

Becoming a Professional Scholar

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C O N N E X I O N S

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Chapter 1

Introduction to the Collection: Becoming a Professional Scholar¹

1.1 Becoming a Professional Scholar While in Graduate School

One of the most thrilling and challenging parts of graduate school is developing a professional identity as a scholar with demonstrable expertise in a special field. As an undergraduates, students begin as novices, gain an overview of their major, and some depth of knowledge about the field's major methods, historical contributions, and problem-solving approaches. As graduate students, candidates need to develop an identity as a professional scholar: a person who can

- place particular issues in the context of past and current work,
- explain those issues' importance and the methods that have been used to address them,
- summarize the findings of key research efforts, and
- undertake research, individually or with others, on specific problems or questions that will advance the field's knowledge and possibly benefit society or industry through particular applications.

While this exciting end-point of graduate school is easy to visualize, the road ahead can be daunting. The modules that follow in this collection can help graduate students (and the people advising them) in achieving just this sort of expert identity. Several of these are quite brief.

1.1.1 Reading as a Professional Scholar

To develop a personal sense of the important work that has gone on in one's field, one must learn to read published articles and glean the important aspects in a memorable form. So many new articles are published every day that a professional scholar cannot re-read entire articles again and again. A convenient management tool for one's reading, such as the free *Zotero* (www.zotero.org) or the commercially available *EndNote* (<http://www.endnote.com>) will help a student develop a collection of notes, summaries, and electronic documents or images. However, these software tools cannot tell the reader what is important to note and remember. The module, *How to Read a Scientific Article* (m15912), will teach readers what to look for, jot down, and summarize. The template at the end of the model can be used in a print version or used in conjunction with the bibliographic software mentioned above. Imagine the template as the spyglass in a detective's hand. It helps the reader detect those clues in the article that matter in the investigations of that particular field.

¹This content is available online at <<http://cnx.org/content/m30980/1.2/>>.

1.1.2 Reporting Scholarly Work

A graduate student's first scholarly work may consist of writing papers in graduate courses, laboratory reports, or participating as a co-author in a research article for publication. However, a fairly large number of graduate students do not prepare many written accounts of their work until they are asked to propose a thesis or dissertation. This requirement can cause dismay just because it seems unfamiliar. The module, Thesis Overview (m15923), explains what goes in a thesis, what questions it must answer, and how to plan for a successful thesis. Another module, Ten Mistakes to Avoid While Writing a Thesis (m16583), suggests how to avoid the most common mistakes graduate students make when attempting a thesis or other major writing project. Brief Introduction to Technical Style (m16059) explains the keys to writing energetic, readable prose in spite of complex subject matter. This module will help graduate students in other fields as well. Finally, fifteen basic editing tips are summarized in Tips on Polishing a Report (m16600).

In a few universities, a report or a combination of reports substitutes for a master's thesis. In such reports the objective is still to demonstrate the candidate's contribution to new knowledge in the field, even though the work may not resemble traditional research. For those asked to prepare this kind of evidence of professional identity, consult Demonstrating Your Knowledge and Contributions to a Profession: The Management Report and the Technical Report for the Professional Science Master's Degree (m16582).

1.1.3 Resources for Coaching Others

Many graduate students are asked to be responsible for some undergraduate instruction while they are in graduate school. Three basic resources can help graduate students mentor undergraduate writers. These are available on the Connexions Web Site (<http://cnx.org>). Writing Module Three: Five Essential Parts of Argument (m17224), summarizes the basic moves of argument; the Manual for Writing Mentors (m15909) is a training manual (with student writing examples) to practice evaluating student writing; and Graduate Seminar Mentoring (m16591) explains how a graduate student can mentor small groups of undergraduates or graduate students on their written or oral assignments.

NOTE: Each of the resources mentioned in this collection was prepared by one or more members of the Cain Project in Engineering and Professional Communication at Rice University (2008): Dr. Janice Hewitt, Dr. Mary Purugganan, or Dr. Linda Driskill.

Chapter 2

How to Read a Scientific Article¹

Reading a scientific article is a complex task. The **worst** way to approach this task is to treat it like the reading of a textbook—reading from title to literature cited, digesting every word along the way without any reflection or criticism. Rather, you should begin by skimming the article to identify its structure and features. As you read, look for the author’s main points. Generate questions before, during, and after reading. Draw inferences based on your own experiences and knowledge. And to really improve understanding and recall, take notes as you read. This handout discusses each of these strategies in more detail.

2.1 Skim the article and identify its structure

Most journals use a conventional IMRD structure: An abstract followed by Introduction, Methods, Results, and Discussion. Each of these sections normally contains easily recognized conventional features, and if you read with an anticipation of these features, you will read an article more quickly and comprehend more.

2.1.1 Features of Abstracts

Abstracts usually contain four kinds of information:

- purpose or rationale of study (why they did it)
- methodology (how they did it)
- results (what they found)
- conclusion (what it means)

Most scientists read the abstract first. Others—especially experts in the field—skip right from the title to the visuals because the visuals, in many cases, tell the reader what kinds of experiments were done and what results were obtained. You should probably begin reading a paper by reading the abstract carefully and noting the four kinds of information outlined above. Then move first to the visuals and then to the rest of the paper.

2.1.2 Features of Introductions

Introductions serve two purposes: creating readers’ interest in the subject and providing them with enough information to understand the article. Generally, introductions accomplish this by leading readers from broad information (what is **known** about the topic) to more specific information (what is **not known**) to a focal point (what **question** the authors asked and answered). Thus, authors describe previous work that led to current understanding of the topic (the broad) and then situate their work (the specific) within the field.

¹This content is available online at <<http://cnx.org/content/m15912/1.1/>>.

2.1.3 Features of Methods

The Methods section tells the reader what experiments were done to answer the question stated in the Introduction. Methods are often difficult to read, especially for graduate students, because of technical language and a level of detail sufficient for another trained scientist to repeat the experiments. However, you can more fully understand the design of the experiments and evaluate their validity by reading the Methods section carefully.

2.1.4 Features of Results and Discussion

The Results section contains results—statements of what was found, and reference to the data shown in visuals (figures and tables). Normally, authors do not include information that would need to be referenced, such as comparison to others' results. Instead, that material is placed in the Discussion—placing the work in context of the broader field. The Discussion also functions to provide a clear answer to the question posed in the Introduction and to explain how the results support that conclusion.

2.1.5 Atypical Structure

Some articles you read will deviate from the conventional content of IMRD sections. For instance, Letters to Nature appear to begin with an abstract, followed by the body of the article. Upon reading, however, you will see that the “abstract” is a summary of the work filled with extensive introduction (for the purpose of catching the attention of a wide audience), and the next paragraph begins a description of the experiments.

Therefore, when you begin to read an article for the first time, skim the article to analyze the document as a whole. Are the sections labeled with headings that identify the structure? If not, note what the structure is. Decide which sections contain the material most essential to your understanding of the article. Then decide the order in which you will read the sections.

2.2 Distinguish main points

Because articles contain so much information, it may be difficult to distinguish the main points of an article from the subordinate points. Fortunately, there are many indicators of the author's main points:

2.2.1 Document level

- Title
- Abstract
- Keywords
- Visuals (especially figure and table titles)
- First sentence or the last 1-2 sentences of the Introduction

2.2.2 Paragraph level: words or phrases to look for

- surprising
- unexpected
- in contrast with previous work
- has seldom been addressed
- we hypothesize that
- we propose
- we introduce
- we develop
- the data suggest

2.3 Generate questions and be aware of your understanding

Reading is an active task. Before and during your reading, ask yourself these questions:

- Who are these authors? What journal is this? Might I question the credibility of the work?
- Have I taken the time to understand all the terminology?
- Have I gone back to read an article or review that would help me understand this work better?
- Am I spending too much time reading the less important parts of this article?
- Is there someone I can talk to about confusing parts of this article?

After reading, ask yourself these questions:

- What specific problem does this research address? Why is it important?
- Is the method used a good one? The best one?
- What are the specific findings? Am I able to summarize them in one or two sentences?
- Are the findings supported by persuasive evidence?
- Is there an alternative interpretation of the data that the author did not address?
- How are the findings unique/new/unusual or supportive of other work in the field?
- How do these results relate to the work I'm interested in? To other work I've read about?
- What are some of the specific applications of the ideas presented here? What are some further experiments that would answer remaining questions?

2.4 Draw inferences

Not everything that you learn from an article is stated explicitly. As you read, rely on your prior knowledge and world experience, as well as the background provided in the article, to draw inferences from the material. Research has shown that readers who actively draw inferences are better able to understand and recall information.

As an example, in the box below is an excerpt from the Introduction of an article in the journal *Biochemistry* (Ballestar et al., 2000). The comments in italics are questions and inferences that might be drawn by a student reader.

Example 2.1

Rett Syndrome is a childhood neurodevelopmental disorder and one of the most common causes of mental retardation in females **Comment: Hmmm...must be related to a gene on the X-chromosome**, with an incidence of 1 in 10000-15000. **Comment: How common is that? Not too likely to happen to me, but there must be several such children born in Houston every year.** Rett syndrome patients are characterized by a period of normal growth and development (6-18 months) followed by regression with loss of speech and purposeful hand use. **Comment: What happens? Something must be triggered or activated at late infancy.** Patients also develop seizures, autism, and ataxia. After initial regression, the condition stabilizes and patients survive into adulthood. Studies of familial cases provided evidence that Rett is caused by X-linked dominant mutations in a gene subject to X-chromosome inactivation. Recently, a number of mutations in the gene encoding the methyl-CpG binding transcriptional repressor MeCP2 have been associated with Rett Syndrome. **Comment: MeCP2 mutations probably cause Rett Syndrome. This must be an important master-regulator to affect so many processes in the brain. I wonder what they know about it...**

2.5 Take notes as you read.

Effective readers take notes—it improves recall and comprehension. You may think you'll remember everything you read in researching class assignments, professional papers, proposals, or your thesis, but details

will slip away. Develop a template for recording notes on articles you read, or adapt the template below for use. As you accumulate a large collection of articles, this template will help you distinguish articles and quickly locate the correct reference for your own writing. The time spent filling out the form will save you hours of rereading when you write a Background, Related Work, or a Literature Review section.

Example 2.2**Template for Taking Notes on Research Articles: Easy access for later use**

Whenever you read an article, pertinent book chapter, or research on the web, use the following format (or something similar) to make an electronic record of your notes for later easy access. Put quotation marks around any exact wording you write down so that you can avoid accidental plagiarism when you later cite the article.

Complete citation. Author(s), Date of publication, Title (book or article), Journal, Volume #, Issue #, pages:

If web access: url; date accessed

Key Words:

General subject:

Specific subject:

Hypothesis:

Methodology:

Result(s):

Summary of key points:

Context (how this article relates to other work in the field; how it ties in with key issues and findings by others, including yourself):

Significance (to the field; in relation to your own work):

Important Figures and/or Tables (brief description; page number):

Cited References to follow up on (cite those obviously related to your topic AND any papers frequently cited by others because those works may well prove to be essential as you develop your own work):

Other Comments:

Chapter 3

Thesis Overview¹

3.1 What is a thesis? What should be in it?

The word “thesis” has two meanings, both of which are applicable to your writing. First, the word refers to either a Master’s Thesis or a PhD Thesis (dissertation). Additionally, the word “thesis” signals the fact that your thesis must be a work of persuasive argumentation. You first make a statement defining the focus of your research (the problem/question/issue that needed to be solved) and signal your results. Then, through evidence and reasoning, you persuade your committee of the validity of your research.

