***Document status: 09.09.2020 (delete this line)***

Title of report/thesis

of

First name Last name

Scientific Report/Bachelor Thesis/Master Thesis

in the degree program <degree program>

(Degree B. Sc./B. Eng./M.Sc./M. Eng.)

in the department <Department>

at the Trier University of Applied Sciences, Environmental Campus Birkenfeld

First examiner: Prof. Dr.

Second examiner:

Date of submission: DD.MM.YYYY



# Table of Contents

1 Introduction 1

1.1 The general structure of a scientific report 1

1.2 Content of the chapter Introduction 2

1.3 Layout 2

1.4 Language 4

1.5 Plagiarism 4

2 Methods 5

3 Results 6

3.1 General structure of the chapter Results 6

3.2 Figures 6

3.3 Tables 8

3.4 Values/units and equations 8

4 Discussion 10

5 Conclusion 11

Bibliography 12

Additional information about references 12

How to cite a publication 13

A thesis also needs a table of figures, a table of tables, and a table of abbreviations. Each table begins on a new page. There is no numbering for these chapters. The first number is used for the introduction. The pages before the introduction are roman numbers (I, II, III, …), the plain text has Arabic numbers (1, 2, 3, …). The tables of contents, figures, etc. are not placed in the table of content. Please delete these lines.

# Introduction

This document gives a brief overview of how to prepare a scientific report. The length of the report depends on the prerequisites given by the professor. The document can also be used for the preparation of a bachelor or master thesis. The general structure of the thesis is identical to the structure of a scientific report, but there is much more content in a thesis. Thus, special care must be taken regarding the argumentation within the thesis.

The MS word file can be used as a template for your report as the format, the layout, and the style are predefined. Please get in contact with your professor if there are any layout requirements that differ from the given ones.

## The general structure of a scientific report

The structure of a scientific report or a thesis follows the standard in science. All publications in a scientific journal follow these guidelines (more or less). Figure 1 shows the typical shape of a scientific report. There are a lot of helpful books and websites, which give an introduction to scientific writing (Glasman-Deal, 2010), (Maxwell, 2020), (Skern, 2011).



Figure 1. The shape of a scientific report.

The five chapters represent the typical structure of a scientific report or a thesis. The width of the form reflects the immersion in the topic.

The five chapters of a scientific report are

1. **Introduction**: Presentation of state of the art and the scientific question of the report
2. **Methods**: What has been done and used to derive the results?
3. **Results**: What has been measured/found/derived/identified?
4. **Discussion**: The results are set into the scientific context. Do the results fit the expectations and to other publications?
5. **Conclusion**: Brief summary of the whole report. The reader must be able to understand the core message without reading the entire report.

The content and the structure of each chapter is described in the next part of this document.

Read the information about scientific writing in OLAT and at carefully. See also:

* https://en.wikipedia.org/wiki/IMRAD
* https://www.nature.com/scitable/ebooks/english-communication-for-scientists-14053993/writing-scientific-papers-14239285/
* https://www.elsevier.com/connect/11-steps-to-structuring-a-science-paper-editors-will-take-seriously

## Content of the chapter Introduction

The introduction can be split into four parts, starting from general information to the presentation of the scientific question.

1. Background information about the topic. Starting with general information and then focus on the field of the report. A scientific source must cite each fact.
2. Provide results of the main publications and research projects in the field of the report. What is the state of the art and well known?
3. Give the scientific question, which will be answered in the report. If there is a gap in the research, provide this information first.
4. Describe the structure of the report and a summary of the key findings. The content of the next chapters is shown to guide the reader.

## Layout

* **Use this document as a template!**
* Language: English (US)
* Font:
	+ Normal text: Times New Roman or Arial. Font size 12 pt, line spacing: 1.5, justified text
	+ Chapter headline: Times New Roman or Arial. Font size 16 pt, bold, aligned to the left, one number.

Example: **1 Chapter headline**

* + Subchapter headline: Times New Roman or Arial. Font size 14 pt, bold, aligned to the left. Chapter number dot subchapter number

Example: **1.1 Subchapter headline**

* + Section headline: Times New Roman or Arial. Font size 12 pt, bold, aligned to the left. Chapter number dot subchapter number

Example: **1.1.1 Section headline**

* + There is no fourth (or larger) outline level (like 1.1.1.1)
	+ You need at least two outline sublevels.
	+ Right:

1 Chapter

1.1 Subchapter

1.1.1 Section

1.1.2 Second section

1.2 Also a subchapter

2 Next chapter

* + Wrong:

1 Chapter

1.1 Subchapter

1.1.1 Just one Section

1.2 Also a subchapter

2 Next chapter

* Margins: Top, Bottom, Left, Right: 2.5 cm
* Use the format styles in Word.
* Avoid creating pages that are only half or 75 % filled when a figure follows on the next page.
* Each page needs a page number (except the title page).

