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Guidelines & rubric for BSc and Msc theses

1. Guideline for reviewers

- Encourage your students to start writing their thesis in an early phase. For example, the introduction and parts of the methods can usually be written shortly after the start of the project (but will have to be updated/revised later).
- **A thesis should be the student's original product**. In the end, the student's work should be evaluated, not that of the supervisor. However, writing a thesis also involves the learning process of how to write it. This includes your feedback: offer your students to provide feedback on a final draft before they officially have to submit their thesis; ideally only once.
- As a supervisor, you should refrain from editing or even rewriting (parts of) student drafts. Try to give feedback from the reader's point of view (e.g., "the definition of this term is missing", "why/how does result X support this statement?", "to understand this, I need more details about X", ...).
- The guidelines in section 2 below are rather general: if for a specific project or for your discipline different or additional criteria should be taken into consideration by the student, please discuss these with the student.
- The table in section 3 below can be used to give feedback on a thesis draft, it can also be used to evaluate the final thesis. See also Reynolds et al. 2009 https://doi.org/10.1525/bio.2009.59.10.11

2. Guidelines for the preparation of theses

General

- Discuss with your supervisor and the reviewers of your thesis whether additional or different guidelines are to be followed for work in your field of research.
- As a general guideline, follow the style of a scientific original paper.
- Structure your work into: Table of contents, List of abbreviations, Summary, Introduction, Results, Discussion, Methods, Bibliography, (if necessary: Appendix, e.g. for additional information which is not immediately necessary for understanding results and discussion and which would disturb the flow of reading), Declaration of authorship. The Methods section can also be placed before the Results.
- Use the spelling aid of your word processing software. Typos leave a very bad impression.
- Write in the language (German/English) that you know best. In the end, the reviewer will grade your work according to his/her impression. Even if there is no mark for the language, bad language and/or grammar will lead to a bad impression. Write simply and precisely. Avoid sentences that are too long and contain too many subordinate clauses.
- Especially in the case of Bachelor's and Master's theses, you will hardly be judged on the basis of the scientific result, but rather on whether you have worked and documented according to the scientific requirements, taking into account the degree of difficulty of the project. Since the reviewers usually do not know how long you have worked on the project, the amount of the scientific data collected or generated cannot be a criterion.
- Put yourself into the shoes of esp. the second reviewer: he/she is asked to evaluate your thesis independently of the first reviewer (who usually is your supervisor). The second reviewer has access only to your written thesis he/she received, and he/she likely has no knowledge about prior work, your lab/field work or analyses. This means that your written thesis should be understandable without consulting additional literature. Therefore, it is best to have your work proofread by another biologist (or fellow student) who is not from the same working group.
- Reviewers are appreciate a succinct thesis.

Table of contents

- The table of contents reflects your document structure. Use at most three levels (e.g. 1.1.1).
- Short chapter headings in the individual sections also allow for clarity in the Table of contents.

- In the results and discussion sections, headings that summarize the take-home-message of the respective sections in one line are better than general or meaningless statements

Abbreviations

- Keep abbreviations (apart from SI units) to an absolute minimum, as they almost always impair readability. (Different rules may apply for theses in ecology: please discuss this with your supervisor/reviewers.)
- The list of abbreviations should not exceed one page and should not contain SI units.
- Define an abbreviation the first time you use within your main text. From then on you should consistently use this abbreviation.

Summary

- Write the summary in such a way that it can be read and understood on its own, without the rest of the text. It should include the main findings and conclusions. Remember that reviewers often read the summary first.
- Limit the summary to one page.

Introduction

- Introduce the topic in such a way that a biologist working outside the field can understand the relevant current state of research and the objectives of your work.
- A complete review of the Für das Verständnis unnötige Details sollten vermieden werden (kein Review des gesamten Forschungsgebietes)
- The objective of your work should be briefly stated in the last section of the introduction and, if possible, as a hypothesis.

