Building a Better Scientific Writer: Strategies for Biology Instructors

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Presentation Overview

- Why focus on writing?
- How do students learn to write?
- What questions do I need to ask about my assignments?
- What resources can help me learn more?
Why focus on writing?

Students often scrutinize a course's assignments as soon as they see the syllabus

Writing skills are key outcomes for degree programs

Writing is a key method for learning about any subject


Writing & the economy

The capacity to write well is among the most universal of skill sets required in the modern workforce. At the same time, preparing students for writing across the multitude of contexts and modalities they will face in the 21st century economy is extremely challenging. It is a challenge worth investing in: Numerous studies over the past decade have demonstrated that raising national literacy rates have a profound effect on the productivity of the Canadian workforce, the quality of life of individual Canadians, and the size of the Canadian economy (Bloom, Burrows, Lafleur & Squires, 1997; TD Bank, 2007; Fisher & Engelman, 2009). TD Bank (2007) found, for example, that a “1% increase in literacy boosts productivity 2.5% and output 1.5%” (p. 14) leading to a $32 billion increase in income for each 1% increase in national literacy rates. Writing ability is an important part of that picture, defined by the National Commission on Writing (2004) as a threshold skill that factors into hiring and promotion decisions at 52% of the companies they surveyed.
Stages of student development

- Non-academic writing from high school
- Generalized academic writing
- Novice approximations of disciplinary ways of knowledge making
- Expert, insider prose

Building a better writer

Writing process knowledge

- What processes are involved in writing?
- Do I benefit from drafting a lot?
- Do I work well with others?
- Do I pay attention to my writing processes (metacognitive awareness)?
- Is writing recursive for me?
Subject matter knowledge

- Do I know enough about the subject to get started?
- Should I combine my efforts with others?
- Should I learn more about this area?

Subject matter knowledge
Do I have a sophisticated understanding of how to achieve my purpose in writing?

Can I write for different audiences in the same text?

Rhetorical knowledge
Genre knowledge

- Is this the right genre for the purpose?
- Have I studied the target text?
- What are the limitations and possibilities in this text?
Recursive, iterative, social

What to do?

1. Identify a project
2. Research, read, write notes
3. Draft, revise, refine
4. Share: Talk about your work
5. Reflect/enjoy, retool/enhance, resume/engage
Your teaching is like an iceberg

• most of it is under the surface
• syllabus is the 1/10 that is visible
• it appears frozen but is constantly changing and moving, responding to currents
• finished written work by students shows only a fraction of the learning they engaged in

http://upload.wikimedia.org/wikipedia/commons/a/ac/Iceberg.jpg
Question 1

• What writing or text-based presentations do you ask your students to do in your class(es)?

• If you do not ask them to write or present, could you?
Question 2

- Do you assign the same or similar assignments as other instructors?
Sample biology genres

- Paper critique
- Blog assignment
- Science forum discussion
- Scientific proposal
- Monograph review
- Literature review
- Article summary
- Discussion
- Essay proposal
- Project presentation
- Lab report
- Field notebook
- Journal
- Poster
Kinds of informal writing assignments

- The reading journal
- Solving real problems
- Generic and focused summaries
- Pre-test warm-ups
- Annotations
- Using Cases
- Response papers
- Letters
- Synthesis papers
- What counts as a fact?
- The discussion starter
- Believing and doubting game
- Focusing a discussion
- Analysis of events
- The learning log
- Project notebooks
- Analyzing the process
- The writing journal
- Problem statement
- One-minute paper
- Role playing
- Frame paragraphs
Question 3

• Do students really connect with those assignments?

Asked another way, do students respond to them “authentically” or are they jumping through hoops here?
Question 4

• Are you genuinely (don’t lie to yourself!) interested in reading what they wrote?

Even a bit?
Question 5

• Who do you ask students to write for?

• Who actually reads what they write: you, other students, some slice of the public?
Question 6

- Do students write or present in groups?

Could they?
Exercise 1: Asking good questions

In a file, write a question about some aspect or area of a course you are teaching now or next year.

If possible, focus on an area about which there is disagreement or where there are alternative positions held by people in the field.

