Guideline for Scientific Writing

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Chair of Mining Engineering and Mineral Economics
Department Mineral Resources Engineering
Montanuniversitaet Leoben

A-8700 LEOBEN, Franz Josef Straße 18
Phone nb.: +43 3842-402-2001
Fax: +43 3842-402-2002
bergbau@unileoben.ac.at

Introduction

A scientific paper is the written result of scientific working. The writing of a scientific paper is based on scientific standards and principles with scientific methods and techniques. Scientific texts are the basis for any scientific exchange. Only they permit scientists[1] to enter a common discourse. Therefore the ability to formulate scientific facts in written form is a key competence which students have to practice and study in the course of their studies.

The following guideline is addressed to the students of the Chair of Mining Engineering and Mineral Economics of the Montanuniversitaet Leoben and offers assistance for the formal form design and writing of scientific papers according to the rules. It is an *obligatory* basis for all Bachelor -, Master- and PhD theses which are written at the Chair.

The appropriate template can be downloaded from the website of the Chair of Mining Engineering and Mineral Economics:
http://bergbaukunde.unileoben.ac.at/en/4016/.

In case you have any suggestions for amendments or corrections we are happy if you let us know.

We wish you good luck with your paper!

[1] For better legibility the masculine form has been chosen in this text: Nevertheless, the details provided refer to members of both sexes.

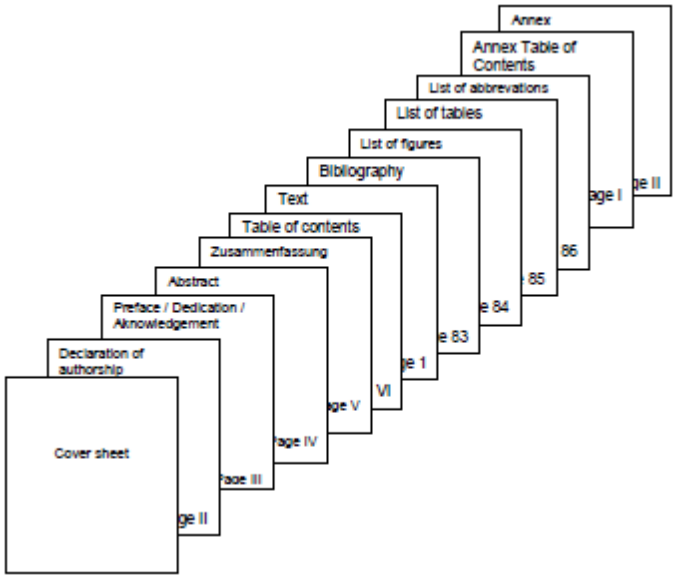
Table of Contents

1 Structure of a scientific paper

A scientific paper has to include the following elements:

1. Cover sheet
2. Declaration of authorship
3. Preface, dedication, acknowledgement (optional)
4. Abstract
5. Zusammenfassung
6. Table of contents
7. Text component
8. Bibliography
9. List of figures
10. List of tables
11. List of abbreviations
12. Annex Table of contents
13. Annex

This obligatory sequence of the chapters is illustrated in the figure below:



The above mentioned chapters are defined in more detail below:

1.1 Cover Sheet

All information which is necessary for the unambiguous classification of the paper has to be stated on the cover sheet.

The cover sheet includes:

- The type of the paper,
- The title of the paper (optional: subtitle),
- The name of the author of the paper,
- The name of the course (optional),
- The name of the Chair / Department and
- The date of origin.

1.2 Declaration of authorship

With this formal declaration (date and signature are obligatory) the author of the paper states that he has produced this paper on his own and has referenced no other than the stated sources. Furthermore he confirms that the paper has not been submitted for a degree at any other institution and has not been published yet.

The exact wording has to be as follows:

> „I declare in lieu of oath that this thesis is entirely my own work except where otherwise indicated. The presence of quoted or paraphrased material has been clearly signaled and all sources have been referred. The thesis has not been submitted for a degree at any other institution and has not been published yet."[2]

[2] The exact wording of the declaration of authorship can be found on the template.

1.3 Preface, Dedication, Acknowledgement

The preface should not contain an abstract.

An acknowledgement to persons who have helped and supported the production of this paper by their personal supervision or motivation or by providing information/resources is possible.

1.4 Abstract / Zusammenfassung

An abstract has to be put in front of every paper. This abstract should not be more than one page in length and give the reader an overview of the contents of the paper. The abstract has to be written in English *and* German.

