Supervision and guidance during the process of essay writing in the life sciences

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INTRODUCTION

Many years of supervision in essay writing have led to a strategy that has worked for many students and is based on a clearly structured schedule of events. It is highly effective, saves the student's and supervisor's time, and it provides opportunities to give high quality feedback and detailed guidance at appropriate stages of the writing process. Any feedback given during this process is cost neutral for the student, i.e. will not be considered when deciding the final mark, since the student performs the final write-up phase independently and has therefore sufficient opportunity to show his/her abilities and understanding. Notably, the structured approach applied here presents a transferable skill that will improve the student's performance also during exam essay writing.

INSTRUCTIONS (FROM SUPERVISOR TO STUDENT)

1) You will be sent or suggested one to two review articles, and we will meet after you have read them.

2) First meeting:
   a) We will discuss the general structure of your essay (details in Appendix Tip 1).
   b) We will discuss efficient strategies for your literature research. Usually a search starts with suitable review articles that cover the area well, branch out into reviews covering sub-topics, and gradually look into well selected and relevant primary publications that appear to convey important messages relevant to your essay (usually identified from reading the reviews).
   c) Finally, we will agree on internal deadlines for sending me an outline (point 4 below) and an example chapter (point 6 below).

2) You start your literature research; you can contact me with queries about literature or topic choices.

3) You choose the title and specific content of your essay. Your choices should be driven by your personal interests, but you must stay within the major theme.

4) DEADLINE 1: You send me a detailed outline of 2-3 pages BEFORE formulating any text passages. This outline MUST adhere to the following instructions:
   - ◊ number your sections and sub-sections, and for each chapter / section of the essay, formulate headings that inform about the nature of the content [*e.g. "1. Introduction / 2.1. A brief overview of NDs / 2.2. Specific features of AD ... / 3. Discussion"*]; this provides a clear structure and makes it easy to refer to text passages.
   - ◊ populate each heading with the following:
     - an introductory thought for this section or how it connects to the preceding section [*e.g. for section 2.1.: "To appreciate the enormous challenges that NDs*

pose to scientists, it is important to recognise the very different forms of NDs that have been described"].

- the key content - list the key statements or facts of this section as bullet points, accompanied by the arguments/facts/examples that you will use to explain and/or support these items [*e.g. a sub-item of section 2.1. could be: "motorneuron disease - definition & key features of pathology (selectively affects motorneurons leading to impaired muscle movements including speech and swallowing; progressive in nature & leading to death); brief description of etiology"*]. Use brackets or bullet points of different orders to structure the information.
- a concluding sentence - spell out the key take-home message of this section or extract information that prepares the reader for the next section [*e.g. "Of the various NDs listed here, AD is the most prevalent in society, and much emphasis has been given to AD research."*]
- It might help you during the final write-up if you have key references assigned already within the bullet point outline.

5) You will get my detailed written feedback on this outline. For example, I may indicate where you go wrong, suggest rearrangements, suggest shifts in emphasis, etc.

6) Based on this feedback you amend the outline and, if required, re-send it to me for final comments. I am happy to meet and discuss my feedback if we consider this to be necessary. Note that <u>creating the outline is the intellectually most challenging part of the write-up process</u> that will require enormous discipline. However, it is an extremely powerful activity to help you structure your thoughts and to allow me to help you compose your essay. Once the outline has been generated, the writing effort will be far easier and will have a clear direction, and this will allow you to pay attention to detail of information and arguments.

6) <u>DEADLINE 2:</u> After we have agreed on an outline you send me one <u>fully written chapter/section of 2-3 pages</u> containing references and at least one figure with legend. You will get my detailed written feedback on your writing style, on the use of references and figures, and on the figure legend.

7) In the final step you use your outline and the agreed writing style to <u>complete your essay</u>.

<u>Throughout the process:</u> My written feedback to you will ususally be sufficient to solve problems or guide the writing process, but a brief meeting may occasionally be necessary to bring final clarification.

Appendix

Tip 1: ESSAY ORGANISATION

A good essay is organised into introduction, main body and discussion.

- The introduction highlights the wider importance of the topic [*e.g. the socioeconomic burden of neurodegenerative diseases (ND)*], identifies a problem [*e.g. the lack of understanding of the cellular processes underlying ND*] and ends with the objective or working hypothesis of your essay [*e.g. "Using Alzheimer's disease (AD) as an example, I will explain potential disease mechanisms and principal strategies to treat the disease"*]
- The main body may start off with a general overview followed by more specific sections [*e.g. first you define neurodegeneration and explain different forms of neurodegenerative diseases, then you focus on AD explaining the specific features of this disease and,*

eventually, you explain current understanding of disease mechanisms of AD and current strategies to treat the disease]

- The discussion usually starts off by responding to the objective set out in the introduction [*e.g. "Here I have provided an overview of current trends in AD research..." - emphasise the key statements or conclusions*], then you can move on to distil overarching conclusions or thoughts [*e.g. are the strategies promising? have they explored a wide range of possible directions?*], consider future perspectives [*e.g. are there any obvious further ideas emerging from current research?*], provide your personal judgement [*e.g. are the strategies promising?*], etc. Note that the conclusion is not a summary, but it is your opportunity to show your depth of understanding and your ability to digest the information and extract key conclusions and perspectives.