If you feel comfortable, post your question to the chat window.
The term paper

• Traditional—“fossilized”
• Pale reflection of the research process in academic fields
• In some contexts, now a pastiche of itself
• Revived in part now through undergraduate involvement in research
Exercise 2: Considering alternative

Create an alternative assignment (alternative to the research paper) that you could assign to students.

Describe it in a sentence or two, and if you feel comfortable post it to the chat window.
Alternatives?

• Moving from a traditional forensic debate

• To

• Hospital rounds + Cash Cab bonus questions
New models of writing

• Model new assignments on research methods that are new or becoming more dominant in your field:
  • Participant action research
  • Predictive statistical modeling
  • Teacher research
  • Evidenced-based practice
  • Multi-disciplinary science (biochemistry)
  • Bioethics, bioethnography
Exercise 3: New models of writing

• Create an assignment for one of your topics modeled on an interdisciplinary approach to research.
Pulling it together

Consider

• Extending the range of genres in the assignments you give to students
• Scaffolding assignments so that the term begins with shorter, less complex assignments and ends with larger, extended work
• Identifying an audience for one piece of writing that is not the instructor
• Assigning students to work in groups on problem-based assignments
Writing Across the Curriculum: A Quickstart Guide

What is Writing Across the Curriculum (WAC)?
- writing-to-learn activities are short, impromptu or otherwise informal writing tasks that help students think through key concepts or ideas presented in a course

What are WAC principles?
- Students learn to write by learning written genres in the departments where they study
- Students continue to learn throughout their undergraduate careers and beyond
- Writing about the subjects they study promotes student learning of that subject
- Informal writing can be used effectively to rehearse and develop formal student writing skills

Common brief writing genres
- The reading journal
- Generic and focused summaries
- Annotations
- Response papers
- Synthesis papers
- The discussion starter
- Focusing a discussion
- The learning log
- Analyzing the process
- Problem statement
- Role playing
- Solving real problems
- Pre-test warm-ups
- Using Cases
- Letters
- What counts as a fact?
- Believing and doubting game
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- The writing journal
- One-minute paper
- Frame paragraphs

Sample writing in the disciplines assignments
- Literature review essay
- Lab
- Assignments/projects
- Reports, essays, papers
- Presentation
- Short summary
- Reviews
- Research essay
- Concept map
- Demographic analysis of neighborhood
- Arctic news project
- Waste audit assignment
- Planning project
- Impact assessment
- Landscape analysis

Best WAC Books
Formal Writing Assignments: Suggestions from Writing Studies Research

Roger Graves

What Does Writing Studies Research Say?

Bean (2011, Ch. 6) differentiates between formal and informal writing assignments: formal writing calls for students to hand in finished prose. Traditionally, these take the form of term papers; sometimes students identify a topic in a proposal. This approach assumes students are familiar with how to pose research questions and find appropriate evidence to explore those questions.

In contrast to the traditional term paper approach, Bean identifies “alternative” approaches which require students to answer research questions using concepts from course readings. Thais and Zawacki (2006) note that there are a variety of ways to create “alternate” kinds of assignments.

Alternative formats might include a personal vision statement, a SWOT (strengths, weaknesses, opportunities, threats) analysis, an interview with a scientist. Alternative arrangements of academic arguments might include presenting multiple perspectives through a personal narrative or posters in addition to a traditional report. A third kind of alternative text would allow for alternate syntax. One example would be to accept the work of non-native speakers of English without penalty for certain assignments. Alternate methods might sometimes be called for in a particular field. Modified ethnographical studies are one example; working on projects with community organizations might prompt collaborative writing opportunities.

Expert writers differ from novice writers because they go beyond “knowledge-telling” or standard responses to prompts and assignments and move toward “knowledge-transforming” or what we might associate with critical thought (Bereiter and Scardamalia 1987). Students making the move from outside a discipline (third or fourth year majors) need to make this kind of intellectual move. Instructors who want to work on this kind of intellectual goal for an assignment need to consider the complexity of this move for students.

Tardy (2009) argues that students in a discipline need to gain “genre knowledge” before they can write well in a disciplinary context. Genre knowledge includes language resources appropriate to the document, processes for composing, rhetorical knowledge (purpose and persuasion), and subject-matter knowledge. Student success on any particular assignment is a function of all of these components.