## Language

* **No mistakes (spelling, grammar, punctuation). Use the spell and grammar check of Word.**
* Use clear, precise, and accurate terms.
* Use of technical terms, no colloquial language, no provocative language.
* Write the article objectively without your own opinion.
* Activate the automatic hyphenation in Word.
* Use the right tense:
	+ Past tense: Work done, work reported, observations.
	+ Present tense: General truths, atemporal facts.
	+ Future tense: Perspectives.
* Use appropriate words and verbs to express your research:
	+ General verbs: examine, compare, agree, analyze, improve.
	+ Expressing research action: apply, assess, calculate, compare, compute, derive, design, determine, develop, evaluate, explore, implement, investigate, measure, model.
	+ Expressing communication action: clarify, describe, detail, discuss, explain, offer, present, proses, provide, report, summarize.

## Plagiarism

* No plagiarism (content, figure, table)! Prepare your text and figures and name your data sources.
* Only your figures/photos or with a valid license (Creative Commons) are allowed. It is not allowed to use figures, diagrams or images from other sources by copy & paste (even with citing the source)!
* Read carefully: https://en.wikipedia.org/wiki/Plagiarism
* **Remark: Plagiarism means that you will not pass the course. Every figure or paragraph/text passage that has not been cited might be plagiarism.**

# Methods

Each new chapter begins on a new page if the report contains more than ten pages. The page break is predefined in the format style. If the report is shorter than ten pages, there is no need for a page break for each chapter.

Both chapters, Methods and Results, are the central part of the scientific report.

The general structure of the Methods can be split into three subsections

1. Provide a general introduction of the used materials and methods.
2. Precise details about the materials and methods. What are the exact parameters and the experimental setup (duration, quantities, conditions, etc.)? Why have these parameters been chosen?
3. Link to the materials and methods to other publications. Are there information from other research groups that have been working on a similar topic?

# Results

## General structure of the chapter Results

The general structure of the chapter Results is split into three parts.

1. General overview of results.
2. Details of the key results of the report.
3. Implications which can be made.

## Figures

* Use a clear structure
* Diagrams need full axis labels and units
* Use a short description in figure caption (figure caption below figure, table caption above figure). All figures/tables need a caption.
* Use the caption management of Word by right-clicking on the figure/table 🡪 add caption
* Give a full explanation of the content of the figure/table in body text.
* Use the cross-reference function to refer to figures/table (e. g. see diagram in Figure 2 or Table 1). Each figure/table must be referenced in the body text.
* The font size must be large enough to be readable. Otherwise, the text within a figure may be illegible to readers
* Reduce the ink-to-data-ratio: Reduce unnecessary lines and information in your figure and focus on the visualization of data (Tufte, 2001).
* Use an appropriate chart type for your data. Think how you can present your data in the best way for the reader. It takes some time to prepare a good figure.
* You can use PowerPoint to draw simple flow charts.
* Generate your diagrams within Word. Do not copy diagrams from Excel to Word as you will use your raw data information.

|  |  |
| --- | --- |
|  |  |
|  |  |
| A close up of a logo  Description automatically generated |  |
|  | A close up of a clock  Description automatically generated |

Figure 2. This is the short figure caption. The figure caption is placed below the figure.

Press ALT+CTRL+ENTER for a new line within the caption. Each figure must be described in detail so that the illustration can be understood without reading the continuous text. Thus, the description can have a length of several lines. Illustrations are provided with captions. The eight diagrams are examples how to visualize data.

## Tables

* The information about figures are also valid for tables (see 3.2).
* Do not use a screenshot/figure as a table.
* Reduce the amount of horizontal and vertical lines (reduce the ink-to-data ratio).

Table 1. This is the short table caption. The table caption is placed above the table.

Press ALT+CTRL+ENTER for a new line within the caption. The contents and the statements of the table are to be described in detail, like the illustration. Therefore, the table description, which is placed above the table, can have a length of several lines.

|  |  |  |  |
| --- | --- | --- | --- |
| **Country** | **Electrical energy consumption in TWh** | **Heat consumption in TWh** | **Energy for the transportation sector in TWh** |
| Utopia | 3.1 | 4.1 | 5.9 |
| Pangea | 5.6 | 4.8 | 7.5 |
| Atlantis | 7.8 | 5.9 | 4.7 |

## Values/units and equations

* If you write down values and units, you need to add a non-breaking space to prevent a newline-break between value and unit.

Press on Windows Word: CTRL + SHIFT + SPACE

Press on Mac Word: ⌥ Opt + Space

Example: The energy is 3.14 J.

There is a non-breaking space between the value 3.14 and the unit J. You can see the non-breaking space by showing the hidden marks .

