (and maybe wait some more …)
10. After the definitive acceptance, congratulations! You can now list the paper as *accepted for publication* or as *to appear in …*
11. When you receive the proofs after the ‘copy-editing’, carefully check the proofs sent to you.
12. If applicable: Negotiate about copyright (publisher/author), pay the open-access fee, order printed copies (probably old-fashioned)
13. Put a link on your web page and update the arXiv record

Applying for a job, writing a grant proposal

(being honest in one's CV, publication list)

- Submitted $\neq$ positive report $\neq$ accepted for publication ($\approx$ published)
- be transparent about non-peer-reviewed publications
- be transparent about 'guest status' vs. 'employed'
- be transparent about role in third party projects

Do mention 'special circumstances', in particular child care duties and similar things.

Consequences of violations of the rules

…in theses. (See §14 of the ‘Promotionsordnung’.)

- you might not be awarded a degree,
- of the degree could be revoked,
- (in theory) a fine could be imposed,
- other parties could take action (your employer, the DFG, …)

…in publications.

- the manuscript could be rejected (if it has not yet been accepted),
- or the paper could be revoked (if it had been published),
- other parties could take action (your university, the DFG, …)

…in applications.

- you might not get the job,
- in extreme cases, you might lose the job after being hired.

Resolution of conflicts

What to do if you notice misbehavior? / or are accused of scientific misconduct?

Talk to

- Your advisor
- RTG mentors
- Gute Wissenschaftliche Praxis at the University of Duisburg-Essen
- Ombudsperson at the German Research Foundation DFG

Further topics in Good Scientific Practice

…less relevant in “pure mathematics”

- ‘dual use’ (technology (or research results) that can be used for both peaceful and military aims),
- data/source code handling.

…less relevant for PhD students

- grading exams,
- refereeing papers,
- reviewing grant proposals,
- conflicts of interest (/conflict of commitment),
- advising students,
- hiring.

Sources /Acknowledgments

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References/pointers

- DFG, Leitlinien / Kodex, Verfahrensleitfaden
- also see Balleier, Kiefer, Der Kodex “Leitlinien zur Sicherung guter wissenschaftlicher Praxis” der DFG, Mitteilungen der DMV **29**/4 (2021).
- Ethical policy for the Journals of the London Mathematical Society
- Ethical guidelines of the AMS
- `https://en.wikipedia.org/wiki/Ethics_in_mathematics`
- Slides by M. Schüssler, MPI for Solar System Research,

Inclusivity in science/mathematics

What are relevant aspects of this for you?

- specifically at ESAGA,
- specifically in Germany (or other places),
- in general?

If there is interest, we should have a workshop of its own on this topic.
Suggestions? Invite outside experts?

Feedback on this workshop

Also: please do give feedback by email or via anonymous feedback link, if something comes to your mind later or if you would prefer to give anonymous feedback. (Especially: What did you not like?)

https://www.esaga.uni-due.de/feedback/6Ps/

Other workshop themes that would be interesting for you?
(E.g., mathematical writing)