Writing Well$^2$: Building Traction and Triumph into co-Authorship

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Write well...

Stay well...

...this is what we learned!
Key Points

• Graduate students can benefit from:
  – informed methods of reading & writing technical literature
  – many ways of outlining
  – developing writing in a stepwise manner
  – a writing recipe
  – tremendous peer and advisor support
  – limited levels of edit at each stage
  – deadlines and timely feedback
Graduate School: A New Game

- New graduate students tend to:
  - start reading for content
  - gather information
  - memorize facts
  - reach their limits quickly in a research environment (a new genre)
  - not know how research really works

- Mature graduate students tend to:
  - read for validity of proposed arguments
  - make connections between concepts
  - know their limits
  - have been transformed into creators of knowledge from data

Undergraduate Education ≠ Graduate Education

Chemical and Materials Engineering

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Journal Articles: A New Genre

In a nutshell:

- Hard reading!
- Much content
- Conflicting ideas
- Array of quality and style
- Varying levels of detail

Undergraduate Reading and Writing ≠ Graduate Reading and Writing
Levels of Editing

• Give timely and constructive feedback.
• Students can only absorb feedback on one or two major points at a time.
• Many levels of edit will happen, for example:
  – Presentation of data and figures (Visual)
  – Structure and Arguments
  – Editorial polishing
  – Big picture
• Be kind to yourself – stop editing after an hour.

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Reading and Writing Exercises

• Start early
• Supportive environment – group meetings
• Two examples
  – Beginning and End
  – Visual Abstract
  – Art of the Argument – in the paper
Example #1: The Beginning and Ending

Goal: identify key elements in a “story”

• Edited article:
  – No citation information at all
  – Introduction, abstract, and conclusion removed

• Students read article and fill in missing info

• Compare and contrast their results with original (advisor feedback)
Example #2: Visual Abstract

Goal: make conceptual connections about research (preparation for story telling)

- Students are given a short presentation about visual thinking
- How to make connections with images

• Each student is given:
  • 1 week to prepare a visual abstract about a research topic of own choosing
  • Visual abstract must be on a **small cocktail napkin**!

• Present, and explain if necessary, their visual abstract at group meeting –
  
  _repeat and refine as necessary_
Example #3: The Art of the Argument

Goal: extract the argument structure

– Article selection:
  • content which the student knows well already
  • disparate views in literature
  • good and poor argument structures

– Students determine:
  • Is the problem identified clearly? What is known?
  • What are the authors contributing?
  • What is their main argument?
  • Is their evidence convincing? What is missing?
  • What makes the paper memorable?

– Discuss with advisor (or in a journal club)
Outlines – use many tools!

• Traditional linear outline does NOT work well – especially for sequential learners!

• Alternatives:
  – The Goddess Nike (Just Do It!)
  – Figures First (What is the story?)
  – Draft Abstract and Conclusions (What are the main points?)
  – Beetle or Spider diagrams (Sort the laundry)
  – Concept Maps (Construct the sequence)
  – Partial construction of paragraphs

• Help the student learn to construct the story!
The Goddess Nike

Many students find it easiest to write a fast brain dump to get all of their thoughts on paper, then sort them out and begin a serious draft!

http://www.ask.com/wiki/Louvre

Figures first

• Many papers start as a presentation!
  – Children’s picture books work from images and captions
  – students like this idea of starting from a storyboard

• The story is written around the data and images
  – Sketch the visuals first – plot everything vs everything
  – Construct the argument and main points
  – Draft figure captions and finalize best figures

• This is the core of the results and discussion
Main Points?

• What are the three most important points in the paper?
• What are the most important contributions to knowledge?
• Draft Abstract and Conclusions
Beetle or Star or Spider Diagrams

- No need to know what comes first
- Sort ideas
- Fast!

*Website CMAP tools – free drawing software for concept maps*
Concept Maps: Making Connections

- Construct the argument in order
- Add connecting words in the logic

Images from:
Concept Maps: Making Connections

Failure

can be caused by

- Inadequate Design
- Misuse of Material
- Improper Material Selection or Processing

and can be manifested by

- Impact
- Fatigue
- Creep
- Corrosion

Images from:
...my current order of attack

1. Experimental
2. Select key figures
3. Visual Abstract and Conclusion – Draft
4. Outline
5. Review figures
6. Results
7. Introduction
8. Edit Abstract and Conclusions; Select Title
Conclusions

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  – informed methods of reading & writing technical literature
  – reading and writing practice in a stepwise manner
  – new ways of outlining
  – tremendous peer and advisor support
  – limited levels of edit at each stage
  – deadlines and timely feedback