Results

- Write the Results section in such a way that it can be read and understood on its own, without having read the Methods section. (Different rules may apply for theses in ecology: please discuss this with your supervisor/reviewers.)
- Describe your results consistently and comprehensibly for your external reviewer („Zweitgutachter“). Consider your target audience in order to find the right balance between too detailed and too concise presentation.
- Make statistical evaluations only on the basis of a sufficient sample size (n). It makes no or only special circumstances sense to calculate a standard deviation (SD) from three values, and such a calculation from only 2 values is gross nonsense, even if it is frequently encountered in theses and even scientific papers. Calculate SD instead of SEM (Standard Error of the Mean), unless there is a specific reason for using SEM. With a small sample size it is often better and more honest to display the single values graphically. A useful literature for this is Cumming et al (2007) J. Cell Biol. 177, 7-11

Discussion

- Avoid redundancies. The purpose of the discussion is not to repeat all the results, but to interpret the results in a broader context and compare them with / relate them to the published results of others. Of course you will have to mention some of the results again in this section.
- Here you can also critically examine your own results and make suggestions for improvement. Consider that not so much the quality of the scientific data is evaluated, but more how you are able to classify and evaluate your results.
- The discussion is the place to postulate hypotheses resulting from your results.
- End the discussion with an outlook on what could be explored in the near future, why and how, based on your work and/or more generally on this topic.
- Helpful questions for discussion: The experiment did not work: what could be possible reasons for this? The experiment did not deliver the expected results: what could be the reasons? How do your results differ from published data? Is there an explanation? In what form would the experiment have to be modified in order to obtain meaningful results? Could different experimental approaches have led to different results?

Materials and Methods

- Describe your methods in such a way that they are comprehensive and so that the results could be reproduced by an outside expert using your thesis as a protocol. Standard methods can be cited, special

methods should be described with their theoretical background, especially if the second evaluator is not working in the same field of research.

- Limit lists of materials to those reagents for which the origin is really relevant for the results or their reproducibility, e.g. specific antibodies, but not salts. (Different rules might apply for different research fields: discuss this with you supervisor/reviewers.)
- Specify organisms used with full species name and, if applicable, strain name. (e.g. *Escherichia coli*, strain JM83 ...)

Bibliography/References

- Literature mentioned in the text must appear in the bibliography and vice versa.
- If possible, use a literature database program such as Zotero (open source), Citavi, Endnote, Reference Manager etc. to insert and manage your references, as this avoids missing or incorrect references and saves a lot of time and work. Using such programs also automatically ensures a uniformly formatted bibliography.
- Use a formatting style for citations and in the bibliography that is commonly used in scientific journals. There is no specific required format, but the list should clearly state the authors, title, and source. In the text, you can cite with author & year or with numbers. Citing with numbers increases the readability of the text. Ask your reviewers whether they prefer a specific style.
- If possible, cite only scientifically sound sources (works listed in PubMed, books with ISBN numbers) and no websites or Wikipedia articles.

Figures

- Each illustration requires a legend and a title (first sentence of the legend).
- Follow the conventions used for figure captions and legends in scientific publications . This means that every illustration should be easy to understand on its own, even without reading the main text.
- Make sure that your font size is large enough (usually not smaller than 8 pt.).
- Each table has a heading and, if necessary, a legend.
- Keep to the order of the illustrations in the text, i.e. refer to illustrations in the text in consecutive order (i.e. not Fig. 2 before Fig. 1).
- Figures or figure parts taken from the literature must be marked as such. Copyright-protected images may only be reproduced with the permission of the publisher. As soon as your work is made available on a publication server of the university (dissertations, some of the best Master‘s theses), the work is considered a publication, and copyrights apply.
- For diagrams, pay attention to and include axis labels and units; for microscope data for scale bars, and for electrophoresis data for the position of size standards (e.g. molecular mass, base pairs).
- The figures in the printed version of your thesis must show what is described in the text. If this is be problematic due to the print quality, please make sure to provide the reviewers a PDF file with a sufficiently high resolution. This applies in particular to microscopic data. Especially the second reviewer does not know your original data and can only evaluate what he/she received by the examination office.

