

Enabling PhD students to write their own manuscripts

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Introduction

Many PhD students, even English native speakers, find academic writing difficult (Thomson, 2006). The problem is not only due to insufficient writing and language skills but also derived from other multiple academic skills including reading and comprehension, literature review and data interpretation. There is a saying that to be a scientist is to be a writer, meaning that one cannot be a good scientist if he/she is not able to formulate a good written story based on the obtained data. The writing process of PhD students is performed in different ways, depending on their levels of the competences mentioned above.

I am the daily supervisor and official co-supervisor of two PhD students which have completely different scientific and writing competences. One Danish student who has deep scientific understanding but limited laboratory skills and one Chinese student who is capable of performing *in vivo* and laboratory experiments but having limited scientific understanding, language and writing competences. Each student is expected to have two-three publishable scientific manuscripts before they can submit their PhD thesis. While the former case can be dealt with by intensive laboratory training, the latter case remains extremely challenging, especially in the process of manuscript writing. At the time before this current project started, the Chinese student lacked of most of the required competences needed for manuscript writing and this has remained challenging for both him and me as the supervisor to complete all required scientific manuscripts within the three years of his PhD period. His first manuscript was accepted

for publication but it was done with my intensive involvement in the writing and revision phases. Despite perfect laboratory work which was based on previously prepared protocol, he had very limited understanding of relevant literature and capacity to interpret his own data, probably derived from inadequate English skills, insufficient reading, literature review and peer discussion with other students. Now he is in the process of writing his 2nd and 3rd papers followed by the PhD thesis.

Based on this background, the current pedagogical project focused on the intervention in my supervision and feedbacks to change his writing approaches, thereby improving his writing quality. After analyzing the previous situations, I decided to change my methods of supervision and made a written guideline for his remaining PhD period (1.5 years), which mainly include some laboratory work and writing tasks of two remaining manuscripts and the PhD thesis. The new supervision methods to be implemented were based on the idea “Research is writing” (Thomson, 2006), which was theoretical and has not been scientifically investigated in real situation with sufficiently high number of participants. These include more activities for individual writing practice and co-writing, formative assessment, peer feedbacks and peer discussion. The aims are to maximize his learning in both scientific understanding and writing, which would help him to achieve the goal of finalizing manuscripts and thesis punctually in the most possibly independent manner. The outcome of the intervention will be assessed qualitatively by comparing the quality of his writing and the independency of his writing management before and after intervention.

Problems and supervision format before intervention

For each sub-project (which will lead to one manuscript in the PhD thesis), I designed the *in vivo* animal studies and *in vitro* studies and developed the study protocol with this PhD student. Based on the templates of previous studies in the group, he modified details according to the requirements of his projects and performed the experiments. For the first study and first manuscript, I intentionally gave him time and freedom to collect, interpret data and perform statistics with encouragements that he should find other PhD students to discuss. After a few weeks, I discovered that he had major issues with writing and interpretation. The problem was that he was not proactive to promptly discuss with the supervisor about uncertain issues but instead he continued until being asked or until the problems were

identified by the supervisor. I felt he might have needed more helps with closer supervisions. Therefore, I started to provide more inputs, including detailed plans of follow-up experiment, suggestion for analytical methods and provision of relevant papers to support his reading. He performed well what he was told to do, but nothing more than that. This was unusual, as many PhD students often prefer to manage projects themselves. I tried to explain to him about the needs of being more independent but everything did not progress unless he was provided with specific solutions for specific problems. I suggested him to start writing the manuscript early as soon as he collected sufficient amounts of data. For the first manuscript which was accepted for publication, it was under pressure to finish early so that that the paper can be used for a grant application. I asked him to write session by session (Introduction, Materials and Methods, Results, and Discussion), then revised his text and discussed directly the scientific problems and solutions. What happened was that he was not proactive and the quality of his texts was insufficient and I had to revise most of the text so that the manuscript can be published on time. In principle, he accepted all my revisions and given tasks with limited critical thinking, reflection and open discussions.

