Writing to Learn & Learning to Write: A Rhetorical Approach to Teaching Professional Writing to Advanced STEM Undergraduates

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University Writing Program
University of California, Davis
Facilitated Discussion

- Professional and public audiences
- Assignment design and scaffolding
- Peer review
Quick Write

What are the obstacles you have encountered or the questions that have arisen for you in relation to any of these three points?
Building a STEM Writing Culture through the Undergraduate Experience

- First Year Seminars
- “Writing Experience” (WE) in STEM majors—hundreds of lower division and upper-division courses
- Upper-Division “Writing in STEM” courses in UWP
- Focus on Undergraduate Research
- Undergraduate Publications
- The Interdisciplinary Writing Minor
- Conversations with Writers and Scientists Discuss Writing
- CETL courses for TAs, the PHCA, and UIIP grants
UC Davis UWP 104E: Writing in the Professions--Science

- One of 20+ upper-level (jr-sr) courses in the University Writing Program taken to fulfill the upper-level writing requirement for all students

- One of 7 such courses popular with STEM majors (writing in biosciences, writing in health professions, writing in engineering, technical writing are among the other courses)

- Taken by 2000 students per year.

http://writing.ucdavis.edu/course-information/writing-in-the-disciplines
Rhetorical Approach to STEM Reading/Writing

• Relies on tradition in science communication studies of analyzing (1) the argumentative structure of scientific articles and (2) differences in scientific writing for specialist and non-specialist readers (e.g., Bazerman, LaTour/Woolgar, Myers, Perrault)

• Focuses on analyzing purposes, audiences, genres, style, and graphics in science documents

• In teaching writers and readers of science, we actively reject the myth that the “data speak for themselves”
Rhetorical Awareness and Inclusivity in Science Writing

Katie Rodger
104E Assignment Overview

1. Rhetorical Analysis of a Scientific Article
2. Technical Description
3. Poster & Presentation of Technical Descr.
4. Literature Review
5. Popular Article
6. Abstract of Popular Article
104E Assignment Overview

1. **Rhetorical Analysis of a Scientific Article**
2. **Technical Description**
3. **Poster & Presentation of Technical Descri.**
4. **Literature Review**
5. **Popular Article**
6. **Abstract of Popular Article**
Assignment...

“This assignment asks you to begin looking at scientific writing not only as a scientist, but also as a writer. The skills of close reading and analyzing are integral to research and communication, and you will likely engage them in virtually any career you eventually pursue.”
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Assignment...

“For this analysis, you are observing how the genre of the scientific (IMRAD) format fits with the way of thinking in the scientific community. As we have been discussing in class, it is just as important to think about how a writer is conveys information as it is to understand what they are trying to convey.”
Sex, Age, and Population Density Affect Aggressive Behaviors in Island Lizards Promoting Cannibalism

William E. Cooper Jr., Ioannis Dimopoulos & Panayiotsi Poulou

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2 Section of Zoology and Marine Biology, Department of Biology, University of Athens, Athens, Greece

Abstract

Island populations may evolve distinct behavioral repertoires as a response to the conditions of island life. Strong interspecific competition is typical in island lizards and may include cannibalism. In this study, we investigated sexual and age patterns of aggression in two populations of the lizard Sceloporus cyanellus (Arcturus) one from the main island of Zygos (Greek Sea, Greece) and another from the satellite island Luravas. The latter is a peripheral predator-dominated biotope, housing a dense population of large-bodied lizards that have been reported to prey cannibalism. In staged encounters, we examined the aggressive preferences of adult males and female lizards against their age-peers and juveniles. Males from both populations were much more aggressive than females toward juveniles and adults. Adult males from Luravas were more frequently aggressive to juveniles and other male lizards than males from Zygos. Dieters cannibals also captured their targets at shorter latency. We describe this distinct behavioral pattern to the high population density, immature and mature aggressiveness entails two great advantages to cannibalism: food and elimination of future rivals.

Introduction

Island life deviates in many ways from mainland biological norms (MacArthur & Wilson 1967). The Island Sympodium (Agrawal & Loomis 2013; Cooper 2014, 2018a, 2018b) describes some of the adaptations that animals have developed in response to the isolation and limited resources in islands. Island species and populations differ from their continental counterparts in a constellation of features, such as body size, daily activity, thermal biology, and diet (Phillips et al. 2007; Muller et al. 2011; Navasovel & Molt 2014; Seigmany et al. 2014; Cooper et al. 2016). Behavior represents an exception. Particular behaviors have been described from island populations, such as island lizards (Cooper et al. 2000f, 2014) and shore-frogs (Phillips et al. 2008; Vermeers 2009).

Island lizards have degenerate components that experience lower predation risk and reduced interspecific competition (Lins & Nolles 2009). As a result, island populations of lizards are particularly dense (Rodriguez-Coyle et al. 2011; Navasovel et al. 2015), triggering high intraspecific competition. This form of competition has been shown that frequently causes amendment of body parts such as tails (Vermeers 2008a) or tails (Vermeers 2008a) and legs (Vermeers 2008b) and strong intraspecific competition (Phillips et al. 2008; Vermeers 2009).

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Scaffolding...

In-Class Group Activity:
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1. How do the authors identify themselves?