Every thesis, either Master’s or PhD, must tell a compelling and exciting story about important original research. In the process of telling that story, you must answer, clearly and precisely, the following key questions:

- What **problem/question/issue** does your thesis focus on?
- Why is it **important**?
- How does your work fit into the **intellectual context of your field**?
- What **experimental design / methods** did you use? Why did you choose those methods? What difficulties did you encounter along the way? How did you solve (or not) those difficulties?
- What are your research **results**? How do they differ from what you had expected or from what had previously been done by others? What **evidence** do you have to support those results? What **conclusions** did you reach?
- What, specifically, is your **unique contribution**?
- What are some **possible applications**, either practical or theoretical, of your findings? What **future work** does your thesis suggest?

In sum, you are writing a fascinating work of non-fiction, complete with beginning, middle, and end. Your readers should be drawn smoothly from one essential page to the next. You must tell

- **what you did**
- **why you did it**
- **how you did it**
- **with what results, and**
- **why we should care (so what).**

In other words, you must **explain** your work to your reader. If you write to the person on your committee who is least familiar with your work, that will help you decide the level of detail and explanation needed. My experience says that most graduate students need to explain more fully. Think back to when you weren’t so familiar with the subject. Leave no gaps in your argument; omit no essential step in your thinking. Include

¹This content is available online at <<http://cnx.org/content/m15923/1.2/>>.

what didn't work as well as what did work. Get comments from someone who can evaluate the technical content **and** from someone not so familiar with your work.

If you are incorporating published papers into your thesis, at minimum they need to be tied together and explained in an overarching Introduction and then summarized in a final chapter. Ideally, however, you will expand a published paper so that you can go into greater detail on answering the Seven Key Questions. Published papers by necessity are short; a thesis gives you the opportunity to give greater depth to your explanations and examples. It can be exciting to talk in detail about work that has been so absorbing and important to you.

Writing a thesis is hard work because you must organize and explain such a huge amount of material. I am convinced, though, that the effort is worthwhile because you learn so much during the process. **Everything you learn about writing accurately, clearly, and concisely you will use over and over in your professional life.**

Remember to **use the required thesis margins: one and a half inches left; one inch top, right, and bottom.** The page number does not have to follow the one-inch margin rule; do what your software wants to do with a page number.

3.2 THESIS CONTENTS:

3.2.1 Copyright notice (if applicable; not all theses are copyrighted)

3.2.2 Title page

Signed by your committee; take 4 copies on 100% cotton rag or 20 lb. bond paper to your defense

3.2.3 Abstract (350 words for Ph.D.; 150 words for a Masters)

The abstract must summarize the contents of the thesis, not merely say what it is about. Write it last because you must have written the Introduction and Conclusion before you can summarize their main ideas in the Abstract.

The first sentence should identify the research problem and signal your method(s) and your results. Then move to details, which must include a clear definition of the problem addressed and its importance, the intellectual context of the problem within your field, your methods, the most important of your findings (be specific!), your unique contribution, and possible applications. You may want to include possible future work suggested by your findings, as well.

3.2.4 Acknowledgments

Try to limit this to one page. Thank your committee first; then team members and others who helped you; and, finally, your family. Be generous, but not flowery.

3.2.5 Table of Contents

3.2.6 List of Tables and Figures (if needed)

3.2.7 List of Definitions (if needed).

If your thesis is interdisciplinary, you will almost always need to include definitions.

3.2.8 Preface (optional; most theses omit this)

3.2.9 Text (The body chapters)

3.2.9.1 Chapter 1. Introduction:

This chapter provides an overview of the thesis as a whole; it does not simply give background. The first sentence should identify the problem and signal your results. Then move to a more detailed overview of problem, importance, method, intellectual context, and your findings. The last paragraph usually briefly lists what will be covered in subsequent chapters. You can usually do it in one sentence per chapter; try to vary the sentence style.

The Introduction is often short, perhaps some 10 pages. Write it after you have written the body chapters and the Conclusion so that you know just what you are introducing.

3.2.9.2 Chapter 2. Background and Literature Review:

Here is the place you situate your work in the field. Your goal is to show that you understand how your work fits into and contributes to the context of the wider research field. Include only references to previous work important to your research project.

The chapter can be organized either thematically or chronologically. Summarize the major contribution of each of the works cited; show how each work relates to what came before or to contemporaneous research; identify issues; link each previous work to your research as well. It should be clear why we are reading about a particular work and how it relates to your thesis research.

Refer to authors by name, not as “[10] then applied this algorithm to the thixotropic properties of ketchup.” Be careful to differentiate your work from that of others.

The main difficulties I see in Lit Reviews: 1) insufficient summary of the main contribution of the author cited; 2) unclear delineation of the issues; 3) unclear chronology of how one work led to another; 4) unclear link between your work and the work of other researchers (why we are reading about this contribution); and 5) insufficient differentiation of your work from that of other researchers: “It has been discovered that...” with no indication that YOU did the discovering.

Note: Some advisors prefer that the Introduction and Chapter 2 be combined. If so, you must still introduce the thesis as a whole rather than simply giving “background.” In some theses, too, especially those based on published papers, you may want to put the lit review at the beginning of each “paper” chapter rather than combining them in Chapter 1 or Chapter 2. All the necessities listed above about differentiation and linking still apply, however.

3.2.9.3 Chapter 3. Materials and Methods:

You may not need a chapter on this; it depends on the sort of research you are doing. You may be able to include the necessary material in a short section of each main chapter, though you will also have to identify your methods in the Abstract and in the Introduction. Do not include details of your research or discuss your findings in this chapter. If you do need this chapter, it may be a good one to start writing first.

3.2.9.4 Chapters 4, 5, and 6:

These chapters make up the main portion of your thesis and give **details of your research**. You may need two chapters for this or more than three, depending on your work. These chapters do not simply present your data, however. You must **explain what you did, why you did it, how you did it, and with what results**. Strive for a coherent narrative; show your enthusiasm for the subject. [If you’re not enthusiastic, fake it.] The average chapter is 30-40 pages long in a PhD thesis; chapters will usually be shorter in a Master’s thesis.

Keep in mind that as your research progresses, your research focus may well be modified because of unexpected good or bad results, time strictures, equipment failure, ineffective procedures, or (oh, please, no!) errors. In that case, you will have to make the modifications throughout the entire thesis.

Do NOT expect simply to lift whole chunks from your proposal. They were written before you had finished your research and the chunks will probably have to be modified to some extent. The “before” and “after” perspectives change what you say.

Some advisors will not allow you to discuss your results in the immediate context of your findings, preferring the discussion to be done separately at the end of the chapter or even not until the Conclusions chapter. Some advisors, including me, prefer an integrated discussion because it is easier for a reader to understand. However, always do what your advisor prefers!

3.2.9.5 Chapter 7. Conclusion:

Here you summarize and discuss your results and their implications. It usually ends with a short section on possible future work. This chapter is also often short, perhaps some 10 pages.

Always write this chapter before you write your Abstract because often your ideas come together clearly as you write it. **Then reread your Conclusion and your Introduction before you write the Abstract.**

- **Bibliography or Works Cited:** Include only those works actually mentioned in the text. Include ALL the works cited in the text, including citations on graphics. The form for the Bibliography varies by field and software. (Either Endnote or Latex is a good choice.) Completeness, accuracy, and consistency are essential, however. You’ll have to proofread carefully no matter what software you use. (Check the accuracy of your bibliography on those days when you can’t force yourself to write; the work will keep you from feeling guilty.)
- **Appendices:** These are optional because many theses do not need them. Use an appendix for material too lengthy or tangential to include in the text, but which is material that some readers may need for reference. Lengthy proofs, lists of data, or computer code, for example, would fit into this category. Refer to all appendices in the body of your thesis.

NOTE: Check the Rice University web site www.rice.edu² to download up-to-date university requirements for thesis procedures and thesis format. Do this NOW to see if the requirements have changed since the last update on 6/2006.

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²<http://www.rice.edu/>

Chapter 4

Ten Mistakes to Avoid While Writing a Thesis¹

4.1 Not clearly identifying the precise focus of your research.

Too often writers fail to identify the focus of their research until several pages into the Introduction. Readers need to know up front, in the Abstract and in the Introduction, precisely what problem you are addressing and why. You must state a claim that summarizes what you identified as needing to be done and what you did to fill that need.

4.2 Not telling us why your work is important.

Why should any reader care about your research contribution? You must answer the question, “So what?”

4.3 Not clearly identifying and defending your choice of method(s) to solve the question addressed in your research.

You almost always have a choice of methods. Why did you choose the one(s) you did? Why not other available ones? You must justify your choice.

4.4 Not situating your work within the context of other work in the field.

All research in science and engineering is incremental, growing out of the research of others. You need to show how your work fits into closely related research and into the wider field. How does your research grow out of, improve, generalize, test, or newly implement the work of others?

4.5 Not clearly differentiating your work from that of others.

I have read many Literature Reviews in which it was not clear what had been done by others and what the student had contributed. Writing “It has been discovered that...” does not indicate that you have moved from discussing others’ work to reporting on your own research. As we read a Literature Review, it should

¹This content is available online at <<http://cnx.org/content/m16583/1.1/>>.

always be clear how your work links with the work of others, but it should also always be clear exactly which portions refer to your own research findings.

4.6 Not defining and defending all assumptions.

Every time you write “I assume. . .” you must defend and explain the reason for the assumption. If your basic assumptions are incorrect, your research will not be valid. Similarly, if you write that you limit your work to one aspect of a problem (to 1D simulations, for example), you must explain why that limitation is valid.

4.7 Not providing a suitable level of detail and explanation.

As you write the body chapters, remember that you now know more about this area of research than anybody else. I have never had a student’s advisor complain that the explanations were too clear; I have had many who complained that the writer assumed too much expert knowledge on the part of the reader. Think carefully about what terms, procedures, and results need to be explained. Identify and include steps that you might have left out because you were so familiar with them. Give enough detail about experiments so that they could be replicated. Use bulleted lists for easy reading. Put non-essential data and computer code into an Appendix.

4.8 Not clearly identifying your unique contribution(s).

Your unique contribution must be clear in the Abstract, the Introduction, and the Discussion/Conclusions section. Work hard on this—many a Job Talk has failed because the speaker failed to identify clearly and precisely his or her contribution to the field. And don’t say “we.” Give your advisor credit, but present the thesis or dissertation as your work. Your advisor already has a degree and a job.

4.9 Not identifying possible applications, either theoretical or practical.

You need to show that you know how your work can be applied in wider circumstances. Otherwise it may look as if your knowledge is more limited than it is. Colleges, universities, and corporations hire those who bring broad skill sets to a job, not those who appear limited to one narrow application.

4.10 Not proofreading for consistent headings, missing citations, gaps in your logic, missing words, grammatical errors, and spelling errors.