Problem analysis

Academic writing is often misunderstood as a simplified procedure including thinking first followed by a gradual writing process to complete a draft and revision only by tidying and polishing (Thomson, 2006). This leads to common advice to students with superficial features including grammar correction and reformulation of sentence structures. Instead, academic writing has been gradually considered as a social practice with the process of writing practice during research time, not after the research being finalized. Therefore, academic writing includes literature review, thinking, linking theory and methods, interpreting data, formulating text, editing and revising, and managing references as a whole (Wolcott, 2001).

With the limited skills in writing and data interpretation in the first manuscript, I realized that he had thought that a good PhD student should produce as many data as possible and the writing part can be done later with minor problem. That was why he spent time to solve practical problems rather than to read literature to accumulate knowledge in the field. This led to insufficient understanding of the study background and limited

data interpretation. In addition, the inadequate English competences (verbal, reading and writing skills) have added another obstacle for him when reading literature and discussing data with other peers. In summary, two key problems were identified: language skills and inappropriate perspectives about a good PhD study. This was the background for me to initiate the proper intervention.

Methods

I started the intervention in the middle of his PhD period (after one year and six months). The intervention will in principle last until the PhD student submits his PhD thesis, but the evaluation of the intervention was conducted after 1.5 months due to the limited time for this final pedagogical project. First I wrote a guideline for writing practice (which was based on the methods part) and sent to him few days prior to the official talk under supervision of my departmental supervisor. In the meeting, I explained the reason for this intervention (his strengths and weaknesses in the previous manuscript writing phases), clarified details the writing guideline and discussed with him how we should work together during the intervention period. After 1.5 months, he was supposed to fill in the evaluation form (Appendix A) and have official talk for the assessment to conclude this project but he is expected to continue the writing practice under my supervision until he submits his PhD thesis.

Specific points for the writing practice interventions included:

1. Consider research as writing and perform daily writing practice: The PhD student was encouraged to change his mind set about writing from writing up as the last part of a scientific study to embedding writing into daily research activities. This was implemented by performing daily 30 min research writing session. The writing practice can be a summary of what the PhD student has worked on that day or the previous day including data interpretation, small report of new results, summary of new research idea or summary of literature that is read during the day. All notes should therefore be organized in a journal/folder. Notes can be bullet points and not necessarily completed sentences with perfect grammar. Some of the notes or parts of the daily writing products may become parts of the final manuscript or PhD thesis. In this way, writing can be considered as thinking as well as a social practice rather than just being a skill: treating research as writing and writing as research (Thomson, 2006). By encouraging frequent writing

practice, the PhD student can train himself not only in writing skills but also in sharpening his scientific thinking. As manuscript writing is a process of telling a good story based on the obtained data, frequent writing practice about the related topics may also help students to gradually find the optimal way to interpret data and organize data in a logical manner.

2. *Frequent discussion of writing products with supervisors and other peers:* All ideas and writing products were suggested to be discussed with supervisors and other peers. The student was encouraged to discuss the writing products with supervisors 15 min every day or every two days to clarify unsolved problems or unclear knowledge and my tasks were to give him formative assessments for the writing products and to suggest constructive feedbacks to further develop his ideas or writing quality. The student was also encouraged to share his idea or writing products with office mate and other students. For many persons, they cannot remember what they read and write after a short time, and discussion will stimulate thinking and memorizing important knowledge. Knowledge from literature can only become one's own knowledge if one can demonstrate, disseminate and discuss it with others.

3. *Find a co-writer for each manuscript:* For each of the remaining two manuscripts, this PhD student was grouped with another PhD student working in similar field (inflammation and infection in newborn pigs) so that they helped each other during the writing process. They acted as co-writer (not necessarily co-author) on each other's manuscript, meaning that one should read and comment on the manuscripts of the other before I (as the supervisor) edited. In this way, they may also discuss the unsolved questions and future research questions to further develop their ideas.

4. *Discuss the outline of the manuscript before writing:* The manuscript writing task was divided into small parts (Introduction, Methods, Results, Discussion) and the student and supervisor worked together to complete one part before moving to the next part. Division into small tasks should make things easier to complete and immediately solve any obstacles. All notes produced by the daily writing practice should be considered to be revised to become parts of manuscripts if possible. In addition, in the initial phase of editing/revising manuscripts, I did not edit in details but only gave comments in the commentary boxes and the student was supposed to work on those comments to improve the text quality. This should facilitate his learning better, in contrast with giving him detailed edited text and he would have accepted all suggested text without trying to understand his previous problems to find a solution to solve.