Tip 2: REFERENCES

It is pivotal that you use literature database programs, such as EndNote or Reference Manager. These programs allow you to perform data base searches and file your choices efficiently. They allow you to link out to your PDF collection, to enter key words, to insert references into your text, and to carry out the final formatting in an automated manner.

Throughout your literature research, get used to developing your personal keyword system that will allow you to efficiently find appropriate text sources. You may ask yourself during the writing process "Which was the paper that described mechanism XY?" or "What review gave the overview of morphological aberrations in XY pathologies?" Prepare yourself for these questions by designing good key words and entering them consequently in your data base. This will allow you to find the right references quickly and safe you valuable time!

Note that EndNote is available to you through the University and its proper use is learned in less than 10 minutes.

Tip 3: COMPOSING FIGURES AND LEGENDS FOR SCIENTIFIC PUBLICATIONS[1]

1) When reading scientific publications, look at figure choices and their design and legends. You will find good and bad examples, but ask yourself what criteria you would use to describe their quality.
2) Choose your images / tables carefully. Well chosen figures tend to be referred to repeated times in the text, demonstrating their value self-evidently. But this is not a general rule, as explained next.
3) Figures/tables can have two principal purposes:
   - They can support statements in the text:
     - be used as a complementary means to convey complex information (e.g. flow diagrams of gene regulatory networks)
     - illustrate statements that are difficult to describe or important to show (e.g. histological section of a dementia patient)
     - provide scientific proof for your statements, particularly in primary science reports (e.g. image documentation, graphs or statistical analyses of data)
   - Figures/tables can be used to present additional information that, if described in the text, would break the flow of the essay. In such a case, you would make a basic

[1] You can download some instructions on designing figures and their legends here: http://figshare.com/articles/2nd_year_Genetics_practical/156395

statement in the text (e.g. "Numerous signalling pathways have been demonstrated to regulate GSKβ kinase activity") and accompany this with a figure in which detail is added for those readers who would like to know more (e.g. add a graph with a regulatory flow diagram illustrating the key signalling pathways upstream of GSKβ)

4) Keep your readers and examiners happy by saving their time! When composing a figure, always design it to be as clear and self-explanatory as possible. Ideally, the specialist reader should be able to grasp the key message and information without having to study the figure legend in detail. Here are a few rules you can follow:
   - Think of a statement you want to make with a figure and choose the images supporting this statement.
   - Arrange images in a logical sequence that can be easily explained in your legend.
   - Label single images with capital letters, and refer to these letters when explaining your images
   - Use symbols or abbreviations in the figure to guide the reader unequivocally and efficiently through your images; use symbols and abbreviations consistently in the figure (or even all figures of the document); all text and symbols should be large enough to be legible - even upon bad print or when the figure is reduced in size.
   - You may indicate specific information directly within each image (e.g. indicate abbreviated genotypes of each specimen in the top right corner of each image and the respective antibody staining in the bottom right corner). This allows a specialist reader to grasp the content of a figure without having to read through the complex figure legend.
   - A figure must show a scale bar if biological material is shown.

5) Compose a concise figure legend that technically explains everything that can be seen in the image. You do not have to deliver explanations or interpretations (which is usually done in the text) - although you may occasionally choose to make such statements to emphasise a key message.
   - Formulate a title for your figure (e.g. 'Morphological aberrations observed in the brain of Alzheimer patients').
   - Explain everything shown: which species, which tissue, which stage, which staining, all symbols, abbreviations and colour codes used; these explanations can be woven into your text (e.g. "in the brain of Alzheimer's patients aggregations of tau can be seen (arrows)"] or listed at the end of your legend (e.g. "Symbols used: arrows, tau aggregates; arrow heads, amyloid plaques;....").
   - Be economical in your wording (e.g. group statements common to all or several images: "all specimens were stained for tau and ß-amyloid"); this strategy saves space and facilitates reading.

Tip 4: MAINTAIN A BRAINSTORM DOCUMENT

Throughout the research and writing process you will come across many interesting statements and examples, and you will have many interesting thoughts and ideas. As they come, collate them as concise bullet point statements with respective literature references in a brainstorm document. Although many of these statements may never make it into your essay, this document will be a most valuable source of information when you write your outline and final text.