Academic Writing for STEM

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Description of Writing Clinic

• Higher order concerns of scientific writing will be discussed, including general structures of scientific stories, story appeal, and recommendations for specific components of scientific reports.

Pre test

https://goo.gl/xC7VkB

All scientists are writers

• As graduate students, writing is one of the biggest challenges through our academic career.

• We write for:
  • Courses
  • Research
  • Conferences
  • Publications
  • Theses/Dissertations
All scientists are writers

- As a scientist, you are a professional writer.
- It is your job to make the reader’s job easy.
- Writing is a bridge to reach our audience.
- To succeed, you must get cited.
- Success is to have others understand your work.

  - Joshua Schimel, WRITING SCIENCE How to write papers that get cited and proposals that get funded

Objectives

Learn

- About HOCs of academic writing.
- Story structures for target audiences.
- How to make a story sticky.

Write

- Stories with different structures.
- Your own research for different audiences.

HOCs vs LOCs

- Higher Order Concerns (HOCs)
  - Design
  - Organization
  - Content
  - Argumentation
- Lower Order Concerns (LOCs)
  - Wording
  - Flow
  - Style
  - Referencing
  - Spelling, punctuation, and grammar

Writing as storytelling

all scientists are telling stories
Four story structures

- **OCAR**
  - Slowest; takes time to develop.
- **ABDCE**
  - Faster; starts in action.
- **LD**
  - Faster yet.
- **LDR**
  - Fastest; whole story up front.

**OCAR**

- Opening: introduce your characters and setting.
  - The iconic coquí is without a doubt the most emblematic endemic animal of Puerto Rican fauna.
- Challenge: present the knowledge gap.
  - After hurricanes Irma and Maria coquí populations have been dwindling and scientists have had a challenge preserving their populations.
- Action: present your research.
  - Strong individuals of 5 endangered coquí species were chosen and used for propagation efforts.
- Resolution: provide a conclusion.
  - Efforts to propagate 3 out of the 5 selected species proved wildly successful. Captive species produced 60% more viable offspring than their wild counterparts.
  - This simple technique has great potential not only for amphibians on the island but for thousands of endangered species around the globe.

**ABDCE**

- Action
  - Begin with dramatic action.
  - Entice the audience to continue reading.
- Background
  - Present the characters and setting(s).
- Development
  - Action, what happens to the characters and setting(s).
- Climax
  - Brings it all together and addresses the problem.
- Ending
  - What happened to the characters after the climax.
**ABDCE**

- **Action:** engage readers.
  - Sea cucumbers have been overfished by illegal fishing practices.

- **Background:** introduce characters and setting.
  - Sea cucumbers are vital providers of ecosystem functions; their absence can bring forth negative ecological consequences.

- **Development:** follow the action.
  - The cucumbers are a delicacy in many Asian countries. They have been fished and shipped to Asian restaurants for many years.

- **Climax:** solve the problem.
  - Educational workshops will be given to fishermen to steer them away from this unsustainable practice.

- **Ending:** offer resolution.
  - Main sea cucumber stocks will take decades to replenish.
  - Sea cucumbers can be continued to be harvested through sustainable mariculture.

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**LDR**

- **Lead**
  - Is the core of the story.
  - Collapses the opening and challenge.

- **Development**
  - Fills the lead’s blanks.

- **Resolution**
  - Provides conclusion.

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**LDR**

- **Lead**
  - "Hundreds of thousands of lives are at risk as a result of a population boom in a seismic zone."

- **Development**
  - The population of Mayagüez has seen a steady increase since the 1920s. The city seems unconcerned about the risk tsunamis pose to its ever-increasing population.

- **Resolution**
  - A group of social activists are currently writing laws that will pressure the state to commence construction of barricades and potentially save thousands of lives.

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**LD**

- **Lead**
  - Presents core of the story.
  - Collapses the opening, challenge, and resolution.

- **Development**
  - Fills the lead’s blanks.
A new analysis breaks down the likely social cost of carbon emissions by country and should make unhappy reading for politicians.