1.5 Table of contents

The table of contents contains **all** the headings of the chapters with the corresponding page numbers. It has to reflect the logical structure of the paper and thus provides first information about the contents of the paper.

The structure of the table of contents has to be in numerical order and graded hierarchically; different hierarchies of headings are indented accordingly. Every heading must have at least two subheadings (i.e.: headings with only one subheading have to be avoided.)

It has proven to be clear and reasonable to present the level of structuring of the headings not more than to the third level.

The page numbers for all the preliminary sections up to and including the table of contents section are set in Roman numerals. The cover sheet is counted as page number one but should not be assigned a page number. The page numbers in the main body of the paper are set in Arabic numerals, beginning with one (“Page 1”).

1.6 Text component of the paper

The text component of a paper is basically divided into three parts:

1) Introduction

2) Main part

3) Ending

1.6.1 Introduction

The introduction contains the aspects of an introduction into the topic of the paper, an illustration of the definition of the paper and its relevance and a concise description of the aim of the paper.

1.6.2 Main part

The main part accounts for the most of the text component of a paper and is divided into chapters. The composition and arrangement of the main part depends on the respective topic. It is important to pay attention to a logic and comprehensible structure. A constant red threat has to be recognizable. Transition sections and short summaries in between or connecting passages to subsequent chapters are advisable.

1.6.3 Ending

The ending of a paper should not only contain a conclusion in context of the aim of the paper but also a summary of the most important points.

1.7 Bibliography

The bibliography contains only those sources that were referenced in the paper. The bibliography section is placed after the text component of the paper and the sources are listed in alphabetical order according to the author's last name.

The sources are divided into books (incl. journals), internet and other sources.

Several publications of one author have to be listed chronologically, beginning with the oldest.

If a source has three or fewer authors then the names of all authors must be provided; whenever a reference has four or more authors then the expression "et al" has to be used after the first author. In case the author, the year or the publishing company is not known the following expressions have to be used: anon. (anonymous), n. y. (no year), n. p. (no publishing house).

When stating the sources you should pay special attention to punctuation.

1.8 List of figures

The list of figures section follows the bibliography and contains **all** the figures which are used in the paper.

Every figure is labeled below ("Figure 1:…") and is numbered consecutively with Arabic numerals.

If the figure is not the author's creation its source has to be indicated by putting the word "Source" in front and the indication of the source with in-text citation. In case the figure was taken over modified the expression "cp." (Compare) is put in front of the author's name.

Extensive figures have to be shifted to the annex section of the paper.

1.9 List of tables

Tables are used for presenting information material in a clearly laid out and compressed way. Every table is an integrated part of the paper but has to be self

contained too. Therefore all abbreviations and measurements used in the table have to be indicated and explained. The presentations of all the tables of one paper have to be consistent concerning the layout, labeling and wording.

The regulations for the list of tables are analogous to the regulations of the list of figures.

Every table has to be labeled below (“Table 1 :…”), numbered consecutively with Arabic numerals and has to be registered in the list of tables with the corresponding page number.

1.10 List of abbreviations

The list of abbreviations has to include all the functional relevant abbreviations used in the paper. Commonly used abbreviations and short forms (such as “etc”, “i.e.”) should be avoided. Otherwise abbreviations, when used for the first time in the paper, have to be written out followed by the abbreviation in parenthesis (From that point onward the abbreviation can be used in the remaining paper.). Additionally this abbreviation has to be registered in the alphabetically arranged list of abbreviations. The first column of this list contains the abbreviation and the second column the corresponding explanation.

It is compulsory that all physical units are abbreviated with the International System of Units!

1.11 Annex

For the sake of readability additional information is stated in the annex section (e.g.: data evaluations, empirical documents, questionnaires, larger tables and long derivates of formulas). If expert interviews are used as a reference source in the paper the transcripts of these interviews have to be included in the annex to insure the transparency of the scientific approach. The respective information of the annex section has to be referenced within the text (see: Annex p. IV).

If the annex consists of more than one contribution a table of contents has to be put in front.

The numbering of the pages in the appendix has to be in Roman numerals, starting with I.