Ask someone to help you with proofreading because we all tend to see what we think is there. Don’t try to proofread for everything at the same time. Read through looking just at headings, then for errors in citation, then for gaps between paragraphs and sentences. If you have a manuscript full of errors, readers will tend to think that your research has also been poorly done.

Chapter 5

A Brief Introduction to Technical Style¹

5.1 What is technical style?

Technical style conveys information about a scientific or engineering topic concisely and clearly. Technical style emphasizes means, actions, and results more than human agents. For example, good technical style in the following sentence places the means in the subject position:

“Efficient column operation in the purification section resulted in 99.5 percent pure ethylene oxide (EO).”

“Efficient column operation” is the means that causes the purity outcome. Contrast that sentence with one that focuses on the human agent:

“The engineer improved the column operations in the purification section to make them more efficient so that the ethylene oxide (EO) in the product stream would be 99.5 percent pure.”

Because of the focus on means, actions, and results, technical style permits more passive voice sentences than some other styles.

Furthermore, technical style emphasizes accommodating the vocabulary, purposes, and decision priorities of decision makers. It ensures that documents, presentations, and visuals are accessible and understandable to the intended audience. It positively connects the writer and audience and meets professional standards. It is consistent with the audience’s culture.

To accomplish these aims, technical style creates syntactic structures that enable readers or listeners rapidly to identify the principal action and its cause. It also uses specific technical terms to reduce the possibility of misinterpretation.

Technical style affects paragraphs as well as sentences. It focuses attention consistently by repeating subjects in a series of sentences and changing subjects only when the logic of the argument requires it.

This brief guide introduces some of the principal techniques for editing to achieve a technical style.

5.1.1 How to edit: Focus on the subject! Capture the action with the verb!

5.1.2 In general, begin a sentence with its subject, that is, name what you want to talk about:

- Technical translators must know both the languages well.
- The infiltration rate decreased over five years.
- Slash pine forests cover the region where the highway will go.

¹This content is available online at <<http://cnx.org/content/m16059/1.2/>>.

5.1.3 Use preliminary phrases only when you need to “set the scene” or establish a condition that will help the reader make sense of your claim:

After turning off the power, open the right hatch door.

5.1.4 In most cases, use concrete subjects that form a picture in the readers’ minds:

- **Abstract:** Input from first-line supervisors is probably the best source of information to aid in the identification of good prospective candidates.
- **Concrete:** First-line supervisors can probably identify good prospective candidates.

5.1.5 Abstractions or generalizations can be good subjects if they are the agents or means of the sentence’s main action:

- Deformations in the concrete jeopardize the roadbed’s stability.
- Permeability of the soil increased infiltration.

5.1.6 Once you’ve named the subject, keep the subject consistent in a long sentence:

- **Inconsistent:** The recently published study, conducted by Darren Harrison, who is a consultant to several major firms, has finished an extensive profile of landfill problems.
- **Consistent:** Darren Harrison, a consultant to several major firms, recently published a profile of landfill problems.

NOTE: The author, not the study, finished the work.

Place precise, active verbs in key positions in the sentence to help your readers follow your argument and appreciate your expertise.

5.1.7 Place the subject and the main verb close together:

- **Separated:** The **delays**, principally involving funding and the slow shipment of construction materials for the levies in New Orleans, **caused** general anxieties about quality of construction.
- **Close together:** The **delays caused** general anxieties about quality of construction: both funding and construction materials arrived slowly for the levies in New Orleans.

5.1.8 Free the action trapped in nouns and “place holder” verbs (verbs with low semantic meaning) by filling in the blanks.

Exercise

Make contact with	contact	Do an imitation of	
Give an approval		Send a referral to	
Have a harmful effect	harm	Offer an explanation	explain

Table 5.1

Chapter 6

Tips on Polishing a Report¹

6.1 TIPS ON POLISHING THE REPORT

1. Use “find” and “replace” to locate words that your fingers mistyped and that the spelling checker recognized as correct words. Lots of us have many common typos— hthe for “the” or “noe” for “one.” Check especially for “**then**” (the adverb of time) when you meant “**than**” (to indicate a comparison; “taller than he was”) and the following:
 - coal “**seem**” where you meant “coal **seam**”
 - “**where**” where you meant “**were**”
 2. Use “few” or “fewer” (comparative) with COUNTABLES. For example, resources can be counted. Say “few resources.” Use “less” with UNCOUNTABLES. For example, visibility or leadership can’t be counted. Write “less visibility” or “less leadership.”
 3. In business style, use a singular pronoun to refer to a company (for example, “This cost will reduce **ABC’s** barriers to entry and improve its rate of acceptance . . .”). Use a plural only when you are referring to a company’s management: “Cisco fought back against AJAX Corp. **They** voted to reject AJAX’s hostile bid.”
 4. Make sure the introduction and the summary are perfect. In the following example the word “be” is needlessly duplicated: “. . . revenue would be potentially be pure profit. . . .”
 5. When you have two clauses in a sentence and intend to show contrast between them with the word “however,” you must put a semicolon BEFORE the word “however” and a comma after it. Use the find command to locate instances of “however” that join clauses.
 - For example: In FY 2004/05, the agency achieved a total water savings that was 15.4 percent below the targeted amount of 16,016 AFY; however, the water savings achieved through landscaping initiatives exceeded the target by 22.4 percent.
- When “however” functions merely as an adverb, a comma on both sides is enough: “Martial law, however, disrupted the refining of petroleum in the region.” Here “however” means “nonetheless.”
6. Introduce figures, insert them, then discuss them. **Don’t put in any figures you don’t discuss.** Introduce the figure **before** it occurs in the text. If you capitalize “Figure” in the figure title (which goes below the figure), capitalize it in the discussion. Your reader is thinking, “Tell me what I’m going to see and then tell me how to interpret what you’ve shown in the figure.”
 7. The bibliography should be in the same font as the rest of the paper, but in smaller point size.
 8. Separate parts of a reference end with periods. There’s a period at the end of each part in all major citation styles. Do look up one and learn the basic types.
 - American Psychological Association (APA) style has four parts, each ending with a period: Last name, F. (date). Title of book. Publication information.

¹This content is available online at <<http://cnx.org/content/m16600/1.1/>>.

- If the author is not an individual, use the association name or if no source can be identified, use a blank underscored space: _____ . (Date). Title of source. Publication city, ST: Publisher.
9. A document doesn't carry your tone of voice, gestures, or pauses. A sentence that can be understood when spoken may sound awkward when read silently. The writer should change "All costs we either recently obtained quotes on or are past operational costs inflated to reflect today's prices" to "The costs below are based either on quotes recently obtained or on past operational costs inflated to reflect today's prices." (You probably had to read that first version more than once to make sense of it; the difficulty you encountered illustrates this kind of problem.)
 10. Make sure sentences have both a subject and a predicate and that adverbs do not create ambiguous readings. The following sentence from an internship draft would be correctly understood if the writer spoke it with a pause following "after": "Shortly after the well was plugged between the 2nd and 3rd coal seams." However, a reader would be entitled to think the writer had begun with a dependent clause when no comma follows "after," as you would if you started to read the following: "Shortly after the semester began, two students left the program." If the writer puts a comma between "after" and "the well," the reader will understand correctly on the first reading.
 11. Also, put a comma after "first" or "second" or any other ordinal number that might be misread if the reader thought it modified the noun that followed it. Don't write "Second measurements were taken" if you mean that after a first step that didn't involve measurements, you took measurements for the first time. Write, "Second, measurements were taken." Do not use "firstly" or "secondly." That form is no longer acceptable in technical documents. Use "first" and "second."
 12. Write out the meaning of symbols the first time you use them. Write out Fahrenheit the first time with (F) in parentheses. Afterward, just use F to indicate Fahrenheit.
 13. A smooth, fast start puts the agent in the subject position and the action in the verb.
 - **Original:** "Firstly, it is the hope of the company that the satisfaction of the energy needs of the field can result from methane reserves from the coals within the lease area."
 - **Fast start:** "The company expects the lease area's methane reserves to supply fuel for the field."
 14. If you want to be recognized for your accomplishments in a business situation, you need to document your own responsibilities and achievements. Don't disappear in the report. The manager who needs the report needs to be able to tell which steps in the project YOU completed and which have been performed by others.
 15. If you are writing a business report and your project did not produce a positive opportunity for the company, you may write about the conditions under which it might do so in the future. For example, say that "although the project is not feasible now, under other conditions (lower interest rate, lower tax rate, increased volume of sales, etc.) the opportunity should be considered."

Look for answers to other questions of usage and style in a resource such as *Management Communication: A Guide*, by Deborah C. Andrews and William Andrews (2003).

Chapter 7

Demonstrating Your Knowledge and Contributions to a Profession: The Management Report and the Technical Report for the Professional Science Master's Degree¹

The reports required for completion of the Professional Science Master's program must demonstrate the writer's scholarship and knowledge. Students report on their internships to faculty and other students as part of the educational process. It may be necessary for the advisor to discuss the student's project AT THE BEGINNING OF THE INTERNSHIP with company managers to ensure that a project will be assigned that has educational benefits as well as corporate benefits. If a company restricts too severely what the student can present to others, he or she will not be able to use the report in his or her job search. Furthermore, if the work to be done is extremely specialized and will not contribute to the student's marketable experience, it should not be chosen as an internship project. Internships must benefit students as well as companies. Being involved in a standard project or a new but explainable project that a student can use to prepare for his or her career should be a major objective in the internship search.

The management report and the technical report are directed to two different audiences. The management report is directed to the management of the company in which the writer interned. The technical report is written for members of the technical discipline that the student has chosen: nanoscale physics, subsurface geoscience, or environmental analysis and decision-making. The needs of these two different audiences usually require that the writer organize the two reports differently, select different details, and use different types and amounts of evidence in each one.

Rarely, circumstances will justify offering a single report to fulfill the degree requirements. Students may request approval for producing a single report when certain circumstances converge: the technical focus of the company, the nature of the managers' expected decisions (requiring technical data or explanation), and the technical nature of the student's work. For example, an article for publication in a scientific journal about work done in a public or government institution might demonstrate both technical details and audience adaptation. Similarly, a technical report to be delivered to a company's client might contain both the technical details and show adaptation to an organization's needs. A technical report with a cover memo to management will **not** usually suffice.

¹This content is available online at <<http://cnx.org/content/m16582/1.1/>>.

7.1.1 The Business Report Audience.

The business report should be written to an upper-level manager or executive committee audience. It SHOULD NOT CONTAIN a great deal of material such readers already know. The manager knows what's going on but needs documentation of what you were assigned to do and why. He or she does not need basic information about the firm. Imagine that Dr. Leebron (the president of Rice University) were reading your report about a project you had done here on campus. He wouldn't need you to say that Rice University strives to provide an outstanding education for undergraduates and graduate students in selected fields or that Rice is located in Houston, right? If you take information about a company's mission from its Web site, paraphrase it, although you should use the exact wording of its mission, which may be a slogan used widely in the firm.

7.1.2 The Structure of Business Reports:

Transmission information plus a two-part structure: the summary and discussion.