Suggestions when designing assignments:

1. Include interactive components. Brainstorming, feedback to drafts, WAC group writing tutorials.

2. Pose a meaningful task. Pose a discipline-specific problem; pose a research question; ask students to support one interpretation or side of an issue or another.

3. Clear explanations of expectations. Be as clear as you can about what kind of document you expect students to hand in. Include a copy of the scoring guide or criteria you will use to evaluate their work.

4. Create a rubric for each assignment. Assignment-specific rubrics can save time and energy and eliminate confusion among students.

5. Begin by focusing on what you want students to hand in. Start with a vision of the document you want students to write, and then work backwards to identify what they will need to do to create that document.
Grammar and Errors in Student Writing
Responding to Student Writing: Suggestions from Writing Studies Research

What Does Writing Studies Research Say?
Bean (2011) offers an excellent summary of the research in writing studies regarding grammar. Perhaps the best place to start, however, is with Hartwell’s definitions of grammar:
Grammar 1 = native speaker’s innate knowledge of their native tongue.
Grammar 2 = linguistic sciences descriptions of the way language works
Grammar 3 = linguistic etiquette/usage
Grammar 4 = school grammar
Grammar 5 = stylistic grammar

Grammar 1 is known to all school-aged children and adults. Grammar 2 is a scientific model of Grammar 1, and it is not useful in learning Grammar 1 for native speakers of English. Grammar 3 is not grammar at all but usage. Grammar 4 is, in Hartwell’s terms, “unconnected with anything remotely resembling literate adult behavior” (p. 364). Grammar 5, or style, can be taught either implicitly through extensive use of the language (one school of thought) or explicitly through the study of prose style (the other school of thought).

Clearly we cannot teach Grammar 1 or (unless we are teaching a linguistics course) Grammar 2. Grammar 3, or usage, and Grammar 5, style, is similarly outside of the usual focus for instructors in courses that are not focused on writing. Grammar 3, school grammar, has been the subject of hundreds of studies since 1900.

Pressure to teach grammar as a way to eliminate errors in student writing comes from assumptions about these grammars. As Connors and Lunsford (1988) showed, however, the rate of errors in student writing per 100 words has remained relatively constant over the last century at about two (345). In a survey of research into the various ways grammar has been taught over this period, Smith, Cheville, and Hilllcock (2008) found that hundreds of studies of various methods of teaching traditional school grammar to improve the quality of student writing is at best ineffective. At worst, it takes time away from strategies that do work to improve student writing (process approaches, genre approaches), and it also focuses assessment on surface errors and correctness—two features of writing that are easier to identify and appear “objective.” School systems create tests that focus on errors and correctness at the expense of audience and purpose, and the result is that students may be able to produce “clean” texts that communicate very little.

Where do errors come from?
Research with student writers at the university level shows that they are capable of correcting the majority of errors they make. Many errors result from poor editing proofreading (Haswell 1983, quoted in Bean p. 75), and Bartholetae showed how students self-correct when reading texts aloud (1980, quoted in Bean p. 75).

Shaughnessy (1977), working with open enrollment students at the City University of New York, showed how errors are best seen as failed attempts by student writers to grow and develop. Without these errors, those students would not try new prose structures and therefore not improve. She advocated that instructors look for patterns of errors in student writing, bring those patterns to the attention of the students, and then work to correct the underlying mistaken rule that students were applying.
Beginning (2011, p. 292) suggested that the more clearly instructors define their marking criteria at the outset of an assignment, the better the final product they will receive. Instructors should define, in advance, their writing assignment expectations, and put them into scoring guides to help make those expectations explicit to students. Students then get a feel for what instructors are looking for and can self-correct as they write the assignment (Glenn, Goldthwaite, & Conners, 2003).

Thaiss and Zawacki (2006) and Nowacek (2009) remind us that assumptions and opinions about good writing vary widely between instructors and students. Scoring guides can eliminate that variance by creating norms of what constitutes good writing. For instance, Diederich’s (1974) study asked 33 professionals in six different occupational fields to grade 300 essays on a scale of one (1) to nine (9). Every essay received at least five different grades and one-third of those essays received every grade on the scale. Diederich was able to train readers to score accurately and more consistently through the use of scoring guides and rubrics.

