1 Introduction

Writing a Ph.D. dissertation is a daunting task. But my experience was not that extremely hard; for my case, the hard part was not with the writing, but with managing the research process. This was actually much, much harder than I had expected — and I heard similar things from my friends who had already got their Ph.D. degrees ahead of me.

But for writing part, believe me — it can be *strangely* fun. Writing is a great process that conveys your thinking to other people. Of course there are other ways to express your thinkings; presentations, discussions, lectures, and so on. However, the point of writing is that it is like a construction process that eventually leads to a *great* building. If I rely on analogy, presentations and lectures are like creating small rooms and facilities *inside* your building. Only writing can connect and organize them into a huge, great-looking skyscraper.

In this manuscript, I intend to lay out my lessons writing my Ph.D. dissertation. Well, I do not think that my writing, especially my dissertation, is a quality one. But my writing experience has been felt great most of time. And I want to share my experience — particularly in terms of what you need to prepare — with other ABD[1] students out there. In addition, I want to talk about good tools out there for dissertation writing. Different people use different tools but the technical advances in "writing support" have been amazing to me during my dissertation writing. Be sure to get the benefit out of them.

1.1 Other guides and tutorials

There are a bunch of them. Some popular ones are:

- Tomorrow's Professor: Preparing for Careers in Science and Engineering

  This book is a classic. Actually, I did not buy this book for the simple reason of being-too-expensive. Instead, I subscribed for an e-mail list which turned out to be pretty helpful. Check out the link at `http://cgi.stanford.edu/~dept-ctl/cgi-bin/tomprof/postings.php`.

- Getting What You Came For: The Smart Student's Guide to Earning an M.A. or a Ph.D.

  This is another great book for any graduate students, particularly for Ph.D. students. I hear a lot of good praises about this book from my colleagues too. Personally, one problem was that I had not quite fully understood what the book was actually talking about *before* I met the situation myself and went it through (for example, explanations on the experience examples for a comprehensive exam).

  Still, well, it is definitely better than tackling something without knowing anything at all. So keep a copy near you.

[1] Informal acronym for all-but-dissertation

2 Thoughts and tips for writing

2.1 Write regularly, but not that much

One thing you will realize after you are done with your first dissertation draft — is probably that you have been writing one page per day on average (double-spaced, 12 pt.).

But please note that this measure is "on average". Sometimes you might be writing a lot, with your fingers gliding smoothly over the keyboard. Of course some other times you might be looking at the blinking cursor for hours and hours without typing anything at all.

The point of writing, in my opinion, is to realize that this is a mental process of pouring down the flow of your thought into an organized form. And like it or not, your mental process is dominated by your cognitive state at this moment. First comes your subconsciousness. You cannot control it but somehow you will notice that your subconsciousness plays a big part with your writing performance; sometimes you have a lot of thoughts but sometimes not. This is because not all of your thoughts are created from your consciousness. If your subconsciousness is not feeling well, you will be facing a strange paucity in the amount of any thoughts in your brain.

Therefore, you cannot avoid writing almost nothing when you do not have any thoughts to write. This is actually very natural; when there is almost nothing in your brain, stop writing. Do something else. A good news is that your subconsciousness is still working even when you are sleeping. When your subconsciousness creates sufficient amount of thoughts, you will be naturally writing a lot.

Second, your thoughts have water-like streaming characteristics. They are not like a stack of materials stored inside a closet, as we typically imagine. When your thought comes up, you need to "save" it somewhere because it is flowing and going away soon. Of course you can retrieve it from your memory later, but a lot of time it is hard since it requires a queue (or a key as in a key-value pair in computer science) to access the stored memory.

For this reason, when thoughts are coming up, try best not to let them flow away. Sit down and write — at least several words (which can be a queue for easily retrieving all the thoughts you are having right now). If you don't have computers nearby, use a pencil and a piece of paper.

And a habit of writing down right at the moment when thoughts are coming up helps the current flow keep going. This is important. If the stream dries up completely, you will be having a hard time taking the water from deep down the well of ideas. But if you keep writing — not too frequently but sufficient enough to keep a very shallow thought stream — then your brain will keep rollin' on.

So the point is that you do not stop writing completely, especially for a long time like a week or so.[2] If writing your dissertation feels like too stressful, work on "writing" something else. Keep your brain warmed up — but just enough to avoid complete freezing.

