

HWM thesis and internship tips

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1 Introduction

We often see that thesis and internship students are struggling with the same things. The aim of this document is to provide some general tips and tricks for research, reports, presentations, etc. Take the parts you find useful – you are not obliged to use any. Hopefully, this document will expand over time. The most recent version of this document and other information can be found via www.hwm.wur.nl → education → MSc theses or Internships and on the HWM thesis Blackboard, where all thesis and internship related information is collected.

2 Arranging an internship

Arranging an internship is your own responsibility, so it is important that you show initiative. Don't wait for an announcement in the Pyrus newsletter, but look for providers yourself. If you have found a company or institute you would like to do your internship at, approach them yourself. There are certain things you could mention in your email to make it more likely that they will take you on.

- Show that you are motivated. Explain what you would like to do (both regarding the topic and the activities) and learn in your internship and why you want to work at that specific provider.
- Tell them what you could offer a potential internship provider. You should realise that internship providers don't get a remuneration for training students (and are not obliged to hire interns). An internship provider wants to "profit" from having an intern. An intern could for example investigate something the regular employees don't have time for. It helps if you indicate what benefit they could have from taking you on ("I worked with GIS tools in my thesis"), which may convince them that you are worth their time and effort.
- Attach a CV to your email listing your study programme, previous working experience and e.g. important university courses or project.

3 Going abroad

Well in advance:

- Check if you need a visa and start your application as soon as you can. This procedure can take months.
- Get vaccinations at Vaccinatiecentrum Wageningen. They are cheaper than the GGD and are located in Wageningen, next to the Idealis office.
- Get a credit card.
- Learn (the basics of) the local language. Speaking the language well is very useful, but people also appreciate it if you know a few words. In'to languages (in the Forum building) offers several courses. There is also a free app called Duolingo.
- Try to skype with your local supervisors to make agreements on work place, computer, housing, etc.
- Collect measuring equipment. It is possible that the HWM group does not own all things you need, so you may have to ask around or be creative and make some yourself.

Before you leave:

- Get travel insurance and check if it covers trips that last longer than the average vacation.
- Activate your bank card to world cover through your bank's website.
- Buy small presents for your local supervisors, for example the typically Dutch (but obliquely appreciated) stroopwafels.
- For Dutch students: remove the student-product (studenten-reisproduct) from your OV-chip card. If you don't, you pay 70 euros per two weeks.

4 Literature

Finding and reading relevant scientific literature is not always easy and there is not one best way to do it. Tips for finding relevant papers:

- Ask your supervisors for one or more papers to start with.
- Follow the references in one paper to find other useful papers.

- Enter keywords in search engines such as Google Scholar, Web of Science and Scopus.

Some people read papers from beginning to end, while others only scan abstracts. When you are looking, remember that you search for a reason. Read the parts of the paper that may help for this reason. If you want to back up statements in your introduction-section, fast forward to the discussion and conclusion sections. If you are looking for inspiration on how to analyse data, fast forward to the results section. And if you want to know how a certain model works, fast forward to the methods section.

5 Proposal

Make sure the proposal contains at least the following sections:

Problem description Remove text from this template and write your own (of course). Feel free to change headers, but make sure the topics are covered. There is a lot of valuable information available on the internet on how to write thesis proposals and the thesis reports themselves. In this Section, you should:

- Motivate and justify the research. Put your research in global context (who cares about your research?)
- State what has been done already. Summarize relevant literature.
- State what has NOT been done yet. Where is the gap in knowledge? This should lead directly to the research objectives in the next Section.

Research objectives State objectives clearly. What is the point of this research?

Research questions Which questions do you want to answer in order to reach the objectives?

Methodologies How are you going to find the answer to your questions? What do you need for this? Describe the core measurement equipment or models briefly.

Data Are you going to use other people's data or collect data yourself?

Timetable Specify special conditions: are you planning to take courses, vacation, etc. Adapt the Table below to make it specific for your project (or make your own). Set deadlines for the products.

6 Proposal presentation

The proposal presentation is mainly a starting point for a discussion. Below are some tips on how to make the presentation in such a way that the discussion will be most beneficial to you.

- Make very few slides with only a little bit of text.
- Don't waste a slide and time on the lay-out of the presentation (all presentations have more or less the same set-up anyway).
- Take a minute to introduce the topic. Don't overestimate the audience (explain specialist terms quickly) but also don't underestimate ("floods are important because they can cause damage"). Use fellow students to test if the level is correct.
- Make the objective clear; it should follow directly and logically from the introduction.
- Include nice pictures of your catchment, a visualisation of the method you will use or some preliminary results (not too many or too detailed).
- Don't copy your whole timetable in the presentation, but do mention a rough planning (which month do you work on which topic; not which week you will write which section).

7 Report

The report is the main means of communicating your findings to a broader audience. Therefore, you should take care to maximize its effect. A report should capture interest and keep interested people reading. Readers are very picky and put down texts when its too boring, too confusing, too difficult or too long.

