The Writing Process for STEM Graduate Students

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Description of Writing Clinic

• STEM students are not only required to successfully complete their research, they must also be able to present their findings through clear and cohesive writing. This clinic will explain how to successfully write for the field of science and the different components one should be aware of when displaying their results in writing.
Pre-test

• On your handout, there is a pre-test about today’s clinic:
  • You will have three (3) minutes to answer the following questions.
  • Please do not change your answers because these will be used for data collection.
Introduction

• As graduate students, writing is one of our biggest challenges through our academic career.
  • We are expected to write for our:
    • Courses
    • Research
    • Conference Presentations
    • Publications
    • Thesis/Dissertation
The Writing Process

OK, WRITING SHOULDN'T BE SO HARD.

EVERYTHING I WANT TO SAY IS IN MY HEAD...

I JUST HAVE TO TRANSFER IT FROM MY BRAIN TO THIS COMPUTER.

WRITING: THE MOST IMPOSSIBLE SHORT DISTANCE IN THE HISTORY OF HUMANITY.

THE NEUROBIOLOGY OF WRITING

HOW IT'S SUPPOSED TO WORK:

- PROCESS LANGUAGE
  Temporal Lobes
- EXECUTE COMMAND
  Prefrontal cortex
- CONTROL HANDS
  Motor cortex
- TRANSMIT COMMAND
  Brain stem
- ACTIVATE MUSCLES
  Motor neuron

HOW IT USUALLY WORKS:

- CONFUSION
  Prefrontal cortex
- INSECURITY
  Limbic system
- NO MOTIVATION
  Anterior cingulate cortex
- FEAR
  Amygdala
- PANIC
  Sympathetic system
- HESITATION
  Inferior frontal gyrus

OK, I NEED TO TRANSFER MY THOUGHTS FROM MY HEAD TO THIS SCREEN...
C'MON, WRITE!
WRITE!
WRITE!
WRITE!
THEY'RE TOUCHING!
TRANSMIT!
TRANSMIT!
THUD! THUD!

WWW.PHDCOMICS.COM
Objectives

Learn

• About the Writing Process in STEM-based writing.
• About the different components of STEM-based writing.
• About research tips to help you look for academic articles.
• Different strategies on how to start writing for your academic project.

Write

• Ideas about your current or future research project.
• And experience the writing process through the clinic.
Writing Process: “Free Writing”

- On a piece of paper, write a paragraph explaining and describing your current or future research project. You will have 6 minutes to complete this writing prompt.

- Rules:
  - Do not erase anything you write.
  - Keep writing, do not stop writing until the time limit is up.
  - Do not review or edit your paragraph when you are done, leave it as it is.
  - You will have five (5) minutes to complete this prompt.
Writing Components for STEM:
The Introduction
How to write an Introduction

• Key questions to consider:
  • How do writers normally start the Introduction?
  • What type of information should be in my Introduction, and in what order?
  • How do writers normally end the Introduction?
What information should be in The Introduction?

- The importance or significance of the research.
  - “much research in recent years…”
- Previous and/or current research and contributions.
  - In other words, what researchers did. Suggested verbs: calculated, monitored, and other, but do not over use did, showed, and found.
  - When writing for science, researchers need to be more specific about their work, therefore using the word “did” won’t provide enough descriptive information about the study.
What information should be in The Introduction?

• Gap/Problem/Question/Prediction.
  • This includes ways to say exactly how previous and/or current research is not yet completed or has not been addressed the problem your paper deals with.
  • Suggested transitions: however, few studies have focused on…

• The present work.
  • This may include your purpose, strategies, and overall design of your project.
Tense pairs

(a) I live in Puerto Rico.  
Present Simple

(b) I’m living in Puerto Rico.  
Present Continuous
Tense pairs: Present Simple/Present Continuous

(a) I live in Puerto Rico.
- Describes a permanent situation
- Present simple is used to state accepted facts and truths.
- This is usually followed by an appropriate research statement.

(b) I’m living in Puerto Rico.
- Describes a temporary situation.
- Can be used to explain current research or findings at the time of the experiments.
- Leave this type of use for results section.
Writing Process: “Key Word Listing”

• On the same piece of paper you used to write your project description, make a list of key words that are relevant towards your research.

• Make a list of 15 to 20 key words.

• You have five (5) minutes for this prompt.
Writing Components for STEM:
The Methodology
Flowchart for Classifying Methodology*

- Is the research based on direct access to the facts?
  - Yes → Classify as Empirical strategy.
    - Was experimental design present?
      - Yes → Classify as Case.
        - Was experimental control present?
          - Yes → Classify as laboratory.
          - No → Classify as Field.
      - No → Classify as individual.
  - No → Did the information come from people?
    - Yes → Classify as Opinion strategy.
    - No → Is the information from a data bank?
      - Yes → Classify as Archival strategy.
        - Did the archive consist of documents?
          - Yes → Classify as Analytic strategy.
          - No → Classify as internal logic.
        - No → Primary documents?
          - Yes → Classify as primary.
          - No → Classify as secondary.
      - No → Classify as group.