[2] This can be different when you are writing a paper instead. For paper writing, a process of "stop writing for fermentation" can be helpful to upgrade your work into a quality one, as if fermentation transforms milk into tasty cheese. Refer to Varian [1] for more information

2.1.1 Working hard for writing?

However, sometimes, actually more than frequently, your brain needs a break. If you observe yourself carefully, you will see that your writing performance pattern shows a lot of fluctuations even for a day. One strange thing is that your brain needs a lot of energy to work on writing. The brain can be energized only when you have (i) sufficient amount of quality food *and* (ii) a lot, lot, lot of break (such as sleeping).

So working up too late and getting up early to meet other schedules is not a good strategy when you need to write some important things. From my experience, it was better to sleep say, for 10 hours, and efficiently work on my writing for two hours, than to trying hard to write something for 6 hours after getting 6 hours of sleep.

And another strange thing is that you need a get-away break sometimes to keep your brain fresh. What you notice at this point is that you actually cannot write anything. And you will probably see that you cannot do other things easily as well and even reading a gossip story about a celebrity will feel like a burden. Then you do need a reboot as you do sometimes with your computer. For me, if I keep thinking about driving four hours to New Jersey for a Korean hot spa trip, then it is usually time for a "reboot" myself.

But most students, including me, make a poor decision of working harder and harder to overcome this situation. Well, it might be needed for a military exercise where a failure might mean life or death, but this only make the situation worse when you work on research. Even in a military setting, I think generals planning strategies must sleep sufficiently. That's the way brain works.

2.1.2 Write some other stuffs

Unfortunately, becoming a *good writer* takes a long time. I need more time to become a good writer too. As an international student with English being my second language, it is much harder for me than my English-speaking colleagues. To make matters worse, the Korean language is quite different from English in every aspects; a lot of time I envy my Chinese colleagues because Chinese is way much closer to English in terms of grammar, not to mention people from countries speaking Indo-european languages.

But what writing actually requires, especially academic writing, is your reasoning skill, not much as language skills. Training your brain into generating a stream of well-organized reasoning thoughts takes a huge amount of time. 10,000 hours? [CITE]

Therefore, write something all the time. Anything is fine. Diary, notes, e-mails, and so on. But one of the best writing practice can be keeping an online blog. Blog postings are typically longer than other form of online writing and this is the environment that induces your brain to organize your thoughts.

In addition, reading books can be important too. Creativity usually starts with imitation. When you read a lot, you will have raw materials for better writing. When you want to take a break, feel free to read. For academic writers, reading is actually another form of writing practice.

2.2 Writing in some other forms

Some of my friends are actually very good at this. They use Powerpoint slides extensively — like writing down your thoughts, ideas, titles of nice articles, etc. onto PowerPoint, rather than using a word processor or other note-taking applications such as Evernote or OneNote.

The advantage of this is twofolds: first, laying out bullet-points is usually easier than writing sentences or paragraphs. Second, you can save time creating your presentation slides with these Powerpoint-based notes. Since the flow of your thought is important with your presentation, writing "thoughts" directly down in the form of slides are actually helpful for your future oral presentation — and easier than creating presentation slides after going over your paper (which has to include a reorganization process of your thoughts).

Interestingly, this was not working very well for me; I guess this is due to my personal characteristic, but the *idea* of laying out bullet-points worked with when I was doing my literature review. When I found out several interesting articles, I usually open up Microsoft OneNote window and start writing down with bullet-points using indents.(You might use word processors or other tools as well)

I do not put much there. Just some keywords or my thoughts with several words or a sentence at maximum. When I am done with this, I just leave it there. When it comes down to writing a literature review part of my paper, this expedites my writing process; I just take one line or two and convert it into sentences.

So this switching between bullet-points and formal sentences/paragraphs helps my writing process in two ways. First, it makes my finger keep typing. Second, it makes easier for me to build nice sentences later — from pieces of a few words.

I still think the PPT note-taking idea from my friend is effective. However, you might want to transform it a little bit to suit your style and needs. And remember that bullet-type writing is usually easier even when you are stuck and cannot write a single sentence at all.

2.3 Work smart, not hard

You do not want it and I do not like it either. But put the highest priority on your writing work from your to-do-list for today. Only when your brain is fresh, you can write. When you start your work, get the writing done first and do other things later. Even a small bit of fatigue in your brain will greatly hamper your writing performance. And be sure to get a lot of sleep.