7.1.2.1 Transmission Information

- Title
- Submitted by (name, address, phone and e-mail addresses)
- Submitted to (name, address, phone and e-mail addresses)
- Date
- Reference Information: project number, contract number or reference number (if any)
- Contact Person Information (if different from the "submitted by" information).

7.1.2.2 Summary (in BRIEF) (1 to 2 pages)

- The specific situation in the industry or firm (for example, the firm in which the writer is interning uses a high volume of certain tests but these have high cost and delays)
- Who is affected by or involved in the situation (whose problem is it?)
- What your company is doing to address this specific problem
- What you were asked to do to help solve the problem
- The outcome at present or the work accomplished during your internship
- Future steps

7.1.2.3 Discussion (8 to 9 pages)

- A slightly more detailed explanation of the situation in the industry or firm. The situation always has a built-in conflict or discrepancy that provides the motivation for the current project. It is good to be able to indicate the specific problem so your statement of your internship's goals will correspond to the problem. The points below refer to an example in which a student had to conduct a series of tests to evaluate whether ABC should offer a new testing product (ABC is the company in which she was interning). **The descriptions below include estimates of the page length of each section.**
 - **Topics to cover about the situation containing the market opportunity.** For example, if doctors prescribe high volumes of certain tests but there are high costs and delays associated with those tests, then "high costs and delays" are the problem. The goal is obtaining a fast, low-cost test. The value of developing a new test would depend on the size of the market for this test. What is ABC's potential market? Describe the tests, machines, and testing approaches now used: What is florescence testing? How many diseases are diagnosed by it? How often are tests run?

What do they actually cost? What proportion of these tests could be handled by an alternative test? Is there a demand for genetically specific drugs? Who needs the solution? Drug companies? Hospitals? Patients? International market? Just the US?

- In other words, the writer should spell out in more detail here the opportunity for the company that exists because of this problem. The description doesn't have to be **too long** because it is written for ABC's management. Write to answer the question, "Why does this situation matter to ABC?" Remind them of what they already know (very briefly to show that you, too, know). Explain in more detail the relevant, specific facts they may not know (such as a competitor's recent patent application filing). (2 to 3 pages)
- One- or two-sentence description of ABC's current project (or your group's project) that addresses this situation (may be stated as a response to a corporate goal).
- Your part in the department's or company's project (5 to 6 pages)
 - The statement of your internship's goals (1 page or less)
 - The work you did, organized by task/topic or by issue and with a brief explanation of method, if it is unfamiliar (3 to 5 pages)
 - The degree to which the goals are now fulfilled (summarize results in 1 to 2 pages of evidence and discussion; put details in appendices if necessary)
 - Work that remains for others in the future (1 page)
- The outlook for the company at present now that you have finished your work in one to two paragraphs. What are the implications of your work? Suggest new possibilities or applications for your work or trends in the market that can be targeted in the future. (Answers the "So what?" question about the value of having you there.) (1 page)

7.2 TECHNICAL REPORT STRUCTURE

This report, approximately 20 pages in length, explains the technical significance of your internship work. It is, moreover, more focused on the technology and the methods used to develop the product or solve the problem your internship involved. You need to be more specific about the technical nature of the problem you solved than you were in the management report. The conclusion is about the value/usefulness of the work done to date in answering this question or solving this problem. You may include recommendations for future research or testing.

7.2.1 Abstract (250 words)

- The technical situation (such as high volume of certain high cost, lengthy tests performed). Volume processing, cost, speed, and reliability are the issues that matter. The vocabulary should be technically precise.
- What your company is doing to address this specific problem (one to two sentences)
- The stage or portion of the work were you asked to participate in
- The outcome at present (results)
- Conclusion (and recommendations, if appropriate) and future steps

7.2.2 Discussion (20 pages total)

- A more detailed explanation of the technical problem the industry or firm faces. What are the technical deficiencies of the tests now available? For example, how many false positives occur? How many false negatives? Under what conditions do they fail? Are there difficulties in measurement, administration, temperature control, feedstock or materials accessibility, production quality, inspection, etc? What are the measures for these features? In other words, spell out the technical challenge in more detail here.

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Students sometimes have difficulty with this section because the company does not want proprietary information disclosed.

- One- or two-paragraph overview of the technical approach used in your work (names of standard tests, materials, etc.)
- Your experience and accomplishments in the project
 - What was your role? What methods did you use? Did you develop the methods you used (say, for testing wafers)? Or was that handed to you and you followed it in a specific role, perhaps in the role of a quality control person?
 - Who performed other work or collaborated with you? For example, who documented the molecular activity in florescence detection kits that you analyzed? **Cite any source that you say is “well known.”** For example, if you wrote, “Several well-known studies have documented the subsidence in southeast Houston,” you should use an in-line reference that lists at least two of these studies. The full references would go in your references or bibliography at the end of the report.
 - What criteria did you apply? Explain how and why criteria were applied. How, for example, does selecting wafers move the company closer to making a decision?
 - What did you find out as a result of the work you did? What do these results mean? For example, tell how much of a problem it is that the device can’t detect a single nanoparticle between the two electrodes.
 - How much of the work did you accomplish? How much had to be left unfinished? Do you have any recommendations about finishing it?
 - What do you have to say about this process or project? Is it effective? Are there gaps or questions to be answered? What technical challenges remain? Answer the question, “SO WHAT?” about this technology in an objective (not a biased or company-prescribed) way.

7.3 TIPS ON POLISHING THE REPORT

1. Use “find” and “replace” to locate words that your fingers mistyped and that the spelling checker recognized as a correct word. Lots of us have many common typos— hthe for “the” or “noe” for “one.” Check especially for “**then**” (the adverb of time) when you meant “**than**” (to indicate a comparison; “taller than he was”) and the following:
 - coal “**seem**” where you meant “coal **seam**”
 - “**where**” where you meant “**were**”
2. Use “few” or “fewer” (comparative) with COUNTABLES. For example, resources can be counted. Say “few resources.” Use “less” with UNCOUNTABLES. For example, visibility or leadership can’t be counted. Write “less visibility” or “less leadership.”
3. In business style, use a singular pronoun to refer to a company (for example, “This cost will reduce **ABC**’s barriers to entry and improve its rate of acceptance . . .”). Use a plural only when you are referring to a company’s management: “Cisco fought back against **AJAX** Corp. **They** voted to reject **AJAX**’s hostile bid.”
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5. When you have two clauses in a sentence and intend to show contrast between them with the word “however,” you must put a semicolon BEFORE the word “however” and a comma after it. Use the find command to locate instances of “however” that join clauses.
 - For example: In FY 2004/05, the agency achieved a total water savings that was 15.4 percent below the targeted amount of 16,016 AFY; however, the water savings achieved through landscaping initiatives exceeded the target by 22.4 percent.

When “however” functions merely as an adverb, a comma on both sides is enough: “Martial law, however, disrupted the refining of petroleum in the region.” Here “however” means “nonetheless.”

6. Introduce figures, insert them, then discuss them. **Don't put in any figures you don't discuss.** Introduce the figure **before** it occurs in the text. If you capitalize "Figure" in the figure title (which goes below the figure), capitalize it in the discussion. Your reader is thinking, "Tell me what I'm going to see and then tell me how to interpret what you've shown in the figure."
7. If you want to be recognized for your accomplishments, you need to document your own responsibilities and achievements. The most important action you performed should be presented in the business report. Don't disappear in the report. The manager needs to be able to tell which steps in the project YOU completed and which have been left to be performed by others.
8. The bibliography should be in the same font as the rest of the paper, but in smaller point size.
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12. Make sure sentences have both a subject and a predicate and that adverbs do not create ambiguous readings. The following sentence from an internship draft would be correctly understood if the writer spoke it with a pause following "after": "Shortly after the well was plugged between the 2nd and 3rd coal seams." However, a reader would be entitled to think the writer had begun with a dependent clause when no comma follows "after," as you would if you started to read the following: "Shortly after the semester began, two students left the program." If the writer puts a comma between "after" and "the well," the reader will understand correctly on the first reading.
13. Also, put a comma after "first" or "second" or any other ordinal number that might be misread if the reader thought it modified the noun that followed it. Don't write "Second measurements were taken" if you mean that after a first step that didn't involve measurements, you took measurements for the first time. Write, "Second, measurements were taken." Do not use "firstly" or "secondly." That form is no longer acceptable in technical documents. Use "first" and "second."
14. Write out the meaning of symbols the first time you use them. Write out Fahrenheit the first time with (F) in parentheses. Afterward, just use F to indicate Fahrenheit.
15. A smooth, fast start puts the agent in the subject position and the action in the verb.
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Chapter 8

Writing Module Three: Five Essential Parts of Argument¹

8.1 Module Three Objectives

- Why Argument?
- The Five Parts of Argument
- Using the Five Parts of Argument
- Assessing and Revising Your Argument

8.2 Why Does LRS View Writing as Argument?

When we disagree about an issue, care deeply about an outcome, or try to convince others of the validity of our approach, we often resort to argument. Argument as it is depicted on television and experienced in times of stress or conflict carries with it many negative connotations of anger, high emotion, and even irrationality. But each of us also makes arguments every day, and in settings that help us become more rational, better informed, and more clearly understood. Arguments help us to gather information from our own experience and that of others, to make judgments based on evidence, and to marshal information toward sound conclusions. Argument is appropriate when we seek understanding or agreement, when we want to solve a problem or answer a question, and when we want others to act or think in ways we deem beneficial, suitable, or necessary. Argument also comes in handy when we seek to convince, persuade, or produce change in our audience, and when circumstances require trust, respect, belief in our evidence or agreement with our reasoning.

Argument is everywhere—on television and radio, in politics and publications, and also in our day-to-day decisions about what to have for dinner, when to schedule the next meeting, and who should walk the family dog. As Colomb and Williams point out, the common notion that argument must be combative is built into our very language: opposing sides “attack,” “defend,” “hold off,” “triumph,” “struggle,” “crush” objections and “slaughter” competitors. On the other hand, in order to use argument as productive and collaborative communication, we must certainly find a way to transcend the vocabulary of argument-as-war. We must negotiate the audience’s needs along with the speaker’s agenda.

Argument is also about conversation. Although sometimes we forget, the best arguments are a forum for:

- Obtaining and expressing information
- Airing and sharing assumptions and reasons

¹This content is available online at <<http://cnx.org/content/m17224/1.1/>>.

- Establishing common ground
- Coming to mutual agreement

Productive argumentation starts with a problem. It makes us realize why we have an interest in seeing that problem solved. It also claims a solution, convincing its audience of the validity of that solution with evidence and reasons that it will accept.

8.3 Writing and Argument

The LRS focus on argumentation raises writers' and readers' awareness of:

- the importance of audience;
- the intersecting languages of information and persuasion; and
- the reading process through which we share the tasks of critical thinking and decision-making.

Argument structure also helps writers to avoid:

- the formulaic “Five Paragraph Essay” that is often assigned in high school (“Scientific progress is good. Here are several reasons why scientific progress is good. In conclusion, scientific progress is good.”);
- the default structure of chronological order (First I set up the lab, then I opened my notebook, then performed the first step in my experiment...);
- simple summary with no “So what”; and
- binary structures where two issues or ideas are described without connection to each other.