- Keep it short. Don't show everything you did, but focus on the interesting outcomes. Help the reader to decide which parts are interesting and which parts aren't by leaving the uninteresting parts out.
- Make the title attractive: complete, but compact.
- Use the introduction to make really clear why this research project is necessary and use the conclusion to answer your research questions.
- Make sure that it's understandable for someone who wasn't involved in the process. Use fellow students as test readers.
- Make figures informative and attractive.
- Keep a logical structure.
- Look at other reports and papers for inspiration.
- Make it small (<8 MB). If it's too big, people won't forward it to others.
- Use enough references to back up your statements and put your research in perspective.

7.1 Report set-up

The thesis/internship report is set-up as a scientific paper, with the following sections*:

Abstract Short summary that can stand alone.

Introduction The problem, what is known, what is not known, and the objective.

Methods What you did.

Results What you found. A report may contain several sections with results on different parts of the project.

Discussion How you interpret the results. This may be a separate section, or combined with the results section.

Conclusions Possible implications and the impact.

Recommendations (optional) What would you advise future research to focus on?

Acknowledgements (optional) Who contributed to the work (data providers, help during field work, etc.).

References How to find the papers referred to.

Appendix (optional) Supplementary material.

There is a wealth of information (online and in books such as the one referenced above) on what to write in which section.

7.2 Figures

- Make vector images (pdf, eps). Make them in R/MatLab for pretty, reproducible results. Try to make the fonts of the axes and labels approximately the same size and style as the rest of the text in the report.
- Make jpg, png, and bmp files (especially photos) smaller (in terms of kB/MB). The easiest way: download the program called “paint.net”, click “image” → “resize”, decrease the number of pixels and save with another name, so you keep the original (you may need a higher resolution for your presentation).
- Optimize the data-ink-ratio: remove unnecessary decimals on the axes, grid lines, etc., but add arrows or text to focus attention on important aspects and making the figure as illustrative as possible.
- Combine similar figures for easy comparison, as long as you can distinguish the lines. Use multiple axes if necessary.
- Be consistent. If you choose a colour or line type for a certain variable, use that throughout the report (if possible).

*based on B. Malmfors, P. Garnsworthy and M. Grossman (2004): Writing and presenting scientific papers, Nottingham University Press, Nottingham, UK.

- Use colors to make on-screen reading more pleasant, but choose colors which are distinguishable when printed in black and white.
- Think of different figure types, such as scatterplots, time series, barplots, etc. Looking at data in a different way can give you different information.

8 Colloquium

- Keep in time. 20 minutes is not very much (but actually long compared to conference presentations of 12 minutes).
- Practise to make sure you keep in time and tell the important parts of the story
- Make fonts (especially axes of graphs) large, so they can be read from the back of the room.
- Ask for feedback. Show your slides to your supervisors and discuss if you are showing the main outcomes.
- A fellow student with a completely different topic should be able to follow your presentation. Give the presentation to friends and fellow students to check if you estimated the level well.
- Don't skip over the methods too quickly. If the audience doesn't understand what you did, the results do not make sense at all. On the other hand, keep the balance between methods and results. Don't use 10 slides to explain how you did it and one to show what information you gained from this exercise.
- Use color to emphasize text and distinguish between lines in graphs, but don't let it distract.
- Movies can be a powerful method of communicating information. Check if they run properly on a different computer – it's always very disappointing when a presenter says: “well, this was supposed to be a very nice example of...”.

9 Using the computer effectively

- Use appropriate programs:
 - R, MatLab or Python for code
 - LaTeX for reports
 - Mozilla Firefox or Google Chrome as browser
 - Free Commander or Total Commander to replace Windows Explorer
 - Notepad++ to replace Notepad or Wordpad
 - Paint.net to reduce figure sizes
 - Adobe Illustrator (not freeware) or Inkscape (freeware) for more complex figures
- Use keyboard shortcuts to minimize mouse usage. It's faster and easier for your arms and shoulders:

- ALT+TAB: change to another program window
 - →/←/↑/↓: move cursor
 - HOME or END: move cursor to begin or end of line
 - Page Up or Page Down: move cursor one page up or down
 - SHIFT + →/←/↑/↓/HOME/END/PgUp/PgDn: select
 - ENTER: open program or folder (in Windows Explorer or similar)
 - Backspace: go to previous folder (in Windows Explorer, Free Commander or Total Commander) or webpage (in browser)
 - ALT+F4: close program
 - Windows key + D: go to desktop (windows only)
- Make back-ups and store them in different locations.
 - Automate things. Generate figures automatically in R/MatLab and avoid sidestepping to Excel. Use LaTeX rather than Word. Excel and Word may seem the faster option at first, but after several versions and rounds of copying and pasting, you will realise that in fact it isn't the faster option.
 - Give files and folders logical names directly (don't think "I'll just call it "temp.txt" for the time being", because you'll end up with many files which look the same). Think of a logical file structure on forehand, but don't hesitate to reorganise your hard drive and make extra subfolders when necessary.
 - Make notes for yourself and possible future users. Add comments in R and MatLab script. Write readme-files to go with the data (specifying units, measurement type, provider, etc.).