2 Basic formal requirements

2.1 Page layout

Margins	Left	3 cm
	Right	2,5 cm
	Top, Bottom	2,5 cm
Font	Text	Arial
	Direct reference	Arial, italic
Font size	Main text	12 pt, spacing: before 0 pt, after 6 pt
	Heading 1	16 pt, bold, spacing: before 12 pt, after 3 pt
	Heading 2	14 pt, bold, spacing: before 12 pt, after 3 pt
	Heading 3	12 pt, bold, spacing: before 12 pt, after 3 pt
	Labeling of figures and tables	10 pt, bold, spacing: before and after 0 pt
	Footer	10 pt, spacing: before and after 0 pt
	Header	10 pt
	Page number	10 pt
Line spacing	Main text	1,5
	Footer	1
	Bibliography	1
	Tables	1

Alignment	Main text	justified
	Footer	justified
	Bibliography	justified, hanging indent 1 cm
	Page number	Right

2.2 Language and style

When assessing a paper the author's competence to impart the contents of his findings in a linguistic adequate forms play a crucial role. Additionally to the scientific criteria of the contents the style, spelling and punctuation of the paper are incorporated in the grading.

When writing a scientific text it is important to pay attention to a scientific style of the language. Colloquial expressions and journalistic phrasing have to be avoided.

Keep in mind:

- Be brief

It is essential for scientific texts that that the contents is presented in a short and concise style without omitting necessary information. Remove or replace words that are repeated or do not add anything useful, use only as many words as you need. (e.g.: "It can be seen from the graph in figure X that…" vs. "Figure X shows that…")

- Be objective

Scientific language should be accurate, appropriate and measured. Emotive language and subjective statements have to be avoided. (e.g.: „best", „should", „enormous potential")

- Be precise

Do not use vague, ambiguous expressions and generalizations. Statements have to be quantified by precise figures (e.g.: “The turnover rose enormously.” vs. “The turnover rose 20% from 2005 to 2007.”)

- Omit redundant adjectives / adverbs

The use of adjectives and adverbs are unnecessary most of the time.

- Use verbs rather than nouns

Verbs are more significant and communicate the message more directly. (e.g.: “pay” vs. “make a payment”)

- Active instead of passive

Science is active! By using active verb forms sentences get more precise and clearer (e.g.: “In this paper it is shown…” vs. “This paper shows…”.)

- Technical terms

Technical terms and foreign words should only be used when it comes to generally accepted terms. The over usage of foreign words makes the comprehension of the paper harder and is not an alternative for accurate statements and precise descriptions.

- Paragraphs

Paragraphs are to be made to assist the readability and the internal structure of the text.

A paragraph consists of at least two related sentences; a single sentence does not make a paragraph.

- Spelling

Make sure that your spelling, grammar and punctuation is correct!

Given the importance of meaning in academic writing, the correct usage of the grammar and punctuation in a paper is critical.

3 Referencing

The crucial criterion of scientific working is that it should be able to trace back and recheck ones work irreproachably by others. This implicates that the sources which are used in a scientific text have to be referenced.

The usage of someone else's intellectual property, either the direct or the indirect reference, has to be marked clearly. Every reference has to be verifiable.

Proper referencing is an expression of scientific accuracy.

3.1 Plagiarism

The Chair of Mining Engineering and Mineral Economics attaches great importance to the compliance with principles of scientific working. These principles not only include the honest handling of data and correctness but also plagiarism.

3.1.1 What is Plagiarism?

Plagiarism means submitting material that in part or whole is not entirely one's own work without attributing those same portions to their correct source. This can refer either to a literal quote, an adaption or the presentation of ideas or arguments.

It is irrelevant whether these text passages are verbatim quotations, paraphrases or appropriations of ideas. The usage of someone else's intellectual property has to be identified as such. This not only applies to written papers (project papers, Bachelor theses, Master theses, Phd theses) but also to lectures, presentations or posters.

3.1.2 Discussion

Plagiarism contradicts the central tenet of science: scientific progress is based on the results of previous works. The accusation of plagiarism can be easily avoided by the proper indication of the original source. Herby, the parts which have been taken from other sources than one's own have to be acknowledged explicitly and beyond any doubt. These indications have to suffice to clearly identify the source of the reference and thus make it retrievable in the original.

3.1.3 Plagiarism is not a trivial offense

Plagiarism is a breach of scientific integrity: it is a question of theft of intellectual property including the usage of significant ideas from someone else and presenting them as one owns.

The violation of this principle is inexcusable – deliberate plagiarism is a sever fraud.

The evidence of plagiarism can have serious consequences: besides the failure of the paper further penalties up to the forced expulsion of the university are possible.