8.4 Preparing Your Argument

To prepare to make an effective argument you must first:

- translate your topic into a Problem Statement;
- frame a situation that is debatable or contestable;
- formulate a question about which reasonable people might disagree; and
- find a claim your analysis has led you to assert.

Now you can begin to imagine what it will take to convince your audience. What evidence, methods, or models do they expect? What conventions must you follow to win approval?

8.4.1 Sketch Your Approach

- What do you want to show?
- Why should readers agree?
- Based on what evidence?
- What are some possible alternatives or objections?
- What conclusion will you offer, and why should your readers accept it as valuable?

8.5 The Five Parts of Argument

The questions that lead to your topic, broadly conceived, also steer you toward what *The Craft of Argument* formalizes in the Five Parts of Argument.

- Claims
- Reasons
- Evidence
- Warrants
- Acknowledgement and Response

8.5.1 These correspond to the Williams' and Colomb's Five Questions of Argument:

- What are you claiming?
- What reasons do you have for believing your claim?
- What evidence do you base those reasons on?
- What principle connects or makes your reasons relevant to your claims?
- What about such-and-such potential disagreement/difficulty?

8.6 Constructing Claims

We learn that, at bottom, an argument is just a claim and its support:

REASON therefore CLAIM

or

CLAIM because of REASON.

Your claim is your main point. It should either be clearly conceptual (seeking to change how we think) or clearly pragmatic (seeking to change how we act). Claims should, by definition, require good reasons. Audiences should be able to disagree with your claim and, by extension, to be convinced and converted by your evidence.

8.6.1 More About Claims

- Make sure your readers can recognize why your claim is significant
- Ensure that your claim is clear and concise. Readers should be able to tell what is at stake and what principles you intend to use to argue your point
- Confirm that the claim accurately describes the main tenets of the argument to follow
- Moderate your claim with appropriate qualifiers like “many,” “most,” “often,” in place of “all,” “always,” etc.

8.6.2 Evaluating Good Claims

- Your solution is possible.
- Your solution is ethical (moral, legal, fair, etc.)
- Your solution is prudent— it takes into consideration both the problem you seek to resolve and the possible ramifications of your proposal.

8.6.3 Reasons and Evidence

Most arguers know from experience that reasons and evidence help to convince audiences. In the simplest terms, reasons answer the question: “Why are you making that claim?” Evidence offers tangible support for reasons. When stating reasons, always be aware of your audience. You will need to choose the reasons that support your evidence that are **also** the most likely to convince your specific readers or listeners. Knowing the general values and priorities of your readers will help you to determine what **they** will count as compelling reasons. Knowing **what kind** of arguments and evidence they will expect from you will guide you in choosing reasons that meet those expectations. Tailor your appeal to the specific needs and acknowledged concerns

of your reading community, because arguments are always audience specific. Evidence should be reliable and based upon authoritative and trustworthy research and sources. It should be appropriately cited, and ample enough to convince. Evidence should also be designed to appeal to your target audience's values and priorities.

8.6.4 When arguing through evidence

- Present evidence from general to specific
- Build on what readers know
- Don't rehearse your own work process; instead, support your conclusions
- Use diagrams, graphs, and other visuals
- Keep support appropriate and simple
- Make sure data is authoritative/expert
- Help the audience to know what is important

8.7 Warrants

The words “reason” and “evidence” are much more familiar to most students of written and oral argument than the term “warrant.” But reasons and evidence are most powerful when they are utilized within the structure of argument we have been discussing. To be convincing, the reasons and evidence you present in support of your claim need to be connected through warrants. Warrants express a general belief or principle in a way that influences or explains our judgments in specific cases.

Take, for example, the old saying:

“Measure twice, cut once.”

Expressing as it does a general belief or principle—that when you take the time to do a thing properly, you don't make mistakes—the saying provides a viable warrant for an argument like:

*“It is never a good idea to hurry a task. [Reason] **[Connected by the beliefs and assumptions expressed by the warrant to the supporting evidence that]** Careless mistakes take longer to fix than it would to do things right the first time.” [Evidence]*

Warrants express justifying principles, shared beliefs, or general assumptions. They are the spoken or unspoken logic that connects your reasons to your evidence. Warrants take many forms, but Williams and Colomb emphasize that they always have or imply two parts:

- one articulating a general belief or circumstance
- one stating a conclusion we can infer from applying that circumstance to a specific situation.

Warrants often take the form: Whenever X, then Y. For example, take the commonly held belief expressed by the old saying “When it rains, it pours.” The same sentiment and set of assumptions could be described by the general truism “If one thing goes wrong, everything goes wrong.” Whether implied or explicit, and whether it takes the form of a general observation or a cultural belief, a warrant states a broader principle that can be applied in a particular case to justify the thinking behind an argument.

8.7.1 More on Clear Warrants

Warrants connect your Reasons to your Claim in logical ways. Whether a warrant is assumed or implied, it is still crucial that the audience be able to recognize your warrant and be able to determine that they agree with or accept your warrant.

8.7.2 Questions for Determining Good Warrants

- Do readers know the warrant already?
- Will all readers think it is true?
- Will they see its connection to this circumstance or situation?
- If they think it is both valid and appropriate, will they think it applies to their family, corporation, or community?

8.7.3 Warranting: A Specific Case

Consider a case when an audience might not accept your argument unless it first accepts your warrant. Take, for example, the following discussion between a mother and her child.

Child (To mother): "I need new shoes."

Mother: "But why, what are your reasons?"

Child: "Because all the other kids have them" X

Child: "Because red is "in" this season and my shoes are blue." X

Mother: "Sorry, but I don't accept your argument that you need new shoes."

Above all, warrants require common ground. In the example above, the success of the child's argument depends upon his mother's sharing the values and assumptions upon which the argument for new shoes is based.

Productive argument will require that the child find, and address, some common belief or assumption about what constitutes "need." While his mother might not be influenced by peer pressure or style trends, she probably does share a set of values that would ultimately lead to agreement (Common Ground).

Consider a situation in which the child's previous reasons had not convinced his mother to accept his argument, and we can see how compelling reasons and evidence can be developed alongside shared warrants.

Child: "I need new shoes because these ones have holes in them and it's the rainy season." ✓

Mother: "Well why didn't you say so?! I agree that you shouldn't be walking around with wet feet!"

We are most likely to accept an argument when we share a warrant. In this case, it is unstated, but implied:

Warrant= When shoes no longer protect the feet from stones and weather, it is time to buy new ones.

There is another way to look at warrants that don't necessarily fit a certain mold. If you believe in a general principle stated about general circumstances (for example, "People who fall asleep at work probably aren't getting enough sleep at home."), then you are likely to link a specific instance (of nodding off at your computer) with a specific conclusion (that you haven't gotten adequate rest). Warrants here can be defined as general truths that lead us to accepted conclusions.

8.8 Acknowledgement and Response

Acknowledgement and Response can be included in your argument in order to

- produce trust
- mediate or moderate objections
- limit the scope of your claim
- demonstrate experience or immersion in a wider field or discipline

Brainstorm useful concessions to potential dissenters by thinking about the difficulties or questions your argument is likely to produce. Within your argument, acknowledgements and responses often begin with: “To be sure,” “admittedly,” “some have claimed,” etc. Concessions allow the writer to predict problems that might weaken an argument and respond with rebuttals and reassessments. Acknowledgement and response frequently employs terms like “but,” “however,” “on the other hand,” etc.

8.9 Using the Five Parts of Argument

After you have sketched out your full argument, and even after you have drafted the entire piece of writing, you should revisit your claim. Ask yourself: Does the claim still introduce and frame the discussion that follows? Are there elements of the claim that need to be revised? Built upon? Eliminated? Explained?

Think:

- Is your claim clear and concise?
- Is it contestable?
- Is there good evidence for your solution?
- Will your audience agree?

8.9.1 Evaluate and Revise Reasons

Consider the specific needs and perspectives of your audience and select reasons that will connect to their priorities and motivations. Make sure that you provide ample reasons for each claim or subclaim you assert. Order your reasons in a way that is logical and compelling: Depending on your argument, you may want to lead with your best reason or save your strongest reason for last. Finally, ask yourself whether any essential evidence is missing from your discussion of the problem.

Think:

- Do your reasons make a strong case for the validity of your claim?
- Can you imagine other reasons that would appeal more strongly to your audience?

8.9.2 Assess and Improve Evidence

If there are authorities to appeal to, experts who agree, or compelling facts that support your argument, make sure you have included them in full. Whether you are speaking from experience, research, or reading, make sure to situate yourself firmly in your field. Create confidence in your authority and establish the trustworthiness of your account.

- Have you consulted reputable sources?
- Have you conducted your research and formatted your findings according to accepted standards?

Think:

- What does your audience need to know to appreciate the solution you propose?
- What makes it easy or difficult to accept?
- What further support might you offer?

8.9.3 Scrutinize Your Warrants

If you can't articulate the connection between what you claim and why you believe the audience should accept your assertion, your readers probably can't either! Good warrants often take the form of assumptions shared by individuals, communities or organizations. They stem from a shared culture, experience, or perspective. If understanding your claim means sharing a particular set of beliefs or establishing common ground with your reader, make sure your argument takes time to do so.

Think:

- Can your audience easily connect your claim to your reasons?
- Are your warrants shared? Explicit? Implied?
- What unspoken agreements do your conclusions depend upon?

8.9.4 Concede and Explain

Gracefully acknowledge potential objections when it can produce trust and reinforce the fairness and authority of your perspective. Try to anticipate the difficulties that different types of readers might have with your evidence or reasoning

Think:

- Where are my readers most likely to object or feel unsettled?
- How can I concede potential problems while still advancing the authority of my claim?

8.10 Assessing and Revising Your Argument

By way of conclusion, we can revisit the issue of method. LRS encourages thinking about the parts of argument in order to produce logic that is

- easy to understand, and
- easy to acknowledge or accept.

Argument structures comprehension by giving readers a framework within which to understand a given discussion. Argument supplies criteria for judgment, and connects reasons with claims through implicit or explicit warrants. Sometimes, crafting a good argument is as simple as asking yourself three basic questions:

- What do you want to say?
- Why should readers care?
- Why should readers agree?

When you set about answering these questions using the five parts of argument, you will hone introductions and thesis statements to make clear and precise claims, make relevant costs and benefits explicit, and connect reasons and evidence through shared and compelling warrants.

Examples taken or adapted from:

- Williams, J. (2005). **Style: Ten Lessons in Clarity and Grace.** (8th ed.). New York: Pearson.
- Williams, J., Colomb, G. (2003). **The Craft of Argument.** (Concise ed.). New York: Addison Wesley Longman, Inc.

Chapter 9

Manual for Writing Mentors¹

9.1 INTRODUCTION

The Cain Project in Engineering and Professional Communication designed this manual for undergraduate students who plan to become communication mentors. The manual prepares mentors for the experience of consulting with student writers—reading, evaluating, and offering helpful feedback in conference with individual students. In some courses and/or assignments, writing mentors also grade papers, so the manual also includes tips and guidelines for assigning grades to student work.