10 LaTeX

LaTeX (<http://nl.wikipedia.org/wiki/LaTeX>) is a very useful text editor which is more practical to write large reports in than Word. We advise to use LaTeX for theses and internships, but it is not obligatory. Many internship providers prefer Word documents – discuss the choice of text editor in an early stage.

LaTeX looks difficult (like code), but it isn't really (you'll understand the basics in less than an hour). Big advantages:

- You don't have to think about the lay-out much, because LaTeX computes where to put figures and text in such a way that it looks nice (so no more cases with one line of text on an empty page or a lot of white space because the next page contains a figure). If you do want to change the lay-out, you can do anything you want (and it looks nice too).

- You don't paste figures in your document, but tell LaTeX where to find them. This saves a lot of time, because you always think that you have the final version of a figure, but you often keep improving. LaTeX will automatically update your document when the figure changes.
- The graphical quality of your pdf document is very high, because you don't lose quality in copying and pasting (the computer will convert the formats and/or resolutions if you do). Of course the quality of the figures should be good to start with, so always make pdf (and not png) figures in R or MatLab.
- It is easy to refer to figures, tables, chapters and literature. The numbers will be updated automatically.

The only disadvantage of LaTeX is that if you type text, you don't directly see what the document will look like. But with an interface (such as TeXstudio, see below), you can have the code in the .tex document and the final .pdf document next to each other and with two keyboard hits (F6-F7) the .pdf will be updated, so that problem isn't too bad.

10.1 Getting LaTeX

TeXstudio is one of the many interfaces to type in and to see the results. MiKTeX will run in the background to compute where to put text etc. (just like when you use the RStudio interface, which runs R in the background). If you work on a university computer with some installing rights, you can install MiKTeX and TeXstudio through the Available-Software-button: "Start → all programs → WUR → available software". If you install MiKTeX first and then TeXstudio, TeXstudio will automatically have the right settings (location of the MiKTeX-directory).

There is also an example of a reference list (references_thesis.bib). JabRef is another program, in which you can easily keep your bibliography. LaTeX will use this bibliography file to cite literature correctly (see the thesis template for examples).

10.2 LaTeX help

There is a huge amount of information about LaTeX on the web. Don't try to read everything, but start with a template and look things up when you get stuck. Useful help:

- Very short intro: <http://tug.ctan.org/tex-archive/info/latex-veryshortguide/veryshortguide.pdf>
- Bit longer intro (with some math examples): <http://www.cs.princeton.edu/courses/archive/spr10/cos433/Latex/latex-guide.pdf>
- The "not-so-short-manual" on for example <http://ftp.snt.utwente.nl/pub/software/tex/info/lshort/english/lshort.pdf>

- LaTeX wiki: <http://en.wikibooks.org/wiki/LaTeX>
- Google your question or error message.
- Ask people (other students or staff) at HWM. Nearly everyone uses it and it's often much faster to ask something than to spend the whole afternoon searching for something, which may be trivial to others.

10.3 LaTeX templates

There is a template for MSc theses and MSc thesis proposals. You can change anything you like - there are no formal rules for formatting MSc theses and proposals. It also contains some general information about what should be covered in a proposal. You still have to write the thing yourself - this is just a framework. The zip-files with templates also includes an example TeX file from a paper, so you can see some commands. You can open them in TeXstudio and try to compile them yourself and they should result in the same .pdf. It is possible that it can't find all figures or that some packages are missing. TeXstudio can automatically install missing packages (or you can download them from the web).

11 Help

- Ask fellow students and supervisors for help and feedback when you need it. Don't stay stuck too long.
- Just Google it. Entering R (or MatLab, LaTeX, etc.) error messages often gives useful help. Sites like StackOverflow give much information.
- Use material from previous courses, such as scripts you built during computer practicals, papers you read and the (very) short introduction to R. (cran.r-project.org/doc/contrib/Torfs+Brauer-Short-R-Intro.pdf).
- Take (short) breaks to refresh your mind. Go for a walk outside to get some oxygen.

1. Training "Van uitstel naar actie" volgen in periode 3+4 die gegeven zal worden door Andre Rozendaal (opgave vanaf 24 november na het 2e college Martijn van der Spoel) 2. Boekje "Nog slimmer!" (hoofdstukken: Uitstelgedrag en Motivatie), of andere boeken hierover die ik aan studenten uitleen... 3. Website van Universiteit van Leiden: <http://www.studietips.leidenuniv.nl/uitdoe.html> (en veel meer interessante tips via google, bv: <https://www.allegrow.nl/blog/20-tips-om-jezelf-te-motiveren>) 4. Regelmatig contact met studieadviseur, studentendecaan of studentenpsycholoog en bespreken/reflecteren over hoe het gaat, eventueel aangevuld met opdrachten. Coaching m.b.v. GROW model bv.

12 More information

On the thesis and internship pages on the HWM website and Blackboard, you can find more information on theses and internships, such as agreement forms, assessment forms and assessment rubrics (you you can see on what your grade is based eventually).

In addition, on MyPortal, under Education links → Education, you can find some links to sites with tips for internships and theses.