2.4 Separate writing and editing

One legendary(?) tip coming from so-called "prolific" writers is that you need to separate writing from editing when you want to write a lot. It sounds simple. And it was not actually that hard when I was practicing it either. Dump whatever thoughts you have right now. Minimize hitting on backspace key. Of course do not think about grammars or whatever. Forget about it after done with dumping. Get a good sleep. Then do editing tomorrow.

The main advantage of this separation technique is that you can save a lot of materials that otherwise would have been cut and discarded by your editing thought process inside your

brain. Simply storing the thoughts in the form of sentences help stacking up the materials. Storing them inside your brain in the form of thoughts are susceptible to volatility.

[But what was the problem with this technique??? Drafter/planner tradeoff?] [Write more on the side-effect of "writing too much"]

3 Tools

3.1 LaTeX

No wonder LaTeX takes care of numerous chores in dissertation writing for you. For example, you no longer need to pay attentions to the layout of the figures. Table of Contents is automatically generated, and the numbering for tables, figures, math equations, theorems, and so on are all automatically taken care of.

But the most significant feature of LaTeX, in terms of researchers' perspective, is its citation management combined with BibTeX. A researcher has to know *where* his knowledge comes from and that is the reason why we need to keep it a habit of tracking citation records. The number of citations for a Ph.D. dissertation easily surpasses 100. If you do not do the record keeping, you will be always lost in recovering your memory.

So how does BibTeX manage your citation records? BibTeX citation file is a simple text file with specific citation field records (See Fig. 1 for an example). You just need to add entries whenever you come across any good papers.

There are other alternatives such as EndNote. EndNote is popular with Microsoft Office users. I do not have any experience with EndNote, so I skip EndNote in this manuscript.

```
@ARTICLE{gode-sunder-1993,
  author = {Gode, Dhananjay K. and Sunder, Shyam},
  title = {Allocative Efficiency of Markets with Zero-Intelligence Traders:
    Market as a Partial Substitute for Individual Rationality},
  journal = {Journal of Political Economy},
  year = {1994},
  volume = {101},
  pages = {119--137},
  number = {1},
  month = feb,
  issn = {0022--3808},
  shorttitle = {Allocative Efficiency of Markets with Zero-Intelligence Traders},
  abstract = {},
  url = {http://www.jstor.org/stable/2138676}
}
```

Figure 1: A BibTeX entry example for a journal paper.

3.1.1 A process of building and managing your paper collection

Personally, I recommend using the combination of Zotero, BibTeX (and LaTeX of course) for managing your paper collection. Imagine it like managing your MP3 music collections. How

do you manage your music collection with, say, iTunes or Google Music? You download or purchase MP3 files of your choice, store them into iTunes folders or Google Music cloud space. Whenever you want to listen to them, you rely on browsing or searching features from your iTunes or Google Music.

Similar process can be true of your academic paper collections. Think of Zotero as the iTunes for your paper collection. You search for a paper and download it. Then you save it to Zotero so that Zotero can automatically add the paper to your collections.

Similar to that iTunes can detect the MP3 tags with artist name, song title, album title, etc., Zotero can automatically detect the paper title, author names, published journal or conference name, publication date, and so on. If Zotero fails to autodetect, you can manually enter the information too.

But you need to *export* your Zotero collection into a BibTeX format text file in order to include the citations as inline ones for your dissertation. This is a step not needed for MP3 collections. You just pick one MP3 file and listen to it. For paper writing, imagine like you are writing a MP3 playlist. But the playlist for your paper has to have an intermediary format and BibTeX is the format for the papers being written in LaTeX.

What is the advantage of having another BibTeX format? One handy feature is that academic paper search services such as Google Scholar or Elsvier provide the citation information in BibTeX format. You can export from Zotero. But you do not necessarily do it from Zotero and you are not locked-in the Zotero service only.

[some conclusive remarks?]

Managing paper pdf files This section is my praise for Zotero; when you search for a paper and save the web page to Zotero service, Zotero not only saves the web page but also stores the paper pdf files automatically. This saves you a lot of effort from keeping two separate collections simultaneously: citation database and paper PDF file database.

This feature is very simliar to Evernote's. Whenever you click on the Evernote button from your web browser, the Evernote plugin clips your web page of interest and saves it. Zotero does the same but it automatically recognizes the paper PDF file linked on the web page and save them altogether, generating a catalogue.

3.2 Editors for writing LaTeX manuscripts

There are a bunch of them — basically you can use Windows Notepad as well. But having a LaTeX-aware provides a great boost with your work efficiency. For me, I find syntax highlighting (or coloring), auto indentation, and auto word-completion (citations, links, etc) features helpful. Note that these features are all present for any LaTeX editors.