Formalities

- According to the BAMA-O, a bachelor thesis should contain up to 30 pages, a master thesis up to 90 pages (font size 12 pt., line spacing 1.5). In case of a large number of large illustrations, this can also be exceeded for bachelor theses.
- If several spellings of a term are possible (e.g. protein gel electrophoresis, protein gel electrophoresis...), use a uniform spelling throughout the text.
- Gene names, parts of genes, or transcript names are written in italics. Use of upper and lower case is dependent on the model organism (please refer to the websites of the respective genome projects). Mutants are usually written in italics and lowercase. Proteins: names are not written in italics. First or all letters in capitals (depending on the model organism); sometimes in fungi the name is followed by the suffix "p" (in budding yeast e.g.: gene, SPC72; protein, Spc72p). See also: https://en.wikipedia.org/wiki/Gene_nomenclature.
- Genus and species names are always written in italics

3. Rubric for evaluating theses

Higher-order writing issues	**outstanding**	**good / satisfactory**	**inadequate**
1. Does the thesis contain sufficient definitions, detail, and explanations for non-specialist readers?	• yes	• some definitions, explanations, or are missing (or superfluous), but non-specialist readers are mostly able to follow	• thesis is written with excessive jargon or lacks important definitions and explanations • thesis contains superfluous explanations or not enough information.
2. Does the thesis make a compelling argument for the significance of the student's research within the context of the current literature?	• yes	some relevant articles may have been missed • student's research is not placed within its context OR its significance is not explained.	• an adequate review of the literature is lacking AND/ OR • the connections between the literature and the student's research project is missing.
3. Does the thesis include the student's research question or the goals of the project?	• yes	•yes, but at times in an unclear, inconsistent, or disorganized manner	• no
4a. [For theses with conclusive and complete results] Does the thesis skillfully interpret the results?	• interpretation of results is insightful •implications of possble problems (e.g., alternative explanations, limitations of the results) are explained	• thesis presents a reasonable interpretation of the results; •it does not explain the implications of potential problems	• no interpretation of the results (e.g., a simple restatement of the results) or the interpretation is superficial.
4b. [For theses with inconclusive or incomplete results] Does the thesis provide an explanation of the reasons underlying the lack of clear results?	• yes, clearly and insightfully	• yes, reasonably	• insufficiently or not at all
Mid- & lower-order writing issues	**outstanding**	**good / satisfactory**	**inadequate**
5. Is the writing within paragraphs and sections is easy to follow? Do logical transitions result in an overall coherent thesis?	• yes, the text is easy to follow, makes sense, and flows well	• yes, mostly	• the writing within paragraphs is frequently difficult to follow • very little structure within sections

6. Is the thesis free of spelling and grammar errors?	• yes	• thesis contains some errors, but they do not distract from the content.	•thesis contains excessive errors that distract the reader from the content.
7. Are the citations presented consistently and professionally throughout the text and in the list of works cited?	• yes	• mostly (some minor inconsistencies or errors).	• no (inconsistent or unprofessional citation format, missing citations)
8. Are the tables and figures (including their legends) clear, effective, and informative?	• yes, exceptionally so	• yes, mostly they are clear and appropriate.	• no
Quality of scientific work	**outstanding**	**good / satisfactory**	**inadequate**
9. Does the thesis demonstrate an understanding of the connections between the methods, the data type, and the (expected) results?	• connections are clear and convincing	• one of the connections is missing or unclear	• connections are missing or unclear
10. Does the thesis represent the student's significant scientific research? *(can usually be evaluated by the supervisor / first reviewer only)*	• thesis represents the student's original thoughts and ideas •thesis demonstrates exceptional innovations, insights, or creativity	• thesis demonstrates the student's ability to contribute his/her own thoughts and ideas into a significant research project	• thesis represents little more than the student's ability to follow the instructions of a research supervisor