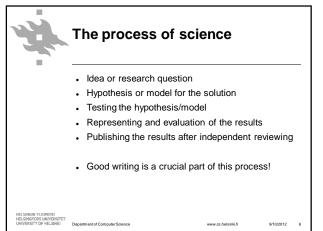


Levels of thinking/ writing/ learning by Boehm (see also Bloom's taxonomy)				
	LEVEL	FOCUS	GOAL	VERBS
1	INFORM- ATION	Identification and repeating - able to repeat accurately	Know that you know	List, repeat, describe, define identify, create titles
2	UNDER- STANDING	Reach the impact and meaning of information	Show that you understand	Explain, condense, interpret, enhance, modify, measure
	APPLIC- ATION	Use information -apply knowledge to new situations	Show: use the information	Apply, use, find solutions or examples, solve, choose methods
4	ANALYSIS	Make conclusions f.e. show relationships between elements and the whole	Show: find the essential elements in the information	Analyse, debate, brake into elements, generalise, create outlines, deduce
5	SYNTESIS	Be creative and original - compose elements and ideas in new ways	Show: create and formulate large wholes	Create, invent, design, produce, implement, combine, compose, merge
6	EVALUATION	Create criteria in order to evaluate the information. Use the criteria.	Show: evaluate ideas, information, methods and solutions	Compare, choose, evaluate, contrast, create criteria, valuate
	HELSINGIN YLIOPISTO HELSINGFORS UNIVERSITI UNIVERSITY OF HELSINKI	ET Department of Computer Science	www.cs	





Contents of a scientific article

- The position of the new idea with respect to the former scientific knowledge
- Clear and formal statement of the new idea
 - Often as a hypothesis or a model
- Description of the novelty of the idea, or the contribution of the article
- Justification of the theory by proof or experiments
- . Note: details of the research process leading to the article do not usually belong to the article!



Structure of a scientific article

- Title and author
- Abstract
- Introduction
- Body of the article (including related research/work)
- Summary/conclusions
- (Acknowledgements)
- Bibliography
- Appendices



Types of publications

- Course books
- Other kinds of text books
- Standards
- Journal articles
- Conference articles
- Theses
- Technical reports
- Manuscript
- Web documents/publications



Nature of publications

- Primary sources
 - · Original, reliable information
 - Articles in scientific journals, conference and workshop books, research reports, theses
 - · Patents, laws and directives, standards
- Secondary sources
 - Useful material for restructuring and analysis of existing information, not original and new results
 - Course books, article collections, surveys, newsletters, dictionaries, etc.



Process of writing scientific text

- · Idea or interesting topic
- Finding and evaluating relevant source material
- Reading material
- Identifying essential issues
- Restructuring them logically
- Writing them down using proper presentation
- Iterative process: text must be re-written several times!



Characteristics of scientific text

- · Content usually technical
- Should be based on facts
 - · Writer's interests and opinions can be seen in the choice of the topic, not in the text as such
- · Based on former theories and research results
- · Motivating on why the problem considered is important
 - Not marketing of the ideas
- · Arguments and conclusions
- · Verifiability, reliability, and repeatability of the results



Characteristics of scientific text

- · Clear and logical structure
- · Not a direct copy from anybody else's text
- · Source material is analysed and restructured
- Based on peer-reviewed research material
 - Journal, conference and workshop articles in computer science are typically peer-reviewed
 - Peer-reviewers are researchers that are experts in the topic in question
 - Writers do not know who the reviewers are



Characteristics of scientific text

- · Text is suitable for its target group
 - · How are the readers?
 - How are they going to use the text and the information given in it?
- Clearness of the text
 - The reader must understand the text in a same way
- Reflects writer's deep understanding of the topic!



Target groups of scientific text

- Readers that have scientific background
- · Other researchers in the same area
- · Whole scientific community
- General public
- Some basic knowledge of the topic is usually required
- In this course and in the seminars: other MSc degree students



How do you learn scientific writing?

- Following the topic area and reading relevant articles
- Writing yourself
- · Searching for feedback from others
 - · Peer students
- · Iterative process!



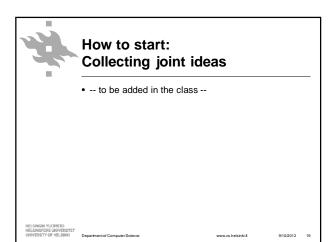
Important things to remember

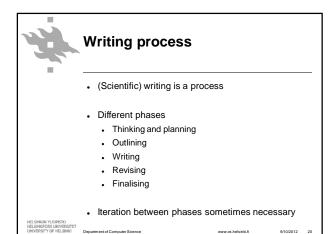
- . It is important that the reader understands what you have written
 - The audience you should write to are the other students in this course!
- · All the texts must be written by you
 - Not a copy of a text written by someone else
 - Not a direct copy from the reference material
- Remember always to check the correctness of the language!