One thing I would like to recommend to you writers is so-called "distraction-free" feature. A number of editors have this — it creates a full-screen editing environment, without a pull-down menus or icons for other jobs that might distract you into something else. Please have a look at my working environment (Fig. 2):

See? This helps you with not wasting time your away with clicking on here and there on your web browser.

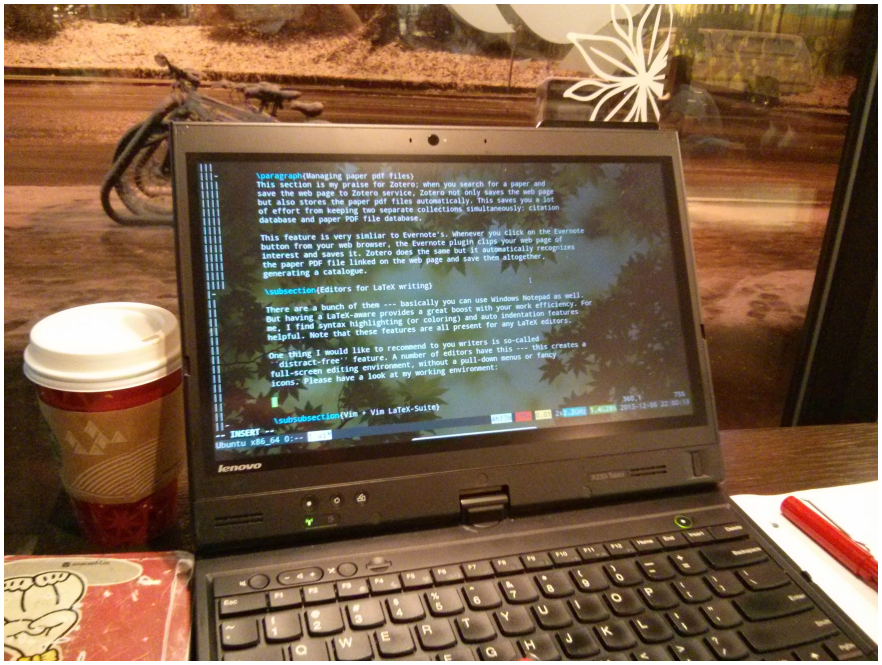

Figure 2: A “distraction-free” editing with `vim` on a Linux terminal

3.2.1 TeXMaker, TeXShop on Mac, and TeXTronics

If you think you are a beginner, start with TeXMaker. You won’t regret it. If you are a Mac enthusiast, consider TeXShop as well. However, note that TeXMaker is cross-platform; it runs on Windows, Mac OS X, and Linux as well.

Some people recommend TeXTronics but I am not so sure about its advantages.

3.2.2 Sublime Text 2 or 3

People are raving on it. Seriously. This is an editor that you might want to purchase.

One drawback is that Sublime Text needs customizations. It is a general-purpose editor, not only for writing LaTeX documents, but also for writing in other programming languages such as C, Java, Python, Ruby, etc. However, once setup, Sublime Text becomes very handy and user-friendly.

In addition, Sublime Text is highly configurable. Therefore you can customize it at your will: font and paragraph customization, themes, shortcut keys, distraction-free environment, preview mode, 80-column indicator, and so on. Some people say that this is the editor with emacs-level configurability. And there are tons of 3rd-party plug-ins.

Sublime Text is the best editor I would like to recommend, if I have to choose one from this section (and TeXMaker as the second for its ease of use). Be sure to give it a serious try at least once.

3.2.3 Vim + Vim LaTeX-Suite

This is my personal choice but learning `vi` can be a pain when you are not accustomed to Linux or shell environment. In other words, very nice for geeks but not very recommended for other users. (And you probably know by now if you need to skip this section or read further.)

In case you are using `vim`, be sure to have a serious look at Vim LaTeX-Suite. `vim` is good enough, but LaTeX-Suite is a plug-in for `vim` and provides extra features such as paragraph folding and quick search for your BibTeX entries.

Of course, you can use the holy `emacs` instead of `vim`. `emacs` is always rich with great features that human minds can ever imagine.

One clear disadvantage with `vim` is its multi-window support. `vim` is now equipped with multi-window support, but my opinion is that `vi`'s interface is not very much multi-window friendly. For me, I ended up using `byobu`, which is an enhancement on the classic `screen`. Or you can use any terminal emulator with multiple tab-window support.