3.2 Suitability of sources

When it comes to the suitability of the sources referenced the bottom line is the observance of basic principles of scientific working. That implies that *only* these sources that can be retraced or controlled can be used for scientific purposes.

The concerns for objectivity and reliability which are authors of scientific papers bound to is in opposition to the referencing of untrustworthy and therefore not suitable sources of information. Examples for such non-reliable/scientific sources are popular magazines and similar publications, at which the classification is always a matter of discretion. Generally, only published sources are regarded as suitable for referencing. Unpublished sources, sources which are not accessible for the public (e.g.: statistical material of a company, transcripts of interviews and

conversations), have to be integrated into the annex section and thereby become suitable sources for referencing (Though before these sources are used they have to be approved by the originator!). Lecture notes and course materials are inappropriate sources.

It is advisable to clarify the sources and their relevance with the supervisor of the paper beforehand.

3.3 Methods of referencing

There are several methods of referencing common, which basically differ in the positioning of the indication of the source. Whereas the German system indicates the source in the form of footers at the bottom of the respective page, the indications of the so-called “Harvard System” (American System, Author-Date System) are positioned directly behind the reference in-text in the form of a short reference note in parenthesis.

The standard used by the Chair of Mining Engineering is the Harvard System.

3.4 Types of references

Basically there are two types of references: the direct (literal) reference and the indirect (paraphrasing) reference.

3.4.1 Direct references

Direct references are exact word-for-word reproductions of the author’s words. The original sources have to be taken over exactly. Alterations of direct references are ineligible, even if the spelling is outdated and the punctuation not correct.

Short references have to be put into quotations marks at the beginning and the end. The quoted text has to italicized.

Example:

„*Bei einem direkten Zitat werden die Ausführungen des Autors direkt (d.h. wortwörtlich) übernommen*.“ (Karmasin and Ribing 2009, p. 88)

Longer references (three lines and longer) are separated from the main text by an additional space before and after the reference, intendion from the left margin, smaller font size and single line space. Due to these formal highlights quotation marks are not required.

Example:

> *Ein Plagiat ist nicht nur ein wörtliches Zitat ohne Anführungszeichen, sondern auch ein sinngemäßes indirektes Zitat, das den Anschein erweckt, es sei aus eigenen Erkenntnissen entstanden. Gehen Sie davon aus, dass Plagiate nicht zufällig passieren. Daran ändert sich auch nichts, wenn mit Paraphrasen gearbeitet wird, also Wörter durch Synonyme ausgetauscht oder Satzstellungen bzw. Reihenfolgen von Sätzen verändert werden*. (Karmasin and Ribing 2009, p. 89)

A paraphrasing description with one’s own words is to be preferred. The direct reference should be used sparingly and is only essential in the following cases:

- Exact definitions
- Analysis and interpretation of an author’s statement
- As an addition for the translation of foreign literature (so that the reader can check whether the author has translated the text correctly)
- Wording of the law and paragraphs are always direct quotations!

Any omission within a direct reference (even a single word) has to be indicated with three full stops in square brackets […]. Remarks about a mistake in the original reference source are remarked by using the addition [sic!].

Example:

„*Do not correct missprints [sic!]*,…“

3.4.2 Indirect references

An indirect reference, or paraphrase, is an analogous reproduction of ideas which are not ones own original. Quotation marks are not used though the beginning and end of the indirect reference should be made clearly apparent. As it is with direct quotations the original source of the information has to be indicated by an in-text reference; the short form “cp.” (“Compare”) has to follow the quotation.

Example:

Bei einem nicht wörtlichen Zitat übernehmen sie Gedanken von anderen Autoren in freier Übertragung. (cp. Karmasin and Ribing 2009, p. 91)

3.5 Position of the indication of the source

It is crucial to indentify where the indirect quote starts and ends. The in-text reference follows the *word*, if the reference applies to one word. In case this word is at the end of a sentence the in-text reference *precedes* the punctuation mark. In case the in-text reference *follows* the punctuation mark the reference applies to the whole sentence. In case the in-text reference is at the end of a paragraph it refers to the whole preceding paragraph.

3.6 Indication of the number of pages with direct and indirect references

In case the referenced passage is longer than one page the following applies:

- Author’s last name Year of publication, p. 17

The reference applies to a passage on page 17.

- Author’s last name Year of publication, p. 17 f.

The reference applies to a passage from page 17 to 18

- Author’s last name Year of publication, p. 17 ff.