Carefully designed rubrics can increase reliability and consistency in marking assignments and reduce marking time (Lindemann, 2001). Generic rubrics are of limited use because they do not give specific information to students about the requirements for each assignment.

Specialized or customized rubrics enable the student to self-regulate and the marker to assess more precisely the degree to which the criteria have been satisfied by the student. Instructors looking for a time-effective marking system may want to consider using customized rubrics to explain specific expectations, moderate feedback to students, and reduce marking time for everyone involved.

Five suggestions when using rubrics:
1. Explicitly define your criteria. Students want to know how marks are awarded for each assignment.
2. Provide criteria at the outset. You may receive a better final product.
3. Train readers to use the scoring guide. They will mark more accurately and consistently.
4. Customize rubrics for each assignment. Task-specific rubrics can save time and energy.
5. Decide what works for you. Your specific expectations can be categorized in simple or highly specified rubrics.
Teaching Writing in Large Classes

Writing Across the Curriculum
Teaching Writing in Large Classes

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What Does Writing Studies Research Say?
Bean (2011) distinguishes between active learning—classrooms which demand that the student manipulates knowledge in some way—and passive learning or lectures based on the transmission theory of knowledge. Bean quotes Bligh (2000) to show that lectures are about as good as any other method of transmitting information, but he takes pains to point out that when the goal shifts to having students critically assess that information, standard lectures fall short.

The key to teaching well in large courses appears to be that second aspect or goal: critical assessment and knowledge transformation. To achieve this kind of learning in a large class format, instructors need to break up the lecture with student-centered activities (Bean 2011, p. 203). Many of these activities involve writing in some way.

Exploratory writing tasks
Bean advocates tying lectures to writing tasks so that students cannot perform the writing tasks unless they listen closely to the lectures. He uses the term “low-stakes writing” to create a category of writing that includes asking questions, posting ideas to Moodle-based discussion lists, and writing paragraph-length responses to ideas from the lecture (Bean 2011, p. 203).

Bean notes that exploratory writing at the start of a lecture can be used to cue students to connect previously learned material to today’s lecture. Here is a list of kinds of short writing assignments that can be used to move from passive to active learning:

- Assign one minute papers prompted by a question such as “What is puzzling you about today’s lecture?” Ask one or two students to read their papers or collect them and read one or two aloud.
- Require students to submit one or two paragraph summaries of a previous lecture. These provide excellent feedback that instructors can use to adjust their lectures.
- Pose your lectures as questions about ideas in your field, and then ask students to summarize your stance or answer to that question. Students learn that your lectures as arguments rather than information (Bean 2011, p. 204).
- Create a formal (graded, extended) assignment that requires students to use lecture material to complete it.
- Model critical thinking by structuring your lecture around a question you had and then taking students through the process you went through as you tried to answer it.

Use online discussions
“Low-stakes writing” can be usefully assigned to online forums—Moodle discussions, blogs, and Twitter feeds. The key here is the prompt for this writing. The best prompts require students to begin by connecting to something said in a course reading, discussion, or lecture and then add their own take on that idea or issue.
Welcome to the WAC Bibliography. The bibliography, developed and presented in collaboration with CompMie, was developed to support teachers across the disciplines who are interested in using writing and speaking in their courses; scholars who are interested in WAC theory and research; and program administrators, designers, and developers who have interests in the latest work in faculty outreach, program design, and assessment.

To view entries in the bibliography, follow the links to the right. If you are a member of the Clearinghouse, you can recommend new sources for the bibliography.

— Justin Jory
Bibliography Editor

http://wac.colostate.edu/bib/index.cfm?categoryid=18
STEM database for WAC

http://www.refworks.com/refshare/?site=044c61176464400000/RWEB102745464/WTL
Links to resources

- **My site:** [http://www.ualberta.ca/~graves1/](http://www.ualberta.ca/~graves1/)
- **My presentations:** [http://www.ualberta.ca/~graves1/documents/FacultyandResearch.htm](http://www.ualberta.ca/~graves1/documents/FacultyandResearch.htm)
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