5. Implement formative assessment, constructive feedbacks and proactive discussion: The student was encouraged to: a) be proactive in calling meetings, discussions with supervisors and other peers, and b) be critical with perspectives during discussion (do not just accept what being told but look for evidence and other alternatives). Constructive feedbacks and formative assessments from supervisors and other peers were also implemented for all meetings (not only during the discussion of writing products in point 2). Notes, feedbacks and assessments from meetings should be recorded (in written form) for follow-up actions and the student would have opportunities to improve the discussed materials.

Results and Discussion

After 1.5 months, the student filled in the evaluation form for the intervention (Appendix B) and we held an official talk to discuss the outcomes and whether or not the student has benefited from the interventions. As seen in the evaluation form filled by the PhD student (Appendix B), he was positive with the intervention and he did feel himself that he has progressed well with both writing competences and scientific communication competences. According to the official evaluation, he felt it was much easier for him to formulate English sentences in different manuscript parts as well as discuss scientific content of the manuscript, partly because he followed my recommendation to allocate more time for literature searching and reading. He also mentioned that he prefers to have daily small conversations than formal appointments and he also kept some important written notes after the meeting for records to follow up in later phase. Finally, he felt comfortable and agreed to continue this way of working until the end of his PhD.

From my own observations, during the first two-three weeks after the first talk about the intervention, the student was actively involved in various types of activities planned in the interventions. I felt he was extremely active and really put an effort to improve his academic understanding and writing. In the remaining part of the intervention period (3 weeks), he was less active than the first period, probably due to multiple busy tasks in the lab as well as his own manuscript writing. Some of the progresses were as follow:

- We had daily conversations about writing and it seemed most of his daily writing practice was associated with his own manuscript, but not

so many other types of writing practice, e.g. notes from meeting, separate notes following reading new literature. This may be due to the classical tradition of scientific writing with only articles but not other types of writing that he used to. The period of intervention (1.5 months) may be too short to completely change his mindset of writing but we planned to continue this way until he submits his PhD thesis and hopefully he will show gradual improvements. Regarding the quality, I received several parts of a manuscript he has been writing and I felt the text he produced showed slightly improved quality in manuscript outline and scientific understanding, but still with multiple errors in grammar and sentence formulation. He understood critical parts of the manuscript and acquired sufficient knowledge related to the story of the manuscript, which was a great improvement relative to the first manuscript. In general, the daily writing practice intervention seemed to stimulate him to search and read literature related to his own work in a more active manner, thereby increasing his scientific understanding and writing quality. However, many other types of daily writing practice was still lacking and he also showed limited understanding of the related projects that other group members have been working with. This part needs to be improved in the remaining time of his PhD.

- He frequently discussed with me and peers about new literature, experimental setup and result interpretation. He did find two relevant co-writers for his two remaining manuscripts in his PhD. In my opinion, these two co-writers have been important colleagues to discuss the content of his manuscript as they work in similar fields. The main issue of this part was that both co-writers are Chinese and Chinese members account for 40% of the total group members. It was so natural for them to always speak Chinese when they discussed without the presence of non-Chinese speaking colleagues. In our group, we evaluated that this was not optimal as scientific discussion in English is an important part for PhD students to think and write in English. However, it seemed to be difficult to change even though we have tried to discuss this in group meetings. On the other hand, I recognized after talking to his co-writers that they frequently discussed via informal forums, especially via WeChat (chatting App in their mobile phones), and this seemed to help them acquire quickly the information they needed. The outcomes would probably be more positive if these two co-writers are not Chinese so that he would have had more opportunities to have frequent scientific discussion in English.

- He took initiatives promptly and properly to discuss with me about important matters related to his own work. The medium of discussion was mainly in the form of informal conversation at either my or his office rather than formal discussion with appointment and well-prepared agenda. I have accepted this type of communication due to the fact that his personality fits well with informal but not formal conversations. I evaluated that 1.5 months was rather short to change many things. In contrast, I plan to push him to try various types of communication in the remaining parts of his PhD as I believe it will be a good preparation for his future jobs.
- In connection with the writing practice focusing solely on the manuscript writing, he only occasionally took detailed notes during meetings followed by written formative assessment. He explained that he remembered all follow-up points and he could solve problems quickly following meetings so that keeping notes was not necessary. Again, I did not push further due to the project time constraints and it may take time to implement this for a person who was not used to taking notes and written records of meeting and formative assessment.