The reference applies to a passage from page 17 to 19

- Author’s last name Year of publication, p. 17 – 21

The reference applies to a passage from page 17 to 21. This form of the indication of the page numbers is used if the reference applies to passage which is longer than three pages.

3.7 In-text reference

The in-text reference includes exactly this information which is essential to refer to the complete indication of the source in the bibliography section.

The in-text reference follows right after the citied passage and has to include:

(Author’s last name Year of publication, Page number).

Example:

(Eco 2007, p. 100)

3.7.1 Several publications of one author in the same year

When there are several works by one author published in the same year they have to be differentiated by adding a lower case letter of the alphabet after the year of publication. (The order of these letters is alphabetical.)

Example:

(Moser 2009a, p. 100)

3.7.2 Several authors

For books with two ore three authors the names should all be included in the order they appear in the original document, separated by “and”.

Example:

(Karmasin and Ribing 2009, p. 10)

3.7.3 Chapter of an edited work

In case of a reference of a chapter of an edited work the in-text reference should include the name of the author of the chapter (and not the name of the editor).

Example:

(Keseling 2008, p. 199)

The required elements of the indication of a chapter of an edited work are described in the bibliography section in chapter 4.2.

3.7.4 Article in a journal

When referencing an article of a journal in-text the author of the article has to be indicated.

Example:

(cp. Romahn 2008, p. 160)

The required elements for the indication in the bibliography section are described in the bibliography section in chapter 4.3.

3.7.5 Article from the internet

Articles from the internet are citied analogously as printed documents with the in-text reference method. In case the author of the online article is unknown the name of this institution on which website the respective article is published has to be stated.

For further details concerning the correct indication of an online reference source see chapter 4.5.

3.8 Secondary Reference

A secondary reference is the reference of a direct or indirect reference from a primary source.

It is advisable to quote only from primary (original) sources because only thus falsifications and misinterpretations can be avoided. Only in cases when the original source can not be traced a secondary reference is acceptable.

The in-text indication of the source is made my stating the primary source and the addition “cit. in” (“citied in”) and the indication of the secondary source.

Example:

(cp. Original author’s last name Year, p. , cit. last name of the author of the secondary source Year, p.)

3.9 Footers

Footers should exclusively contain the author’s additional comments and references concerning the content.

They are indicated in the running text by a superscripted number immediately following the passage of the text the note is in reference to, numbered consecutively with Arabic numerals and separated from the main text by a line (5 cm in length, left aligned). The footer has to be on the same page as the passage

of the main text it refers to. Makeups of footers on following pages are to be avoided.

4 Bibliography

The bibliography section contains exclusively those sources which are citied in the text. In order to guarantee a quick and absolute certain retrieval of these sources the indications have to be correct and complete.

The bibliography section follows the main text and is listed in alphabetical order of the authors' last names.

It is sub-divided into "Books (including magazines)", "Online sources" and "Other sources". Several publications of one author are listed chronologically – beginning with the oldest title. In case the author, the date of publication or the publisher is not known this is indicated as follows: anon. (author unknown or anonymous), n.y. ("no year") or n.p. ("no publisher").

When stating the sources you should pay special attention to punctuation.

4.1 Monographs

The following indications are essential:

- Last name and first letter of the first name

All authors are to be indicated in the form of "Last name, first letter of the first name". Two or three authors are separated by "and". In case of four and more authors only the first is specifically indicated and followed by "et al" (and others). In case the author cannot be indentified the addition "anon." (author anonymous or not identifiable) has to be stated.

- Title (eventually subtitle)

The complete and original title has to be indicated.

- Volume

In case the source consists of several volumes the respective number of the volume and the addition "vol." has to be indicated.

- Edition

In case there is at least a second edition of the publication the addition “ed.” and the respective number of the edition has to be indicated.

- Publishing company
- Year

The year of the publication follows the publishing company. In case this date is unknown “n.y.” (no year) has to be added.

Example:

Eco, U.: Wie man eine wissenschaftliche Abschlußarbeit schreibt, 12th ed., C. F. Müller Verlag, 2007

Skern, T.: Writing Scientific English, Facultas Verlags- und Buchhandels AG, 2009

4.2 Edited book

An edited book is a book consisting of a collection of chapters, each written by a different author / groups of authors, edited by an editor or an institution. The in-text reference lists only the author of the chapter. The required elements of the bibliography section are: last name and first letter of the first name of the author of the chapter, the title of the chapter, “in”: title of the book, last name and first letter of the first name of the editor of the book, edition, publishing house, page numbers of the chapter and additionally last name and first letter of the first name of the editor of the book, “(ed.)”, title of the book, edition, publishing house, year.