* You always need to give the unit together with the value (in the body text, in equations, and diagrams/tables)!
* Use equations to explain mathematical content. Word provides an equation editor to write mathematical equations. Describe the variables in the body text.

Example: The kinetic energy *E*kin is the product of one half of the mass *m* of body times the velocity *v* squared is shown in equation (1) Use the bullet point, not a cross for multiplication.

|  |  |
| --- | --- |
| $$E\_{kin}=\frac{1}{2}∙m∙v^{2}$$ | (1) |

* Write variables in italic, text/indices in normal text (not italic).
* Word does not offer a caption/numbering of equations. You need to add a new caption type in Word[[1]](#footnote-1). This caption type has already been defined in this Word template.
* Use variables, no words in your equations:

Wrong (words instead of variables, cross instead of dot)

$$kin. Energy=\frac{1}{2}×mass×velocity^{2}$$

* Do not add units to equations

Wrong:

|  |  |
| --- | --- |
| $$E\_{kin}\left[in J\right]=\frac{1}{2}∙m[in kg]∙v^{2}[in m/s]$$ | (2) |

* Equations and formulae should be typed and numbered consecutively with Arabic numerals in parentheses on the right-hand side of the page (if referred to explicitly in the text).

# Discussion

The Discussion begins with a summary of the general result and finally widens the view to the overarching topic (see Figure 1).

1. Summary of the general results.
2. Mapping the own results to the results of other scientists.
3. Implications and achievements.
4. Outlook on future work.

# Conclusion

1. Summarize your whole article of your report:
	* One paragraph for the introduction.
	* One or two paragraphs with key results.
	* One or two paragraphs with the scientific discussion.
2. Do not add new information/results/facts to the conclusion.

# Bibliography

Adams, P., & Doe, J. (2020). Title of the publication. *Name of the scientific journal, 1*(2), 5-9.

Glasman-Deal, H. (2010). *Scientific Research Writing.* London: Imperial College Press.

Maxwell, A. (2020). *Write like a scientist*. Retrieved September 19, 2020, from http://sites.middlebury.edu/middsciwriting/

Skern, T. (2011). *Writing Scientific English: A Workbook* (2 ed.). Wien: UTB facultas wuv.

Tufte, E. R. (2001). *Visual Display of Quantitative Information.* Bertrams.

## ****Additional information about references****

* **Use only scientific publications.**

**Allowed are:**

* + **Articles from scientific journals**
	+ **Conference proceedings**
	+ **Books**
	+ **Chapters from books**
	+ **Studies or surveys published by institutions like universities, ministries, etc.**

**Not allowed are:**

* + **(Non-scientific) Websites (in particular Wikipedia)**
	+ **Publications from companies, NGOs, etc.**

**Information from companies can only be used in case of data sheets or technical information.**

* **The reference chapter has no number.**
* **Use the Harvard System of Referencing. You can also use the APA style:**

**https://library.aru.ac.uk/referencing/harvard.htm**

* **You can use the software Citavi or the CloudSoftware Mendeley. Both software tools offer a Word Plugin. The university provides a student's license for Citavi (just for Windows, not for Mac).**

**Citavi: https://www.umwelt-campus.de/campus/organisation/verwaltung-service/bibliothek/service/literaturverwaltung/ (in German)**

Mendeley: www.mendeley.com

The citation software helps you to organize and cite your sources and generates the bibliography as well.

* The reference list has to be sorted alphabetically regarding the surname of the first author. If Word does not sort the bibliography automatically, do this:
1. Convert the bibliography to static text (or copy & paste the bibliography as static text.
2. Sort the paragraph alphabetically.
* Each entry must contain all relevant information like: Names of authors, year of publication, title of publication, name of journal, publisher, doi (digital object identifier). Word, Citavi or Mendeley do the organization of your references for you.
* Cite about one publication per two content pages (neglecting the title page, the table of content, etc.) of the article. If your article has a length of ten pages with your content, you should cite at least five scientific publications.

## How to cite a publication

* **References must always be given for statements.**
* **All data sources must be cited, too.**
* **Do not cite yourself like “Source: own visualization”. That is not necessary.**
* **Insert a citation by using the Word feature. Do not organize your references manually.**
* **Choose (Last Name(s), Year) for citation like** (Adams & Doe, 2020)**. Do not cite a reference by using just numbers like [1].**
* **The citation is placed before the fullstop, not after the fullstop. Example**

**Right: Adams has shown this result in his publication** (Adams & Doe, 2020)**.**

**Wrong: Adams has shown this result in his publication.** (Adams & Doe, 2020)

1. To define new captions see:

<https://www.officetooltips.com/word_2016/tips/how_to_create_captions_for_equations.html> [↑](#footnote-ref-1)