When you use `byobu`, some shortcut keys conflict with Vim LaTeX-Suite's. A quick tip: press `shift + F12` key to disable them.

3.2.4 Online LaTeX editors:

Templates available. Especially resume or CV's.

3.2.5 Fixed-width fonts

Better fonts than Courier new.

3.3 Learning LaTeX

Math on LaTeX.

StackExchange is awesome.

3.4 Packages

AMSmath and AMSsymb packages: indispensable.

Some font packages: But use Computer Modern for printouts. On screen: CM is not good. Use up-to-date fonts:

fullpage

setspace: onehalfspacing, doublespacing

3.4.1 Tables, Figures, and picture import

start from
includegraphics.

Tables and Figures: Use this template.

Pictures: use png most of time. pdf is actually better in terms of high-resolution printing. Note that MS Office now provides save-as-pdf feature as well.

Look for conferences or journals: they have nice templates as well.

3.4.2 Creating a poster with LaTeX

pros: Scales easily. Flexible textbox support. Math equations

cons: Takes more time for learning than using ppt.

poster tips: 24in by 36in is a US standard. 3-fold poster panel size: 48in by 36in. Most large-format printers support up to 42in.

Cheapest one: use Acrobat reader and color print with the poster option. Letter-sized mosaics. Glue them on the poster panel.

Tips for using Sans Serif fonts:
usepackage. Droid, Dejavu, Bera, Helvet, etc. Sans Serif fonts are good for ppts or presentation materials. Complaints about Arial. Microsoft's C-series fonts are pretty good but limited use under LaTeX environment.

4 Mental support

4.1 Counselling

It might sound strange, but this can be important for your research. Sometimes you can have difficult time making progress as a researcher due to some emotional factors. If this is so, consider talking to a counsellor. Usually the symptoms for any emotional problems for a Ph.D. program student can be roughly referred to "depressions." However, there are numerous reasons when a person experiences depression and it is often hard to identify the specific cause for the depression.

Counsellors are professionals trained to detect this specific cause of the depression and they can give you "prescriptions" depending on your specific type of the depression identified. For example, some people have trouble with fear management. Others might have problems with concentration. These are beyond the scope of your advisor — actually way up beyond their handling capability.

One tip is that you probably have health insurance coverage for counselling. A good(?) news is that the coverage for counselling is usually very nice when your insurance coverage comes from your graduate assistantship work. (TA or RA) So use them if you need — not only for your mental health but also for your research output — and work efficiency including your advisor and your department as a big community.

5 Fun, hobby work

One thing I regret is that I have not had any hobby (or fun) work during my long Ph.D. program period — note that I use the word "hobby work" instead of "hobby" or just "fun." Do it. Do it regularly like a work — or do it like a regular exercise or training depending on your personal taste.

The main reason is that (again!) your brain does need breaks. Having a break from your research work is hard since it is a mental process. As long as you are awake, some thoughts on your research work will always pop up. Well, sometimes you will see them in your dream as well.

So you have to figure out a way to *enforce* some regular break to your brain. The easiest way is to make your brain concentrate on a totally different thing other than research. What different thing will be good then? Your hobbies are naturally the easiest choice.

Those can be anything. Physical sports activities are the actually the best since they not only gives your brain a significant break but also heals up your body. In terms of brain activity, you will have more blood flow in your brain after your sports activity. And do not forget: healthy body eventually leads to healthy spirit as well.

I would like to recommend art activity as a second. (Unfortunately I am not a sportsman type person and I do not have enough experience with physical sports activity myself.) Personally I listen to jazz and classics. But that is not sufficient since you need a practice-like activity — even with music appreciation. So I started practicing piano playing a few months ago.

From my experience, the benefits of this piano-playing practice are like these: first, as I said before, your brain can have a true break while practicing piano-playing by focusing on something different from your research.

Second, you can explicitly observe your progress as time goes on. It is often hard to see progress from your research since this is a mental activity. But these trainings, or practicing things actually generate the observable evidence that you are making progress. And this can become a big emotional support for your lonely journey of the Ph.D. program.

And finally, your life deserves something valuable other than the Ph.D. degree. And the Ph.D. process takes a long time. Of course, your Ph.D. is invaluable to your life but . . .

6 Conclusions

References

[1] Varian, Hal R., *How to Build an Economic Model in Your Spare Time*, `http://people.ischool.berkeley.edu/~hal/Papers/how.pdf`, University of California at Berkeley, 1994.