* Adapted from Buckley, Buckley & Chiang Exhibit 26, p. 80.
A Framework for Research Methodology*

Problem Generation
- Formal
  - Research
  - Analog
  - Renovation
  - Dialectic
  - Extrapolation
  - Morphology
  - Decomposition
  - Aggregation

- Informal
  - Conjecture
  - Phenomenology
  - Consensus
  - Experiential

Mode
- Inductive mode
- Deductive mode

Strategy
- Opinion
- Empirical

Domain
- Individual
- Group
- Survey
- Delphi
- Interview
- Case
- Field
- Laboratory
- Observation
- Simulation
- Time & Motion study

Formal - Techniques - Informal
- Primary
  - Content analysis
  - Scanning

- Secondary
  - Sampling
  - Scanning

- Physical
  - Erosion/accretion
  - Observation

- Analytic
  - Internal Logic
  - Mathematical modeling
  - Philosophical argument

* Adapted from Buckley, Buckley & Chiang Exhibit 1, p. 15.
What information should be in The Methodology?

- You, as the researcher, are going to describe what you did in your project and how you elaborated in your investigation.
  - This is exactly what I did, I did it carefully and I had good reason for doing it in this way.

- When you begin explaining your materials/methods section:
  - Make sure you explain every detail within your study.
  - For example, if your research is about the evolution native plants in Puerto Rico, you might want to mention:
    - Where did you get your specimen?
    - Was it supplied by a laboratory facility?
Signaling language

• One of the most common errors in writing is failing to connect one sentence or idea to the next.
  • In other words, every time you end a sentence, your reader has no idea what the next sentence is going to say or do.
  • If you don’t share the links between those sentences with your reader, you create a gap in the text which will cause problems.
Signaling language

• One of your main text as scientific writers is to make sure that gap is closed, so that your reader is carried carefully from one piece of information to the next.

• Tip:
  • Using transitional words, especially different variations of them, can make your report or project sounds fluently.
Signaling language

- Thus
- Hence
- Therefore
- As a result
- Because of this
- For that reason
- Consequently
- Wherefore
- This being the case
Writing Process: “Highlight & Color Coding Key Word”

• Take a look at your list of 15 to 20 key words.

• From the list, select 5 key words that you consider are the most important for your research.

• Once you have selected them, highlight or circle them with a different colored pen or highlighter.

• Those key words will be the ones you will use to conduct your article research.
Writing Components for STEM: The Results
How should I structure The Results section?

<table>
<thead>
<tr>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
<th>Option 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Results or Data Analysis</td>
<td>Results or Data Analysis</td>
<td>Results and Discussion</td>
<td>Results Or Data Analysis</td>
</tr>
<tr>
<td>Discussion</td>
<td>Discussion</td>
<td></td>
<td>Discussion and Conclusion(s)</td>
</tr>
<tr>
<td>Conclusion(s)</td>
<td></td>
<td>Conclusion(s)</td>
<td></td>
</tr>
</tbody>
</table>
Writing Process: “Create your Title”

• Use your top five (5) key words to create a possible title for your research project.
  • This is not your final title, this activity is to give you an idea of how your title should be structured and written.
  • Your goal is to write three (3) to four (4) possible titles.
  • Your title should be less than fifteen (15) words.
  • You will have five (5) minutes to complete this activity.
Writing Components for STEM:
Discussion/Conclusion
How do I structure my results section?

1) Revisiting previous sections; summarizing/ Revisiting general or key results.
2) Mapping (relationship to existing research).
3) Achievement/Contribution; Refining the implications.
4) Limitations; Current and future work; application.
Writing Process: “Questions”

- Read everything and reflect everything you have crafted in today’s writing clinic.
- Think about what type of research you are going to undergo.
- Answer the following question based on what you are planning to do or are currently doing in your research. Write your answer in complete sentences.
- You will have ten (10) minutes for this section.
Scientific Research Publications

The shape of a research article or thesis.
Research Tips

When searching for information for your research project!
After experiencing the writing process…

• You can use the information you acquired at this clinic to quickly search for article that will aid you on your own project.

• Remember, there are multiple ways to analyze academic article by looking at their main components, such as:
  • Title
  • Abstract
  • Introduction
  • Methodology
  • Results
  • Conclusion
What should you look for?

- Read the title:
  - Try to predict the type of information you expect to see.
  - Use your list of key words to help you in this process.

- Look at the name of the author:
  - The information you know about the writer will help you predict and evaluate the content.
What should you look for?

• Check the date:
  • Use this to help you access your content.
  • Tips:
    • Keep a tiny notebook to write down all your authors and dates of your articles.
    • If you print out the articles, on the top left corner of the article use a sharpie to write down the date and the last name of the author. This will help you organize your sources and organize the timeline of your research.
What should you look for?

• Read the abstract:
  • To find out what researchers did/have done in their field and what they have found.
• Look quickly at the first paragraph and the first sentence of each paragraph:
  • Be on the lookout for key words and information related to your research project.
• Read the last paragraph:
  • Especially if it includes the “summary” or “conclusion” section.
What should you look for?

- Read the abstract:
  - To find out what researchers did/have done in their field and what they have found.
  - This will give you key information that will help you towards your research.
  - It is a faster way to look at multiple articles and decide which ones are right for you.
What should you look for?

• Look quickly at each figure/observe data and read its title:
  • For STEM, it is important to know how researchers use and display their visual data.
What should you look for?

- Look quickly at the first paragraph and the first sentence of each paragraph:
  - Be on the lookout for key words and information related to your research project.
- Read the last paragraph:
  - Especially if it includes the “summary” or “conclusion” section.
Post-test

• On your handout, there is a post-test about today’s clinic:
  • You will have three (3) minutes to answer the following questions.
  • Please do not change your answers because these will be used for data collection.
References


Thank you for your attention!
Evaluation: http://uprm.libsurveys.com/tiger
Password: 2016

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