

An Introduction to Scientific Research, Writing, and Presentations

NRC 601

Research Concepts in Natural Resources

Department of Natural Resources Conservation
University of Massachusetts Amherst

Fall 2009

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Overview

- (1) Graduate School - general goals and expectations
- (2) Scientific Writing - from proposals to peer-reviewed publications
- (3) Proposals - purpose, format, and approaches
- (4) Other Logistics - other matters for discussion

Graduate Research - Some Goals

- (1) To learn about science and the scientific method, the process of research, and the details of your chosen field.
- (2) To produce a thesis, dissertation, or professional paper - a final report for stakeholders.
- (3) To publish one to several scientific, peer-reviewed papers in the retrievable, scientific literature.

Graduate Research - Some Challenges

A new process for you, but must stand up to rigorous review.

Based on previous research, and the need to grasp extensive literature bank.

Produce something original and add to the general base of knowledge.

1-3 field seasons is a big investment, yet a mere snapshot in time.

Pulled in a species-specific approach, but can you contribute to knowledge about a process.

Graduate Research - Some Logistics

- (1) Review and adhere to guidelines of both the Graduate School and the Department (requirements, timelines, etc.).
- (2) Form a committee early; keep them informed; ask their preference for documents (e- vs. paper).
- (3) IACUC and Human Subjects requirements:
 - a. individual training and certification
 - b. research approval

The Research Cycle

- (1) Identify questions/problems/hypotheses.
- (2) Conduct literature review.
- (3) Write a proposal.
 - includes background, objectives, design, timing, budget.
- (4) Proposal review >>>>> *you want criticism HERE!*
- (5) Obtain funding.
- (6) Conduct the research . . . gather data.
- (7) Analyze the data.
- (8) Organize the data . . . tables, figures.
- (9) Present results at meetings.
- (10) Write manuscripts and endeavor to publish the results >>>>>
most criticism received here . . . i.e., the search for the "fatal flaw".

Scientific Writing

(1) The scientific proposal

(2) Thesis, Dissertation, or Professional Paper

- one large document vs. a few to several chapters
- chapters written as manuscripts for journals

(3) Scientific manuscripts.

(4) Scientific presentations.

(5) Scientific publications in peer-reviewed journals.

Some Thoughts on Scientific Writing

The goal of scientific research is publication . . . It is the only way to authenticate the research and add it to the body of information called scientific knowledge.

The scientist must provide a written record that explains *why, what, how, and so what* . . . And is REPRODUCIBLE.

Peer-reviewed, primary research journals represent *new* knowledge.

Good science depends on good communication.

Origins of Scientific Writing

4000 BC - clay tablets

2000 BC - papyrus rolls from papyrus plants and glue

190 BC - parchment from animal skins

105 AD - Chinese invent paper

1100 AD - Chinese invent movable type

1455 - printing press credited to Gutenberg

1665 - first scientific journals in England and France

1981 - some 70,000 scientific and technical journals

20th century - other mediums such as electronic storage
and the internet (e.g., *Civil War vs. Vietnam War*)

What is Scientific Writing?

The key characteristic is *clarity*.

Strive to be clear, simple, and well ordered.

Strike a balance between detail and brevity.

Avoid literary embellishments or devices
(see the following examples . . .)

Metaphor =

implied comparison achieved through a figurative use of words.

"From Stettin in the Baltic to Trieste in the Adriatic, an iron curtain has descended across the continent." - Winston Churchill

Simile =

an explicit comparison between two things using "like" or "as".

"Swear words drifted out of the kitchen like a whiff of urine." - Garrison Keillor

Idiomatic expressions =

hidden or lost meaning to describe a circumstance

"To bite the dust; Nip in the bud; Bury the hatchet."

Jargon =

narrow, unobvious meaning specific to a profession

"Paradigm shift, holistic management, habitat."

Goobledygook =

nonsense, often attributed to high scientific meaning

"Wildlife stakeholder acceptance capacity."

The Principle of Reproducibility of Experiments

Credited to Louis Pasteur's germ theory of disease versus spontaneous generation.

Pasteur found it necessary to describe his experiments in detail so competent peers could reproduce his results.

This led to a separate METHODS section in scientific papers.

This led to IMRAD

What was studied?

Answer in INTRODUCTION

How was it studied?

Answer in METHODS

What were the findings?

Answer in RESULTS

What does it mean?

Answer in DISCUSSION

Now we have . . . Title, Authors, Abstract, Introduction,
Study Area, Methods, Results, Discussion, Literature
Cited, Tables, Figures . . .

TAAISAMRDLCTF ???

The Proposal: Proposal vs. Publication

- different content
 - what you plan to do >>> future tense
 - what you did >>> past tense
- number of authors
 - multiple (2 or more) >>> use “we”
 - single (only you) >>> use “I”
- write and present a PROPOSAL for this class, even if you have completed a year of work

The Proposal: Why Bother?

- requirement
 - for this class
 - for the department
- to learn the process
 - to understand and evaluate science
- to obtain full or partial funding
 - NSF, NIH
 - state and federal conservation agencies
 - Non-governmental organizations (NGO)
 - private individuals and institutions
- to receive open, honest, sometimes severe criticism
- because we all need to have a plan

The Proposal: Content and Format

- content
 - what the proposal is all about
 - objectives and questions
 - background and implications
 - project design, data collection, analyses
- format
 - the logistic details
 - everything from font size and type to page length and literature cited

The Proposal: Getting Started

- talk to your advisor
- is there an existing proposal?
 - submission for funding
 - funding already obtained
 - how much detail exists
- no existing proposal?
 - start with a general topic
 - refine it down to a more specific area
 - define some objectives
 - ask a question or questions

The Proposal: The Outline

Working title

Personnel and Affiliations

Abstract

Introduction

- background
- literature review
- objectives and questions

Study Area

Methods

Anticipated Results and Implications

Time-line or schedule

Budget

The Proposal: First Assignment (1-2 pages)

- (1) meet with your advisor
- (2) create a working title
- (3) names and affiliations
- (4) brief statement of proposed research; use full sentences (i.e., not bulleted statements)
- (5) include objectives or questions
- (6) use 12-pt font; no “unusual” font types; double-space throughout the document

Some Realities of Publishing

The Time Lag

Out of the field:

Analyze data and write first draft	6-12 months
In-house review	1-2 months
Revise	1-2 months
Submit for peer review	6-8 months
Revise and resubmit	
accepted	1-2 months
second round of reviews	2-4 months
In the publishing queue	6-12 months

RANGE OF TIME: 23-42 months, 2-3.5 years!

Other Issues

Authorship and co-authorship

important to you and your advisor

you are lead author, advisor and cooperators co-authors

advisor could lead on a related paper

what qualifies someone as a co-author?

Dickson et al. 1978. Guidelines for authorship of scientific articles. *Wildlife Society Bulletin* 6:260-261.

Research can be divided into 5 basic areas: (a) conception; (b) design; (c) data collection; (d) analysis; & (e) manuscript preparation.

All authors should contribute to (e) and at least 1 other category.

Other Issues

Plagiarism

Dual publication

Rejection rates

Page charges