Conclusion and perspectives

After 1.5 months, the intervention, to a certain extent, has helped this particular PhD student engaged more in academic writing. In addition, reconsideration of academic writing as a social practice rather than “writing up” has reset his mindset about the definition of a good scientist from being productive with data and experiments to being more comprehensive in all relevant competences with writing practice as a core component. More engagement in reading and writing were key to his development. The learning process was slower than expected due to two main reasons: 1) he mainly focused on his own manuscript rather than overall writing practice; 2) the main co-writers and colleagues he discussed with are Chinese, which limited his capacity in scientific discussion in English. However, he has progressed and he is expected to reach to a better level at the time of thesis submission.

Following discussion with my departmental supervisor, a few important perspectives from the project outcomes were discussed. For my own development as a supervisor, in this current project, I learned that students have their own developmental strategies and that supervisors need to have dif-

ferent and appropriate approaches to individual students so that both their strategies are respected and their weaknesses can be improved. Supervisors also need to find a balance in the way of supervision rather than only guide students to develop into the directions of supervisors' preference. The learning processes of academic writing or other types of academic training may be time consuming; therefore I found that patience, positive thinking and constructive supervision are critical factors to obtain "win-win" partnerships.

In principle, this type of intervention can also be applied to other PhD students or scientists. However, this is still a great challenge to all young scientists, not only to non-native speakers, to balance these competences due to the time constraint (typically 3-4 years for PhD projects). On the other hand, the role of supervisors is key to guide their PhD students to become good scientists, but not only "data producers", despite the fact that scientific journals currently have tendency to demand more and more data. The main limitation of this project was to only include one PhD student for the intervention and the intervention started slightly late in his PhD (half way). It is therefore unknown how other students with different backgrounds, culture and language skills respond to the intervention. However, with those having difficulty with academic writing but good motivation for scientific research, this intervention is likely a "win-win" approach to both students and supervisors.

References

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- Wolcott, H. F. (2001). *Writing up qualitative research*. Sage Publications.

A

Evaluation form for academic writing intervention (1.5 months)

1. How often did you perform the everyday 30 min writing practice (everyday, twice, three times a week)?

2. What are the main writing activities in your writing practice (report new results, summarize new literature, write your own manuscript, summarize new ideas)?

3. How often did you discuss the content of the writing practice with your supervisor?

4. Which aspects did you learn the most from the frequent writing practice?

5. How often did you discuss with your co-writer? Did it help you to facilitate your writing process?

6. How often were you in charge of the meeting (agenda/progress) with your supervisors?

7. How did the formative assessment with your supervisor and co-writer during the writing process help you?

8. How did you take notes for records after each meeting with your supervisors?

9. Did you feel your academic writing competences have been improved in general?

B

Evaluation form for academic writing intervention (1.5 months)

1. How often did you perform the everyday 30 min writing practice (everyday, twice, three times a week)?

If include manuscript writing, I almost wrote everyday for the first month.

2. What are the main writing activities in your writing practice (report new results, summarize new literature, write your own manuscript, summarize new ideas)?

The main part of my daily writing are related to ~~new~~ new results and manuscript.

3. How often did you discuss the content of the writing practice with your supervisor?

We talked everyday before the meeting in China and ~~also~~ also with peers and co-writer

4. Which aspects did you learn the most from the frequent writing practice?

I learnt how to formulate a good sentences and discuss my results.

5. How often did you discuss with your co-writer? Did it help you to facilitate your writing process?

Twice or three times a week about discussion and data analysis. It helps a lot.

6. How often were you in charge of the meeting (agenda/progress) with your supervisors?

We had small talks everyday rather than big meetings.

7. How did the formative assessment with your supervisor and co-writer during the writing process help you?

I had some follow-up notes and kept them in the file. It helps when I have

8. How did you take notes for records after each meeting with your supervisors? some ideas and writing notes

Wrote down some key words, and ~~to~~

9. Did you feel your academic writing competences have been improved in general?

Yes, my weakness are English skills and discussion.

After this 1.5 month writing intervention, I feel I improved for these two parts.