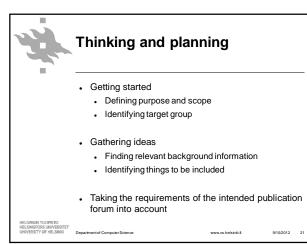


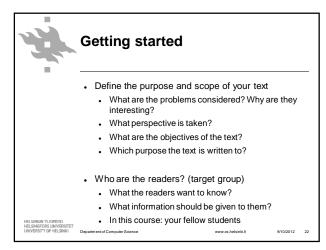
Important things in your paper

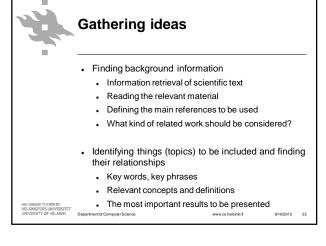
- Department's layout for thesis and reports
- Structure of our text
- · List of references

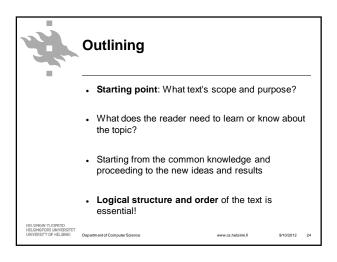














Outlining (2)

- · Helps authors to
 - · organise their thoughts
 - · evaluate relevance of different topics and their representation
 - remember the relationships between topics
- Should support reading and reader's understanding
 - Describes
 - · structure of the text
 - logical presentation and reading order
 - · Should still support several types of reading
 - browsing, specific information searches, learning, \dots

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Outlining (3)

- Should lead to a logical, clear story
 - In a concise form in the list of contents
 - · Clarified in the introduction, especially if there is something special in it
- · Questions to answer:
 - · What topics are considered?
 - . In which order they are told?
 - What is the importance and length of each topic?



Outlining (4)

- · What kind of parts are needed?
 - · Which chapters?
 - Only in longer texts; seldom in scientific articles
 - · Which sections?
 - · Which subsections?
 - · Some other parts?
- Finding
 - · a good title for the whole text
 - · headings for chapters, sections and subsections



Outlining (5)

- Some publication forums may have strict rules on the outline
 - For example: Introduction, Methods, Results, Discussion
- Can cause problems in explaining complex topics in phases
 - For example a comparison of two methods => Introduction, Background, Methods, Results, Discussion, Methods, Results, Discussion

Not typical in computer science



Different types of outlines

- · Chaining outline
 - · Presentation of the problem
 - · Related work, earlier solutions and their flaws
 - · New solution
 - · Results and their evaluation
- · Specificity-based outline
 - First general explanation/description, then more specific ones
 - For example for describing a system consisting of several components



Different types of outlines (2)

- · Example-based outline
 - · Idea or results explained first with help of a typical case or situation
 - Generalisation of ideas/results and describing them more formally
- Complexity-based outline
 - First presentation of a simple case
 - Then description of a more complicated case (generalisation, extension)



Titles

- A title of an article/thesis/report must be informative and concise
 - Too general terms and titles should be avoided
 - Every term should be necessary
- Must be attractive
- · Not too complicated and filled with words
- · Not too short either

Preciseness is more important than conciseness and attractiveness!



Titles (2)

- Examples:
 - · Too complicated:
 - An Investigation of the Effectiveness of Extensions to Standard Ranking Techniques for Large Text Collections
 - - · Extensions to Ranking Techniques for Large Text Collections
 - Too general:
 - · Huffman Coding for Databases
 - Better:
 - Limited-Memory Huffman Coding for Databases of Textual and Numeric Data



Chapter and section headings

- · Should reflect the structure of the work
 - For example
 - 4. List and trees
 - 4.1. Lists
 - 4.2. Trees
- · Not complete sentences
 - . Example:
 - Not: Replication of Data Leads to Reduction in Network Traffic
 - But: Replicating Data to Reduce Network Traffic



Chapter and section headings (2)

- Not too lively
- Avoid questions or abbreviations
- Headings at the same level should
- be comparable in their contents and structure
- have a clear connection to the balanced outline
- Third-level headings, i.e. subsubsections, seldom needed
- Usually the need of them indicates problems in the outline



Chapter and section headings (3)

- · Paragraph titles should be avoided
 - If needed, should be part of the paragraph
- Numbering of headings depends on the publication forum
 - · Unnumbered headings must be distinguished by a specific font, style or font size At our department numbering of headings is required



Paragraphs

- · Building blocks of chapter, sections and subsections
- · Should not be too long
 - · Logical flow of the text becomes difficult to follow
- · Short paragraphs easier to read and they make communication more efficient
 - No paragraphs consisting of just one sentence!