The goal of the mentoring process, both for mentors and their student clients, is to develop a voice in the field. Because science and engineering fields are highly collaborative, fast-changing, and competitive, individual members of these disciplines must be able to communicate effectively with one another in teams; give feedback; and analyze, summarize, and respond to published studies. As new members of a community, student writers need to feel that they are involved in a conversation with engaged members of their field. Even a summary can manifest a dialog between the student writer and authors or presenters whose work is summarized. By relaying the ideas and findings of others, student writers construct a position for themselves alongside these others in the field. As readers, mentors relate to the published authors through the voice of the writer who summarizes. Mentors judge the value of a summary in terms of accuracy and a well-constructed explanation of the source, as expressed in the summarizer's own words.

Writing mentors are typically advanced students who are actively involved in analyzing published work and working on their own research or design projects. Through the mentoring process, they develop an ability to respond to student writing, hone their own writing skills, and act as guides and examples for younger students. In a large course whose rigorous content can sometimes intimidate, these younger students may end up feeling like faceless wheel-cogs in the information-churning academic machine. Mentoring brings human interaction back to the forefront of intellectual activity in science and engineering.

9.1.1 What Is a Mentor?

A mentor cares about the person who learns, and that means the mentor commends before criticizing, tries to understand the student's purposes, and directs comments toward helping the student succeed. Realizing that praise changes habits much more than nagging or condemning, a mentor may point out a place where a student made a decision correctly and then suggest that the student look for a couple of places where the decision went wrong and try to figure out why.

A mentor models the attitudes he or she wants others to imitate. It's all right to tell a student that you were disappointed in the work and that you hope he or she will do a better job next time. It's not all right to demean the student. However, you don't want to give a student the idea that a weak draft will earn a high grade; you can't take responsibility for the student's work, which must remain his or her own. So you want

¹This content is available online at <<http://cnx.org/content/m15909/1.1/>>.

to be honest. Furthermore, when you grade the student's work, you must be free to award points without favoritism. Students should expect warm human beings with high standards in the scientific and engineering communities.

9.1.2 Dialogic mentoring through grading

A mentor develops relationships through dialogs with student writers. Sometimes the dialog takes place through comments on papers or grading sheets, but these comments have to be fashioned with the main goal in mind: a helpful human connection. Here are points to remember:

- **Make your first comment a "person to person comment."** Put it at the top of the grading sheet. If you don't connect, the student will probably not look at the circled errors or other comments. You're making a bid for a conversation. If you start comments out with a bland, "Nice job!" readers don't have any reason to think you read the paper carefully or that you have anything worth listening to. When you're grading, you're in charge. When students get their papers back (if they pick them up), they're in charge. You need to acknowledge their power by addressing their initiative: "You used this essay to investigate a new explanation for the Cambrian explosion. Being able to recognize the critical features of a new theory like this one will help you keep up with this rapidly changing field."
- **Be selective in what you comment on. Students turn off overwhelming criticism** or feedback. Do not "nitpick" or emphasize grammar, punctuation, and style. If you would like to comment on these things, pick one or two errors to highlight which, when addressed, would most dramatically improve the student's writing.
- **Make a difference with your help.** Link your written advice to those aspects that would change the paper's quality. Don't correct a comma when the value of the whole sentence is in doubt. Work on the organization, the clarity of the thesis, and the forecasting sentence in each paragraph before making notes about other aspects.
- **Use your time for comments that describe rather than label.** Many English teachers maintain their power through negative labels: "awkward," "trite," or "vague." You wouldn't say that to the student directly in a conversation, and it won't help the student write better, so rephrase to describe what you're seeing: "The sentence has three major claims in it, but I can't tell how you want me to see their relationship." "If only I had a specific example from the article, I would be able to understand your reasoning better." "This phrase is so general that it doesn't make your point precisely."

9.2 MENTORING

9.2.1 Helping students read scientific articles well

In many courses, students must write a summary or critique of a published research article. Younger students often struggle to read journal articles and will seek your help as a more experienced reader and writer.

Before they read the article, tell them to make a short list of questions, issues, or concerns that caused them to seek the article in the first place. Those questions will function like "mental hooks" to snag connections as they read.

While they're reading the article, suggest that they

- Make notes (see page 8 for a note-taking template)
- Highlight key passages
- Draw lines between the highlighted parts and write a phrase that shows in their own words how these passages are connected

- Look for evidence that a concept explained in class was applied to a new population or situation
- Look for evidence that contradicts something that was said in class
- Figure out relationships among key concepts

As they plan their papers, tell them to

- Organize the paper to show the answers to their own questions
- Explain whether the key terms in the article seemed to be defined in the way they heard them in class (they should be applying knowledge as they write)
- Have fun while they write—enjoy being part of the community that evaluates scientific or engineering issues

When you consult, develop students' reading skills as follows:

- Start by discussing low-level information vs. high-level hierarchies and subordination of ideas. What's the main point of the article? How is it organized? What questions must be answered to accomplish the authors' purposes? What questions are answered first, second, and so on?
- Ask students whether the article has the qualities they want in their own papers: An excellent article **will**:
 - Set up a context that shows why the issue to be studied matters in the field
 - State its focus clearly early on
 - Explain the work of previous investigators
 - Describe its methods and theoretical assumptions clearly
 - Present results convincingly, discussing their relevance and linking them to the theories and assumptions presented earlier
 - Draw reasonable, sometimes limited conclusions
 - Look forward to the next steps and future research remaining

9.2.2 Strategies to help students reading scientific articles

Reading a scientific article is a complex task. The worst way to approach this task is to treat it like the reading of a textbook—reading from title to literature cited, digesting every word along the way without any gross assessment of the document, without reflection, without a critical eye. Rather, the reader should begin by skimming the article to identify its structure and features. Advise students to look for the author's main points as they read. They should generate questions before, during, and after reading, and draw inferences from the article based on their own experiences and knowledge. And to really improve understanding and recall, readers should take notes as they read. These strategies, discussed in more detail below, will help students read, comprehend, and summarize their chosen articles.

9.2.2.1 Strategy 1: Skim the article and identify its structure

Most journals use a conventional structure: an Abstract followed by Introduction, Methods, Results, and Discussion. Each of these sections normally contains easily recognized conventional features, and if you read with an anticipation of these features, you will read an article more quickly and comprehend more.

Features of Abstracts

Abstracts usually contain at least four kinds of information:

- purpose or rationale of study (why they did it)
- methodology (how they did it)

- results (what they found)
- conclusion (what it means)

Most scientists read the abstract first. Others—especially experts in the field—skip right from the title to the visuals (figures and tables) because the visuals, in many cases, tell the reader what kinds of experiments were done and what results were obtained. Students should probably begin reading a paper by reading the abstract carefully and noting the four kinds of information outlined above. They should next preview the visuals and then move to the rest of the paper.

Features of Introductions

Introductions serve two purposes: creating readers' interest in the subject and providing them with enough information to understand the article. Generally, introductions accomplish this by leading readers from broad information (what is known about the topic) to more specific information (what is not known) to a focal point (what question the authors asked or what claim they made). Thus, authors describe previous work that led to current understanding of the topic (the broad) and then situate their work (the specific) within the field.

Features of Methods

The Methods section tells the reader what experiments were done to answer the question stated in the Introduction. Methods are often difficult to read—they are loaded with technical language and a level of detail sufficient for another researcher to repeat the experiments. However, students can more fully understand the design of the experiments and evaluate their validity by reading the Methods section carefully.

Features of Results and Discussions

The Results section contains statements of what was found and reference to supporting data in figures and tables. Normally, authors do not include information that would need to be referenced, such as comparison to others' results. Instead, that material is placed in the Discussion—placing the work in context of the broader field. The Discussion also functions to provide a clear answer to the question posed in the Introduction and to explain how the results support that conclusion.

Atypical Structure

Some articles deviate from the conventional structure. For instance, Letters to Nature do not contain section headings. Often the abstract contains introductory information as well (for the purpose of catching the attention of a wide audience).

Therefore, when a student begins to read an article for the first time, he/she should skim the article to analyze the document as a whole. Are the sections labeled with headings that identify the structure? If not, he/she should note what the structure is, decide which sections contain the material that is most essential to understanding the article, and then decide how to approach the reading.

9.2.2.2 Strategy 2: Distinguish the article's main points

Because articles contain so much information, it may be difficult to distinguish the main points of an article from the subordinate points. Fortunately, there are many indicators of the author's main points:

Document level

- title
- abstract
- keywords
- visuals (especially figure and table titles)
- first sentence or the last 1-2 sentences of the Introduction

Paragraph level: words or phrases to look for

- surprising
- unexpected
- in contrast with previous work
- has seldom been addressed

- we hypothesize that
- we propose
- we introduce
- we develop
- the data suggest

9.2.2.3 Strategy 3: Generate questions and be aware of your understanding

Reading is an active task. Before and during reading, a student should reflect on these questions:

- Have I taken the time to understand all the terminology?
- Have I gone back to read an article or review that would help me understand this work better?
- Am I spending too much time reading the less important parts of this article?
- Is there someone I can talk to about confusing parts of this article?

After reading, the student should ask these questions:

- What specific problem does this research address? Why is it important?
- What methods were used? Were they good ones?
- What are the specific findings? Am I able to summarize them in one or two sentences?
- What evidence supports the findings?
- How are the findings unique/new/unusual or supportive of other work in the field?
- What are some of the specific applications of the ideas presented here? What are some further experiments that would answer remaining questions?

9.2.2.4 Strategy 4: Draw inferences

Not everything that readers learn from an article is stated explicitly. Students should rely on their prior knowledge and world experience, as well as the background provided in the article, to draw inferences from reading material. Research has shown that readers who actively draw inferences are better able to understand and recall information.

As an example, the box below contains an excerpt from the Introduction of an article in the journal **Biochemistry***. The comments in italics are questions and inferences that might be drawn by a student reader.

Example 9.1

Rett Syndrome is a childhood neurodevelopmental disorder and one of the most common causes of mental retardation in females **Comment: Hmmm...must be related to a gene on the X-chromosome**, with an incidence of 1 in 10000-15000. **Comment: How common is that? Not too likely to happen to me, but there must be several such children born in Houston every year.** Rett syndrome patients are characterized by a period of normal growth and development (6-18 months) followed by regression with loss of speech and purposeful hand use. **Comment: What happens? Something must be triggered or activated at late infancy.** Patients also develop seizures, autism, and ataxia. After initial regression, the condition stabilizes and patients survive into adulthood. Studies of familial cases provided evidence that Rett is caused by X-linked dominant mutations in a gene subject to X-chromosome inactivation. Recently, a number of mutations in the gene encoding the methyl-CpG binding transcriptional repressor MeCP2 have been associated with Rett Syndrome. **Comment: MeCP2 mutations probably cause Rett Syndrome. This must be an important master-regulator to affect so many processes in the brain. I wonder what they know about it...**

*excerpt from *Ballestar, E., Yusufzai, T.M., and Wolffe, A.P. (2000) Effects of Rett Syndrome Mutations of the Methyl-CpG Binding Domain of the Transcriptional Repressor MeCP2 on Selectivity for Association with Methylated DNA. Biochemistry 31, 7100-7106.* Comments in italics added.

9.2.2.5 Strategy 5: Take notes as you read

Effective readers take notes—it improves recall and comprehension. Advise students to put quotation marks around any exact wording they write down so that they can avoid accidental plagiarism when they write about the article. Read more about recognizing and avoiding plagiarism² here.

