Scientific writing

Each scientific project culminates in writing scientific text. Reason is, that the data, information, and knowledge you gain by pursuing a scientific project only then becomes relevant if it is presented in a way that allows others to

1. comprehend what you did and why
2. understand what you found out
3. reproduce your work
4. embed it into state of the art in the research field

The only reasonable way to achieve this is, to cast the corresponding information into text, figures, and tables, just to mention the main three components of a text. Now, many people are not what one would call a gifted writer. Until recently, this resulted in text that leaves some room for improvement both with respect to content and style, and this after spending days and weeks on the text. Meanwhile, AI based solutions abound whose service can range from a mere polishing of your close to finished text to writing the entire text for you. Quite obviously, the latter is not acceptable irrespective of whether you write a protocol or a manuscript that is meant to be published in a scientific journal. Goethe University has compiled a catalogue of information about how you can make use of generative AI during your studies. Table 1 gives an idea about how to plan the use of generative AI tools[1)] . Please take a look at this information and stick to the rules that are specified therein. Discuss this topic also with your peers, tutors and professors.

Phase in the writing process	**Support through AI**	**Own contribution**
Topic selection and literature research	Brainstorming Rough overview of topics	Focus on finding scientific sources
Reading and excerpting	Summary/outline for initial overview; Simplify text passages	Thorough reading and revising AI-generated texts
Rough draft	Formulating bullet points; Cooperative freewriting	Jot down key points; Write to clarify your thoughts; Revise AI-generated texts
Revise	Generate different text versions; Adjust style/perspective	Select and adapt the appropriate text version; Obtain human feedback
Linguistic correction	Specialized tools such as DeepL, Write, and Duden Mentor	Check if meaning has changed

Table 1: Admissible use of generative AI during scientific writing

Lab protocols

Most practical modules in your curriculum require that you write a lab protocol at the end of your project. This lab protocol is your proof of achievement, and thus must be taken seriously, independent of whether it is graded or not. Please find below some information that should give you an idea of what to consider when writing a protocol.

There is a difference between a lab protocol, and the daily documentation of your work in the WIKI. You can write, in principle, a lab protocol as a set of WIKI pages, but then we expect that it adheres to the guidelines listed below

Objective

Before writing a lab protocol, you should ask yourself not only *why* your are writing a lab protocol, but much more *what you want to achieve* with the lab protocol. The answer is considerably simple: You write the lab protocol for

- yourself. It should bring you in the position to easily repeat your analysis - or parts of it - somewhen in the future, and probably at a time point where you can no longer do it from the back of your head[2)]
- for any other person that comes after you, such that this person has a chance to understand
  - what you did
  - why you did it
  - and how you did it

With the help of your protocol, any person should be able to quickly reproduce your analysis. If you keep this objective in mind, then you should already have a good idea of how to write a protocol.

How to write a lab protocol

It happens often that people have no clear idea of how to write a protocol. We have, therefore, compiled a short guideline of what to take into account when writing a protocol.

1. A protocol is a scientific text, and thus the same rules apply
2. A protocol is typically written for a short term project. Its focus is more on the technical part and the results, and less on answering a particular scientific question[3)]
3. A protocol is meant to provide
   1. all data
   2. all programs
   3. all analysis steps

   that are required to reproduce your analysis

Follow this LINK to get some additional ideas of how to write a good report

It is a good idea to carefully read the guidelines

How to write scientific text

Some additional points to consider

Below, we have compiled a collection of points that you should check before writing a protocol, and afterwards as well

Structure of the protocol

Try sticking to the standard structure, which is also referred to as the IMRAD schema

- Introduction
- Material & Methods
- Results
- Discussion
- References

Don't mix up the contents of the main sections! In particular, there is always the danger to write results in the discussion section, or vice versa! Likewise, people tend to write results into the methods section. Simply don't do it...

Figures

Before inserting a figure, think about what it should tell the reader, and then design it accordingly. In particular think about the final image size when drawing it. Figures for print are typically either 80 mm (single column) or 160 mm (two columns) wide.[4)]

Each figure...

- **has a figure number**. Figures have to be numbered in the order they are mentioned in the text. This rule applies also for the supplementary figures
- **has to be mentioned in the text**
- **has a short and informative title**
- **has a description that reflects the message of the figure**. Make sure that the figure description does not end up in the main text
- **should be interpretable on its own**. It is generally not optimal to refer to other figures (other than supplementary figures) in the figure caption. Likewise, you do not want to have figure descriptions in the main text.

Watch out for the following

- Screenshots as figures can be ok, but only when the image quality is sufficiently high.
- make sure that the font and the font size is uniform across the figures. Text must be sufficiently large to ease the access to the figure content.
- avoid figures in landscape format

Tables

Like with figures, think about the information that should be provided with a table

- **tables have to be successively numbered** according to the order they are referred to in the text. You must not mention Table 2 before Table 1.
- **each table has to be mentioned in the text**
- **each table has an informative title**. Table columns can be explained in the table footnotes
- **avoid landscape tables**
- **avoid tables that extend over more than one page**. Consider placing large tables into the supplement
- **don't use vertical lines to delimit table columns**. Horizontal lines to delimit rows are ok, though

Methods

- provide references for the programs you use, the URL from where you have downloaded it, and provide the program version together with the relevant parameter settings

References

Remember why we use references? This is because we have to back up each statement in a scientific text with supporting evidences. Supporting evidence is either your own data, or it stems from previously published **and** peer-reviewed literature with a stable digital object identified. In either case, the supporting information must be invariant with time. Thus, **Wikipedia cannot serve as a reference for scientific text** for several reasons. One of the most important ones is that article contents are subject to change over time! See the

PDF

provided by the Goethe University Frankfurt on this topic.

- Make sure that references in the text, and your bibliography is correctly and consistently formatted. We prefer the *author, year* format for in-text citations over numbers.

You can read more about how to cite in this document provided by the University of Cologne (in German only): Handout_Ueberpruefbarkeit

Abbreviations

Abbreviations, that cannot safely be considered common knowledge, have to be explicitly introduced.

- For example you can write “We used the *Quest for Orthologs* (QfO) set of reference proteomes…
- Species names have to be given in full length, before you start abbreviating them. For example you should write: ”(…) we extracted all ribosome biogenesis factors from yeast (*Saccharomyces cerevisiae*)“. Later in the text, you can then abbreviate the species name to *S. cerevisiae*.

Spelling

Most editors provide a spell checker. Make sure to use this!

Headings

Headings should be concise and informative. Something like ‘Getting an idea (of) how to use HaMStR…’ should be avoided. This could be reformulated to ‘Establishing the HaMStR Workflow for …'

Miscellaneous

- Use standards whenever possible
- briefly introduce relevant methods such that you - as well as any other person - comes into the position to understand what kind of analysis you are actually doing.
- Avoid lab jargon. For example, *to blast* is not the appropriate verb for *performing a Blast search* or even better for *searching for significantly similar sequences in a database using the Blast algorithm*
- Avoid group-internal abbreviations such as *DROME* as an abbreviation for *Drosophila melanogaster*
- Datensets
    - Introduce data sets that you use in your analysis in the Materials section, and make sure to explain where the data is located

1)
based on https://lehre-virtuell.uni-frankfurt.de/knowhow/einsatz-von-generativer-ki-im-studium-handlungsempfehlungen-fuer-studierende/; last accessed 2025-10-13
2)
since you have forgotten about all the details
3)
It is, thus ok to keep introduction and discussion concise
4)
it is not a good idea to draw figures in any size first and later re-scale them. This will result in font sizes and line weights that to be different for each figure!