Example:

Keseling, G.: Schreibblockaden überwinden, in: Die Technik des wissenschaftlichen Arbeitens, Franck, N. und Stary, J. (ed.). 14th ed., UTB, 2008, p. 197 – 223

Franck, N. und Stary, J. (ed.): Die Technik des wissenschaftlichen Arbeitens, 14th ed., UTB, 2008

Gamsjäger L.: Rechnergestützte Datenverarbeitung im Explorations- und Gewinnungsbereich, in: Erdöl und Erdgas in Österreich, Brix, F. und Schultz, O. (ed.): 2nd ed., Naturhistorisches Museum Wien und F. Berger, 1993, p. 564 – 566

Brix, F. und Schultz, O. (ed.): Erdöl und Erdgas in Österreich, 2nd ed., Naturhistorisches Museum Wien und F. Berger, 1993

4.3 Article in a journal

Journals are periodically published publications. They contain articles from experts from a specific field.

The following elements are required:

- Author's last name and first letter of the first name (see: books)
- Title of the article
- After the title the addition "in" has to follow
- Name of the journal

The full title of the journal has to be stated

- Year, volume number, issue number

The issue number has to follow the year of publication. In case the issue number is unidentifiable it can be deleted without substitution.

- Page numbers

First and last page number of the article

Example:

Romahn, A.: Moderne Strebfördertechnik im Steinkohlebergbau, in: Glückauf, 144 (2008), vol. 4, p. 157 – 162

Brux, G.: Sprengvortrieb mit Erschütterungsbegrenzung, in: Felsbau Magazin, (2009), vol. 5/6, p. 308

4.4 Theses

This implies post doctoral theses, dissertations or master theses from any national or international university. It must be pointed out that you can reference only from "superior" theses. I.e. you can not reference a Bachelor thesis in a Master thesis.

Theses are basically referenced in the same way as books. Additionally the type of thesis, the name of the university, (if possible the institute) and the year of origin have to be stated.

Example:

Lurf, R.: Mineralische Rohstoffgewinnung von der Sprengung bis zum Versand - Von der Lagerstätte zum Markt, Dissertation, University of Leoben, Chair of Mining Engineering and Mineral Economics, 2008

4.5 References from the internet

Due to the fact that there is no quality control of the source references from the internet pose a problem. In addition to that the internet is a living media in which the availability of websites is changing constantly, which again makes the verifiability of sources more difficult. In order to preserve the scientific character of a source from the internet it is advisable always to save a copy of the online text on ones pc. Due to the inconsistency of the content it is very important to state the exact date of the download of a source from the internet!

In case the publication is published in both the internet and the printed form you should reference the printed version.

Online Sources are referenced analogously to printed sources. In case of an online pdf document the page number has to be indicated.

The following elements are required:

Author’s last name, first letter of the author’s first name: title of the document, subtitle, (if identifiable: date of origin of the content), URL, (date of the download)

Example:

Waß, C.: Zitieren von Werken in elektronischen Netzen, http://www.rechtsprobleme.at/doks/zitieren-elektron-werke-wass.pdf, (20.07.2009), p.

Willamowski M.: Zitierfähigkeit von Internetseiten, http://www.jurpc.de/aufsatz/20000078.htm, (03.03.2010)

Further reading

The following titles can be obtained in the library of the Chair of Mining Engineering and Mineral Economics and the main library of the University of Leoben:

Eco, U.: Wie man eine wissenschaftliche Abschlußarbeit schreibt, 12th ed., UTB, 2007

Karmasin, M. und Ribing, R.: Die Gestaltung wissenschaftlicher Arbeiten, 4th ed., UTB, 2009

Rossig, W. und Prätsch, J.: Wissenschaftliche Arbeiten, Beste Zeiten Verlagsgesellschaft, 6th ed., 2006

Skern, T.: Writing Scientific English, Facultas Verlags- und Buchhandels AG, 2009

Theisen, M.: Wissenschaftliches Arbeiten, Vahlen, 11th ed., 2002

Van Aken, D. und Hosford, W.: Reporting Results, Cambridge University Press, 2008

Zdrowomyslaw, N. und Bladt, M. (ed.): Wissenschaftliches Arbeiten. Erfolgsbaustein für Studium und Karriere, Deutscher Betriebswirte-Verlag, 2008