Example 9.2

Essential notes to take about an article:

Complete citation. Author(s), Date of publication, Title (book or article), Journal, Volume #, Issue #, pages:
 If web access: url; date accessed
 Key Words:
 General subject:
 Specific subject:
 Hypothesis:
 Methodology:
 Result(s):
 Summary of key points:
 Significance:

9.2.3 Helping students understand the goal of "readability" for their papers

Several researchers have tried to define "readability" as features of a text that enable readers to grasp the message or information quickly. However, the experience a reader has with the subject being discussed and his or her familiarity with the vocabulary and concepts affects how quickly and effectively the reader interprets a text. Indexes developed in the mid-twentieth century (such as the "fog index") focused on the number of words as well as the number of polysyllabic words per sentence. Today experts advise paying attention to the audience's level of expertise in choosing words and controlling sentence length. They also emphasize using sentences that put the agent (human, concrete, or abstract) into the subject and the action into the verb (with the object following) to make sentences easy to comprehend.

Consider the following example:

Original: In approaching the resin coated male dummies with larger claws and with raised claws (vs. claws in the resting position), a strong preference for the larger and raised claws was shown by female fiddler crabs in the study.

- **Structure:** prepositional phrase, action, object, agent

Revised: Female fiddler crabs that approached resin-coated male dummies in the study strongly preferred males with larger claws or raised claws over those with smaller or resting claws.

- **Structure:** agent, modifying clause, action, object

9.2.4 Helping students understand coherence: "The Given/New Contract"

Linguists contend that readers expect writers to begin with concepts both readers and writers understand (the "given") and then to add elaborating details or new information (the "new"). When writers break this contract by introducing new information that is not linked to shared understanding, the reader must hesitate, extrapolate or infer meanings, and risk misunderstanding.

²"Recognizing and Avoiding Plagiarism" <<http://cnx.org/content/m15883/latest/>>

Figure 1 was taken from a student paper in Introductory Biology at Rice University. In this paragraph, the writer discusses the primary finding of research on how the Hawaii amakihi bird persists in its habitat despite the introduction of infectious disease to the area. The arrows in the text demonstrate how "new" (later) information elaborates on already "given" (earlier) phrases.

The data gathered in this study showed a greater abundance of resident, breeding amakihi at lower elevations, where there is also a high prevalence of year-round, local transmission of avian malaria. This unique phenomenon suggests that evolutionary processes on hosts or parasites have facilitated the coexistence of avian malaria and Hawaii amakihi. If supported by future studies, this coexistence between a native host and foreign parasite will be one of the few hallmark examples of coevolutionary processes that occur within only a few hundred generations (since avian malaria is a relatively new introduction to Hawaii). In addition, the ramifications of this study also extend to conservation biology, as it provides convincing evidence for humans to start concentrating efforts to preserve lower elevation forests.

The diagram consists of several arrows pointing to specific underlined phrases in the text. One arrow points from the phrase 'greater abundance' to 'lower elevations'. Another arrow points from 'unique phenomenon' to 'greater abundance'. A third arrow points from 'this coexistence' to 'coexistence of avian malaria and Hawaii amakihi'. A fourth arrow points from 'few hallmark examples' to 'ramifications'. A fifth arrow points from 'lower elevation forests' to 'lower elevations'.

Figure 9.1

Help students look for the pattern of "given" and "new" concepts in the articles they read. These patterns will help them understand how the argument is organized. If the pattern is broken, it will help them figure out why they are having difficulty following the authors.

9.2.5 The Honor Code and consulting as mentor

Example 9.3

from 2002 Rice Student Handbook:

Re: Pre-grading assistance. Tutors or consultants may discuss homework, papers, projects or assignments on which the student is working, but they may not provide the answers to problems or suggest the exact wording to be used on a paper. They may coach a student who is mastering scientific concepts, developing a line of scientific reasoning, evaluating paper topics, brainstorming or formulating a thesis, but the tutor or consultant may not perform the specific intellectual task on which the student is to be graded. Tutors and consultants may use similar problems or examples to show students the process they are to go through. A labbie may weigh a different sample to demonstrate how to use a balance; labbies should not weigh students' samples for them.

Being a mentor is a little different from being a tutor. A tutor is someone who knows course material that a student does not know; it is assumed that a student who approaches a tutor "needs help"—that the student is unable in some way or finds difficult the task of learning the material in a course. A tutor teaches content that the professor has assigned for the session or that the tutor thinks would be helpful to students in that stage of the course. A mentor who is consulting, on the other hand, is an advisor and learning resource that a student can work with in the process of pursuing projects and assignments. Mentors share their student clients' enthusiasm and commitment to excellence in learning.

A consulting session is driven by the student's agenda or by the agenda that the student and his or her instructor have chosen for the session. The first part of every consulting session is a review of the student's goals and a mutual definition of the session's purpose. In other words, the mentor provides the assistance requested based on his or her training and experience; the student carries out his or her work. The mentor does not take over a student's project, write papers, choose the actual words used, proofread papers, or earn the grade: those are the student's responsibilities.

These differences have important consequences in the session. It is the mentor's job to help the student perform for himself or herself the primary intellectual tasks of the assignment and to improve the process of scholarship—to suggest ways to think about the tasks, to point out tools, and to teach the student techniques the student needs to know. The mentor may go over similar papers or projects, talk about the processes used, and prompt the student to identify elements of an example that may be a guide for the student's own choices. But in every case the mentor makes these choices in order to achieve the objectives of the consulting session and separates his or her work as someone consulted by the student from the work the student is supposed to perform.

Abiding by the Rice University Honor Code is essential. The Honor Code forbids "aid," which includes supplying the content of a paper, specific words, or corrections—roughly the parallel to handing the student the answer on a test. When you consult with a student, you are not providing him or her with a paper to hand in. Rather, the mentor helps the student learn what he or she must do to write well—how to discover ideas, formulate a thesis, support ideas with evidence, organize, revise, and edit. The mentor might identify a problem in the student's grammar and then advise him to look for other examples of that error so that he can correct multiple errors himself. Remember, a consultant must determine whether the assignment is one in which the student is allowed to consult a writing mentor before beginning the session.

9.2.6 How to conduct a consultation

9.2.6.1 Establishing rapport

Be friendly and professional. Chat a moment. Gauge the client's feelings and attitudes. Why is he or she here? Is he or she in a hurry? Ready to take a break and talk things out? Set an appropriate tone.

9.2.6.2 Hearing the student's understanding of the assignment

People only solve the problems they identify; they only do assignments as they understand them. Even though you KNOW what the assignment is, you will not be able to help unless you also know what the

student thinks he or she is supposed to do. Those are not always the same. You can clarify misconceptions and get better results just by ensuring that the assignment is understood. However, you're not supposed to let a student bring work for you to do. Don't indulge a student who says, "What am I supposed to do?" To that you reply, "Well, where's your copy of the assignment? What do YOU think you're supposed to do?"

9.2.6.3 Asking the student client what his or her goals are

One glance at a page with no paragraph breaks may cause you to think that organization is the primary goal for the session, but you need to find out what the student hopes to gain from the session. Don't be too quick to jump into an analysis of the paper. **ASK WHAT THE STUDENT IS CONCERNED ABOUT.**

9.2.6.4 Establishing a plan for the session

If you're working on a 30-minute session, allocate time to the issues the student has identified. Perhaps 3 minutes to skim the paper, then 10 minutes on the student's first concern, 5 minutes on the second one, and then, you can inquire whether it would be all right to deal with some format or organization issues or whatever else you think should get attention. However, the student's own issues come first.

9.2.6.5 Working through the plan

Always try to get a picture of the student's view of the issue. Suppose the issue is how well the method has been explained. Ask what the student considers the main tests for a well-explained method. Then ask where the draft accomplishes those objectives (states the main steps, descriptive or measurement techniques, and interpretive techniques, for example, and shows how these are related to the purpose or aims of the study). Then you can comment on either the tests/criteria or the way the draft fulfills these.

Keep on schedule. Monitor your time according to your plan for the session.

9.2.6.6 Eliciting the student's summary of what he or she will do next

The student may not work on the paper again soon. Ask the student to sum up what he or she will do next toward completing the paper. Suggest that he or she jot these ideas down and then tell you what they are. Augment or reinforce these plans before the student leaves.

9.2.6.7 Concluding the session

Describe the best thing you think has happened or that the student has done in the session. Close with an encouraging word.

9.2.7 Interpersonal skills (The "COACH" approach)

Although some professional sports coaches are notorious for their callous and rude behavior, a writing mentor is a different kind of coach—someone who takes the following actions:

- **Commends**
- **Observes**
- **Asks questions**
- **Constructively criticizes**
- **Helps**

Remembering this acronym can make you a better mentor. It also will make you a better team member or leader in a research project.

Mentoring requires good interpersonal skills. As a mentor, you need to be sensitive to more than how much your client knows about the topic. Students often confide in consultants and mentors about stress, fears, and problems that are beyond the mentor's power of action. If someone has a serious problem, suggest

talking to a college master or an advisor, or going to the University Counseling Center. The people at the Counseling Center are experts: what they do every day is evaluate people's situations and find help for them.

Students sometimes try to avoid acting in their best interests by playing a game psychologist Eric Berne refers to as "Why don't you? Yes BUT..." They tell you their problem. They remain in charge of the game by saying "Yes, but..." whenever you make a suggestion. So long as they come up with reasons why your suggestion won't work, they remain in charge of the game. To end the game and shift your position, you reply to the student: "That's really bad. What do you plan to do about it?" This reply puts YOU in charge, and then you can evaluate how well the student's suggestion is going to work OR suggest that the student discuss his or her plan with a counselor at the Counseling Center. Here is the reference you need:

9.2.7.1 Rice Counseling Center Office

303 A Lovett Hall

8:30 am - 12:00 pm and 1:00 pm - 5:00 pm

Monday through Friday

Phone (713) 348-4867 (24 hours)

Fax (713) 348-5953

<http://rcc.rice.edu/>³

9.3 WRITING

In Introductory Biology at Rice University, students write short summaries/ critiques of published research articles. Below are some well-established techniques for writing this kind of assignment. Mentors may find this information useful in consulting as well as in their own academic life.

9.3.1 Summarizing a scientific article

Some writing texts advise you to include "the author's main points" in a summary. That may work well for other kinds of materials, but not so well for a scientific article. If you are writing a summary to show a professor that you read and understood a research article, you will need to answer the Twelve Essential Questions for Summarizing an Article.

Twelve Essential Questions for Summarizing an Article:

1. What was the topic of the article?
2. How was the problem/question/issue defined?
3. What was the purpose of the research? What question, problem, or issue did the article address in relation to the topic?
4. Were any assumptions unusual or questionable?
5. Why is the question, problem, or issue important?
6. What work has been done or what situation exists that motivated the research?
7. What experimental design was used?
8. What methods were used?
9. What were the results?
10. How were the results interpreted?
11. What did the researcher conclude?
12. Why were YOU reading this paper? Why is the article valuable or noteworthy?