Economists from 13 universities have collaborated to analyze the costs global climate change will bring upon nations worldwide.

They found that the money that is saved by using cheap but dirty fuel is not comparable to the money necessary to reconstruct infrastructure after environmental disasters.

On a piece of paper, write a draft for a proposal using the ABDCE structure.

One sentence per part of story structure should be enough.

Writing a scientific article using OCAR for IMRaD
Opening - Introduction

- Power position

- Three goals:
  - identify problem,
  - introduce characters, &
  - target an audience.

- Schemas
  - Alligator meat tastes like chicken, but fishier.

Opening - Introduction

- Opening; include context & characters.

- Background; provide a broad introduction.

Opening - Introduction

- The iconic coquí is without a doubt the most emblematic endemic animal of Puerto Rican fauna. They have survived the fury of hurricanes and continued to prosper for thousands of years. Their resilience is attributed to the great quantity of young one coquí mother can rear and the outstanding growth rate of juveniles.

Suggestions

- Verbs for introduction:
  - calculated, monitored, assessed, measured, described…
**Challenge – Introduction**

- Acknowledge knowledge gap.
- Set goals.
- Include thesis statements, hypothesis, research objectives, research question, etc.

**Challenge – Introduction**

- Despite abundant knowledge on tuna fish migratory patterns, fish ecologists can only predict tuna school locations with a probability of 25%. Careful observation of migratory patterns demonstrate that there is indeed a pattern in the way they change. This research analyzes and applies these patterns of change to predict the location of tuna schools more precisely.

**Suggestions – Transition from O to C**

- When presenting the knowledge gap:
  - give audience feeling of unexpectedness,
  - instill curiosity,
  - then tell them how you will solve the problem to satisfy that curiosity.

**Action – Methods and Materials**

- Represents the body of your story.
- Make the story flow with the opening.
Action – Methods and Materials

• A population growth rate curve was created using the protocol described by Ramos (1998).
• A population growth rate curve was created by estimating the average number of eggs laid and growth rate of juveniles.
• To create a coqui population growth rate curve the amount of eggs laid by each of our captured females were counted using a dissection microscope. After the young hatched they were kept with their mother, simulating natural conditions. Weight and volume...

Action – Results and Discussion

• Make the reader's job easy.
• Distinguish between what you found and what you think.
• Address each of the following:
  • data,
  • inference, & interpretation.

Action – Discussion

• Climax; interpret your data.

• Resolution; tell the audience why the data is important.

Resolution – Discussion

• How does your research relate to others?
• What does your research accomplish?
• Why is it important?
• Which applications does it have?
• What is your future work?
Resolution – Discussion

- A good story ends near where it started.
- Do not undermine the power of your work.
- Show how your work advanced our understanding of nature.

Suggestions – Flag your resolution

- Let readers know that you will conclude your work by using:
  - in conclusion,
  - to conclude,
  - finally...

Activity 2

- In a piece of paper, use your knowledge of OCAR to write a simple draft of your current or future research.
- One sentence per part should be enough.

OCAR

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Make stories sticky

S U C C E S

S

- Simple
  - $E=mc^2$, plate tectonics, natural selection, DNA double helix, atomic orbitals…

- Schemas

S U

- Unexpected
  - There are always new questions to ask.
  - Identify a knowledge gap and fill it.

  - Answering old questions does not make novel science.

S U C

- Concrete
  - Simple has power, but concrete adds mass.

  - A balloon is simple, but you notice more when you get hit on the head by a brick.

  - Write for someone who is not an expert; avoid hard to understand abstractions.
SUCC

- Credible
  - This is the distinction between science and science fiction.
  - Make proper use of citations and references.

SUCCE

- Emotional
  - Why are we scientists? Curiosity and excitement! Transfer that to your audience.
  - Appeal to the nerds.
  - Get reviewers excited about your project.

SUCCES

- Stories
  - Use modules to unite your research into a story.

In summary

- Write a story.
  - Apply OCAR for IMRaD.
  - Use a structure adequate for your audience.
- Make it sticky.
References


Evaluation

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