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Writing

- Scientific text should be impartial, accurate and objective
 - · Arguments must be based on evidence
 - Statements should be supported by examples
 - Sources of information and ideas must be indicated
 - Use enough words to make your meaning clear
- . Started by writing a draft of the text
 - Flow of ideas
 - A short text can be drafted completely



First draft

- Freely written
 - · Concentrate on presenting ideas in a logical way
- Raw text
 - . Style, layout and punctuation can be corrected later
 - Exception: mathematical and formal issues as precisely as possible from the very beginning
- · Must be edited and revised carefully and thoroughly
 - · Several times
 - Difficult things more times than easier



How to proceed with writing

- · Different approaches
 - Write the introduction first
 - . Start from the body of the text
 - => use the method that is the best for you
- · Write something even if it is hard
- Start with easier things
- If everything else is difficult, fix the technical details (list of references, etc.)



Revising

- · After the first draft is ready/complete
- Aim: ensure that thoughts created in the mind of the reader(s) are the same as the thoughts of the writer(s)
- Checking
 - the order of presented ideas
 - the use of words and terminology
 - · style, layout and punctuation



Revising (2)

- · No statement should be introduced abruptly and without warning
- · Relationships between parts at a same level should
 - Each section should be related to the preceding and the next one
 - Similarly with paragraphs in a section and sentences in a paragraph



Revising (3)

- Paragraphs and sentences should be in a logical and effective order
- Balance is important
 - Parts must be balanced in themselves, and in the relation to one another
 - · Holds for sections, subsections, paragraph, and even sentences
 - For example, no sections with just one subsection!



Revising (4)

- Important and difficult parts typically re-written several times
- · After a revision, put the text a side for a moment
 - · Avoid blindness to your own text!
- · Ask someone to read your text and give comments!
 - Experts versus non-experts
 - The function of criticism and feedback is to improve

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Finalising

- When all the parts of the text are written at least once
- Check that objectives, motivation and restrictions are in line
- Evaluate issues that the readers or reviewers might criticise or argue against
- Check technical details
- If published, the critics of the reviewers should be taken into account
- Changing publication forum may require bigger changes...



Structure of a thesis, report or seminar work

- Title page
- Abstract
- Table of contents
- Introduction
- Body of the work
- Conclusions
- · List of references
- (Appendices)



Abstract

- Helps the reader to decide whether to read the whole text or not
- Should be short, but clear, informative and concise
- Details or description of the outline not part of the
- Final version is written after all the other parts of the text are ready
- Aimed to large audience
 - · Readers are not necessarily experts on the topic

· No references to other articles



Introduction

- Introduction should be the easiest part of the text to read and not too long
- . Must tell what are the new ideas and the main results presented in the article/report/thesis
- Must show that that the whole text is worth reading
- Can be written first, but then typically must be revised



Introduction (2)

- · Not too technical, but specific and informative enough
 - · Not technical terminology
 - Not very detailed definitions of terms/concepts
 - Not too much mathematics and formulas
- Must contain motivation
- No deep literature analysis
- Importance of the results, not conclusions
 - (References to relevant work)



Introduction (3)

- Typical contents and structure
 - · Description of the topic and its context
 - · (Related work)
 - Description of the problem considered
 - · Summary of the proposed solution
 - Evaluation of the solution
 - Application areas
 - Consequences
 - · Brief description of the outline of the work
- In surveys: why the certain approaches were



Literature overview

- Related work, survey
- Connections to earlier research on relevant topics
- As important as the description of the contribution of the text
- Location in the text
 - In the beginning of the article (description of the context, a part of introduction)
 - · If large, a separate section is required
 - . As a part of the body of the text
 - After the body, where a comparison of old and new solutions is possible
 - In different sections when it is appropriate

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Definitions

- Terminology, variables, abbreviations and acronyms must be defined or explained the first time they appear in the text
- Consistent emphasising
 - Different style of letters: italics, boldfacing, \dots
 - · Only the first occurrence
- · Sometimes several explanations can be good
- Definitions are given when needed
 - Usually a separate section "Definitions" is not needed/good
 - · Every defined term should be necessary



Results and their analysis

- · Traditional order of presentation:
 - · Description of all results
 - · Analysis of the results
- Drawback: the reader might not be able to follow what happens
- More reasonable order of presentation:
 - Analysis is combined with the description of results and how they are obtained
- · Description of a particular result should usually start with a brief summary on the main observations



Conclusions

- Brief repetition of the main ideas, results and conclusions as well as their meaning
- Restrictions of the work can be repeated
- No new ideas or conclusions that are not presented in the body
- Can be stated
 - · Unsolved problems
 - Which points or perspectives were omitted
 - Which variations should be considered/researched further



Divided authorships

- All the authors have some kind of contribution to the contents of the article
- · Brainstorming and developing ideas
- · Even writing together
 - Each author write a certain part of the text (different styles, non-coherent style)
 - One or two authors write the draft, and other revise it in turns