In most cases, some of these questions will be much more important than others. Every published article contributes to the scientific field in some unique way, and in summarizing you want to make that aspect of the article especially obvious.

Some of the possible reasons that an article is special:

³<http://rcc.rice.edu/>

- Answers a previously unanswered question
- Introduces a new method or technique
- Contradicts an old set of conclusions
- Connects earlier research in a new way
- Tests a method or conclusion on a new type of data or specimen
- Tests an earlier conclusion by a new method or with a larger sample
- Proves an old assumption faulty.

Which of these possibilities (or others we left out) is the main reason the article you read is worthwhile? Your summary should make clear what aspect of a work makes it valuable. If the method, for example, is less complicated or more efficient than earlier methods, you should give enough detail about the method and its simplicity or efficiency to help the reader understand that aspect of the article. In that respect, the summary of a scientific article may not be a mere miniature of the larger article, but the answers to the principal questions above.

How much you say in answer to any one question will probably be determined by your purpose and the reason that article is valuable.

Steps for writing a summary:

- Writing a summary begins with annotating the original article. After you've skimmed the article quickly to get the main idea of the paper, read to find the answers to the Twelve Essential Questions for Summarizing an Article. Highlight the answers in the text or make notes in the margin of the text.
- Without directly quoting the article, write a sentence that tells why the article is valuable or noteworthy. Then write answers to the key questions without worrying at all about the kind of sentences you write. Just get the answers down.
- Go back and wordsmith the answers (rewrite them with a more polished, precise style). Divide the summary into paragraphs that have one topic and point per paragraph. Whenever you change topics or say something substantially new or different about a current topic, create a new paragraph.
- Polish the sentences to eliminate unnecessary words. At the same time, put in extra transitional words. Summaries, because of their brevity, have to have more "pointers" such as "first," "second," "in contrast," and "however" to connect the content.

9.3.2 Sample of Using the 12 Essential Questions to Generate a Summary

Jagdt, Bjorn, Warncke, K. Auer, H., and Rudiger, H. *Sleep deprivation does not induce sister chromatid exchange in humans*. *Mutation Research* 361 (1996): 11-15.

What was the topic of the article?	Validity of sister chromatid exchange (SCE) for measuring genotoxic exposures.
<i>continued on next page</i>	

What was the purpose of the research? What question, problem, or issue did the article address in relation to the topic?	The research was conducted to determine whether results of a preliminary study by Bamezai and Kumar could be verified. In the preliminary study, dramatic increases of SCE were reported after sleep deprivation,
How was the problem/question/issue defined?	Whether there were significant deviations between the SCE rates of workers who were sleep deprived and normal sleep.
Were any assumptions unusual or questionable?	Previous genotoxic exposures would not have elevated the mean baseline of persons in the studies.
Why is the question, problem, or issue important?	Widely used procedures might give faulty results and misjudge genotoxic exposures in the workplace.
What work has been done or what situation exists that motivated the research?	Unusual results after sleep deprivation suggested that SCE levels might be confounded when occupational medicine studies involved night shift workers.
What experimental design was used?	Comparison of 20 persons' SCE levels during control and experimental periods under different sleep behaviors.
What methods were used?	Individual baseline of SCE was estimated by the mean of the SCE per metaphase of two subsequent days (control period) and compared to that of a test period two weeks later, plus questionnaires about sleep and dietary habits.
What were the results?	The rates were slightly different, but the differences were not statistically significant.
How were the results interpreted?	The study did not verify the results of the earlier study. Differences in conditions of cell cultures might explain the outcomes.
What did the researcher conclude?	The effect of sleep deprivation on SCE, if there is one, would be in the range of normal day-to-day variance, and does not have to be taken into account when SCE is used for genotoxic monitoring at workplaces.
<i>continued on next page</i>	

Why were YOU reading this paper? Reason article is valuable/noteworthy	The article by Bjorn and others confirms that using sister chromatid exchange to measure genotoxic exposures in the workplace produces reliable results for men and women who work night shifts as well as for ordinary daytime workers.
--	--

Table 9.1

9.3.3 Sample 250-Word Summary

"Sleep deprivation does not induce sister chromatid exchange in humans," a 1996 article in *Mutation Research* by Bjorn and others, confirms that using sister chromatid exchange (SCE) to measure genotoxic exposures in the workplace produces results within the range of normal daily variation for men and women who work night shifts as well as for ordinary daytime workers. A preliminary study by Bamezai and Kumar in 1992 reported dramatic increases of SCE after sleep deprivation. If confirmed, these results would have raised questions about whether SCE levels might be confounded when occupational medicine studies involved night shift workers.

Bjorn and his colleagues compared the SCE levels of 20 persons (10 men, 10 women). Individual baselines of SCE were estimated by the mean of the SCE per metaphase of two subsequent days (control period) and compared to that of a test period two weeks later after 24 hours without sleep. Daily questionnaires about sleep and dietary habits were used to eliminate possible influence of other factors. The rates differed slightly, but the differences were not statistically significant. Differences in conditions of cell cultures might explain differences in the two studies. Previous genotoxic exposures were assumed not to have elevated the mean baseline of individuals. Bjorn and colleagues concluded that the effect of sleep deprivation on SCE, if there is one, would be in the range of normal day-to-day variance, and does not have to be taken into account when SCE is used for genotoxic monitoring at workplaces.

9.3.4 Standards for Citations and References

Each assignment may have its own requirements for citations and bibliography. This section details the requirements for Introductory Biology at Rice University, which reflect the conventions of many bioscience journals.

References to works by three or more authors in the text should be abbreviated (*Able et al 1986*). When different groups of authors with the same first author and date occur, they should be cited thus (*Able, Baker & Charles 1986; Able, David & Edwards 1986*).

The references in the bibliography should be in alphabetical order with the journal name unabbreviated. The format for papers, entire books and chapters in books is as follows:

- Boutin, C. & Harper, J. L (1991) A comparative study of the population dynamics of five species of *Veronica* in natural habitats. *Journal of Ecology*, 79, 199-221.
- Clarke, N.A. (1983) *The ecology of dunlin (Calidris alpina 1.) wintering on the Severn estuary*. PhD thesis. University of Edinburgh.
- Pimm, S.L. (1982) *Food Webs*. Chapman and Hall, London.
- Sibly, R.M. (1981) Strategies of digestion and defecation. *Physiological Ecology* (eds C. R. Townsend & P. Calow), pp 109-139. Blackwell Scientific Publications, Oxford.

9.4 GRADING

When you give written feedback on student work, be sure to say something that specifically addresses **that student paper**. Avoid trite stock phrases ("interesting topic!", "nice writing," etc.) or automatic responses that offer little insight regarding improving writing ("look at second source"). To address problematic writing specifically, write notes in the margin. Margin notes are effective for engaging specifics of a paper, and show the student that his or her paper is actually being read by a human.

Read and analyze the instructor's assignment carefully before you begin grading. Make sure the student has chosen an article from the allowed list of journals, met the format requirements, etc. If you have an assessment sheet, make sure you understand the criteria and how points are to be awarded. Bring any questions or concerns to the course instructor. Quality written feedback that supports the numerical grading will strengthen the relationship between student and writing mentor.

Chapter 10

Graduate Seminar Mentoring¹

10.1 What are Seminar Mentors?

Seminar Mentors are postdocs and upper-level graduate students from the Department of Biochemistry & Cell Biology who have been selected by faculty to advise BIOS 581/2 speakers. Mentors help speakers prepare effective seminars by meeting with them a few days before their seminars and reviewing their slide presentations. Mentors then attend the seminars and provide feedback to the speakers afterward. Mentors comment on the speaker's slides, delivery, and handling of questions, thereby helping students understand how to improve their seminars in the future.

Whenever possible, a speaker is paired with a Mentor who is a semi-expert in the speaker's area of research. With this kind of pairing, mentors can provide the best possible feedback on scientific explanations while also being attentive to the needs of the diverse BIOS 581/2 audience.

10.2 Will I work with a Mentor?

Mentors focus their attention on students with less experience giving presentations, although students with more experience may have the choice of working with a mentor. Requirements for students are outlined below.

10.2.1 Requirements for students in 2nd or 3rd year of study

You are required to meet twice with a Mentor (once before and once after your seminar). A Mentor assigned to you will contact you by email approximately two weeks before your scheduled presentation. Four to seven days before your seminar, you will meet with your Mentor, show your slides, and “talk through” your presentation (this is not a formal rehearsal with projected slides; you may sit at a computer together). If you have little experience with presentations, you should schedule this meeting well in advance of the seminar—you may wish to revise and meet again with your Mentor before your scheduled seminar date.

Your mentor will attend your seminar and meet with you the following week to discuss your presentation.

10.2.2 Requirements for students in 4th year of study

You are required to meet with your Mentor just once, before your seminar, to talk through your slides. Your Mentor will attend your seminar and email you feedback afterward.

¹This content is available online at <<http://cnx.org/content/m16591/1.1/>>.

10.2.3 Requirements for students in 5th year of study

You are encouraged but not required to meet with a Mentor. Consult the BIOS 581 website at <http://www.bioc.rice.edu/bios581>² for the names and contact information of this year's Mentors. Please contact the Mentor you wish to work with at least one week in advance of your desired meeting date.

Students in 6th year of study or higher will not work with a Seminar Mentor.

10.3 How else can I improve my seminar?

You are highly encouraged to give a copy of your presentation to your advisor a week before your seminar. Your advisor can provide feedback on key details of your slides.

²<http://www.bioc.rice.edu/bios581>

Bibliography

- [1] Yusufzai T.M. Ballestar, E. and A.P. Wolffe. Effects of rett syndrome mutations of the methyl-cpg binding domain of the transcriptional repressor mecp2 on selectivity for association with methylated dna. *Biochemistry*, 31:7100–7106, 2000.
- [2] R. Burnett. *Technical Communication. 5th*. Harcourt College Publishers., San Antonio, 2001.
- [3] M Zeiger. *Essentials of Writing Biomedical Research Papers. 2nd*. McGraw-Hill., St. Louis, 2001.

Index of Keywords and Terms

Keywords are listed by the section with that keyword (page numbers are in parentheses). Keywords do not necessarily appear in the text of the page. They are merely associated with that section. *Ex.* apples, § 1.1 (1) **Terms** are referenced by the page they appear on. *Ex.* apples, 1

- B** Business Report, § 7(19) mentoring undergraduates, § 1(1)
- C** Communication, § 3(7), § 8(25), § 9(33), § 10(49) **P** Presentation, § 10(49) presenting scholarly work, § 1(1)
- D** Dissertation, § 3(7), § 4(11) dissertation writing, § 1(1) **R** reading a scholarly article, § 1(1) reading a scientific article, § 1(1)
- E** editing, § 1(1) Engineering Communication, § 2(3), § 5(13), § 8(25) **S** Seminar, § 10(49) Examples taken or adapted from:, 31
- G** graduate school, § 1(1) graduate student, § 1(1) **T** Technical Report, § 6(17), § 7(19) technical style, § 1(1), § 5(13) Thesis, § 3(7), § 4(11) thesis writing, § 1(1)
- M** Management Report, § 7(19) **W** Writing, § 3(7), § 4(11), § 6(17), § 7(19), § 8(25), § 9(33)

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