1. What is the tone of the article?

1. Who is the audience?
Scaffolding...

In-Class Individual Activity:

<table>
<thead>
<tr>
<th>Student Name:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>WHAT the Author Does</th>
<th>HOW the Author Does</th>
<th>WHY the Author Does</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Author's thesis/Main idea+</td>
<td>lothes thesis explicitly explained? Expressed directly as question, statement, etc.?</td>
<td>Why did the author choose this thesis idea to study?</td>
</tr>
<tr>
<td></td>
<td>lothes purpose explicitly explained? Otherwise, restate the thesis. What evidence of this purpose in the text?</td>
<td>Why did the author choose this purpose? What effect does it have?</td>
</tr>
<tr>
<td></td>
<td>Where do you see evidence of the intended audience?</td>
<td>Why do you think the author chose to write for this particular audience?</td>
</tr>
<tr>
<td>3. Author's intended audience?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Cooper and Pafalis’ (2014) preliminary Introduction paints a concise, basic overview of their hypotheses using the logos rhetorical appeal. [...] Interestingly, the authors also apply previous studies using a general-to-more-specific approach that parallels an ecological concept that underlies their very study.”
“The authors also utilize a strong active voice and the first-person perspective. [...] It adds to their credibility and ethos, and makes the readers more aware of who the authors are rather than just the experiment by itself without a name to it. The authors are more well-known this way, which is an advantage in the science world; it may lead to more recognition and more citations for their article which will show the success of the article.”
Pedagogical Implications…

• Working vocabulary of rhetorical terms
• Critical engagement with writing process
• Awareness of discourse community
• Rhetoric as “code” for disc. community
• Student agency as writers
• Scientific knowledge as “constructed”
Communicating Scientific Information to Public Audiences

Melissa Bender
## Assignment Overview

### Writing in Science

1. Rhetorical Comparison of a Scientific Article and a Popular Science Article
2. Literature Review
3. Lit Review Abstract
4. Popular Science Article
5. Grant Proposal

### Writing in Health Prof.

1. Rhetorical Comparison of a Scientific Article and a Popular Health Article
2. Literature Review
3. Lit Review Abstract
4. Case Study for Public Audience
5. Health Education document
Adaptation Strategies

Narration
Example
Definition
Analysis
Comparison (Analogy & Metaphor)
Graphics

--Penrose & Katz, Writing in the Sciences
The National Science Foundation:

“Scientists have an obligation to present their work to the public and to demonstrate the implications that research may have on issues of public concern.”
Rationale

1. Ethical
2. Economic
3. Political
Rationale

1. **Ethical**: The impact of science reaches beyond the laboratory and has the potential to impact the larger society.

1. **Economic**

1. **Political**
Rationale

1. Ethical

1. **Economic:** Since much scientific research is publicly funded through taxpayer dollars, scientists must be able to explain why their projects are worthy of such funding.

1. Political
Rationale

1. Ethical

1. Economic

1. Political: Public funding of research is affected by how favorably an informed public looks upon particular scientific projects or aims.
Rationale

1. Ethical

1. Economic

1. Political: Public funding of research is affected by how favorably *an informed public* looks upon particular scientific projects or aims.
4. **Educational**: Given how ill-informed much of the general public is about things like childhood vaccinations, climate change, and stem cell research, our future scientists need to think about their roles as educators, even if they are not going to be educators in the formal sense.
'In Assignment 1, you compared the writing style of two articles on the same subject, one written for an audience of experts, the other for a general audience. This assignment has given you a general understanding of the differences between writing for two very different kinds of audiences. For Assignment 3, you will be translating the research that you presented and evaluated in the Assignment 2, the Literature Review, into an article that would be suitable for a public audience.'
Adapt your scientific topic for a public audience through at least three of the following strategies:

- Narration
- Example
- Definition
- Analysis
- Comparison (Analogy & Metaphor)
Scaffolding Activity: Metaphor

1. Select a term or concept from one of your literature reviews that you would expect to be unfamiliar to most college-educated readers who are neither scientists nor healthcare professionals.

2. As a group, generate ideas for a metaphor or analogy that would help your readers understand the term.

3. Select the strongest of the metaphors from your group and post it on the Forum (the threaded discussion site on our class management system).

4. Prepare to discuss your metaphor with the rest of the class.
Preparatory Reading

- Lakoff and Johnson, *Metaphors We Live By*
- Martin, “The Egg and the Sperm: How Science Has Constructed a Romance Based on Stereotypical Male-Female Roles”
- Danforth and Naraian’s “Use of the Machine Metaphor in Autism Research.”
Structured Peer Review

Brenda Rinard
Writing Feedback: Peer Review

→ Structured peer review on rough drafts
→ Use checklists and rubrics focused on rhetorical concepts and assignment instructions
→ Include a brief metacognitive writing response
→ Use the peer review checklist as you grade
Writing in the Biological Sciences: Review Paper

Audience:

→ Written for fellow scientists with a field of study.

→ Review articles are often targeted to a broader audience than a primary research report.

→ Published in peer-reviewed journals so may be targeted to a specific journal’s audience
Purpose

→ To describe and evaluate the studies of others
→ To note gaps or shortcomings in the literature
→ To help the field take stock of a rapidly developing research area
→ To persuade funding agencies that more research is needed
What if you don’t have enough time for extensive peer review?

Ask students to engage in peer review using GoogleDocs after class.

After giving written feedback, ask students to spend 10 minutes filling in the grading rubric based on your marginal comments.
What strategies could you employ to incorporate writing or scaffolding into your courses?
Sources:


