Teaching Rhetorical Reading of Primary Scientific Literature (PSL) to First-Year (American) Undergraduates

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**Problem:** Can first-year composition students in an American university (all science novices) be taught to read primary scientific literature (PSL) with a reasonable degree of rhetorical understanding?

**Larger theoretical problems:** Based on novice-expert theory, where and how should science students be introduced to PSL? In either American or European contexts, how can science students be taught to read PSL with rhetorical sophistication? [See “expert, insider prose” diagram--item #1--in handout.]

**Thesis:** My research suggests that with pedagogical guidance science novices can learn to read PSL rhetorically.

**Setting for my research:** “General education” first-year composition course in an American university with mostly non-science majors. (I am also a science novice.)

**My pedagogical strategies:**
- Find scientific controversies reasonably accessible to science novices
- Develop motivating assignments that apply PSL to civic controversies. [See assignments--items #2 and #4 in handout]
- Teach rhetorical strategies for academic reading
  - Reading like an ant (crawling sequentially over each word)
  - Reading like a bird (seeing the “big picture” formal and rhetorical structure of a text)
  - Reading like a flying ant (my humorous attempt to address special problems of PSL)
- Create “reading guides” for one or more scientific articles [See item #3 for a sample reading guide]
- Create a “thesis-seeking” exploratory essay to scaffold a later thesis-driven argument [see item #3 for the exploratory essay assignment and student examples in items #5-#7]

**Problem of curricular application:** Is it possible to integrate some of these strategies into a science curriculum in either the U.S. or Europe?

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**ABSTRACT (REVISED SLIGHTLY FROM ORIGINAL EATAW SUBMISSION)**

At what point in their undergraduate careers should students be asked to read primary scientific literature (PSL)? How and when should this skill be taught, especially if the goal is to teach students to read PSL rhetorically with attention to audience, purpose, motivation, and exigency? My presentation reviews competing answers to these questions in light of novice-expert theory, including disagreements among scientists and compositionists. I argue that novice students, under the right conditions, can read PSL with rhetorical sophistication even if they can’t understand the scientific mechanisms that engage the specialized scientist. The key is to find controversies, debated in the PSL, that are reasonably accessible to non-specialists. (I use four such controversies: a pomegranate juice company’s use of sponsored scientific research for marketing purposes; therapeutic touch as evidence-based medicine, the possible link between abortion and breast cancer, and the “Mozart effect” linking classical music to improved cognition.) For a common first assignment given to 19 first-year students in an American regional university, my pedagogy used guided class discussion to scaffold an argument on POM Wonderful’s use of science research in its marketing campaign. For a second assignment, students chose among options. This assignment had two stages—a “thesis-seeking” exploratory essay used as scaffolding for a later thesis-governed argument to a concerned stakeholder in the controversy. Based on my rubric scoring of these assignments (N=19 for each assignment), 9 students reached my aspirational goals by the end of the term, 7 were satisfactory, and 2 were marginal. Although this research was conducted in American setting, my findings may be useful for writing teachers within the faculties of social, physical, or health sciences in European universities.
(1) Knowledge/Skills Needed for “Expert Insider Prose” Within a Discipline

This diagram is adapted from Anne Beaufort in *College Writing and Beyond: A New Framework for University Writing Instruction*. Logan UT: Utah State University Press, 2007, p. 19.

(2) Assignment: A White Paper on POM Wonderful’s Marketing Use of Sponsored Scientific Research

Background:
- Pom Wonderful has spent more than $35 million on scientific research aimed at showing the health benefits of Pom Wonderful’s pomegranate juice and extracts. PomWonderful makes health claims about its pomegranate products based on peer-reviewed scientific studies (funded by Pom Wonderful) featured on its website.
- The US Federal Trade Commission (FTC) and the Food and Drug Administration (FDA) have sued Pom Wonderful for making “false and misleading” claims and for “unsubstantiated” representations of Pom’s health benefits.

The issue-question to be addressed: Did the Federal Trade Commission overstep its bounds in ruling that Pom Wonderful’s marketing campaign is “unlawful”? 

Your audience and rhetorical context: The FTC has scheduled a hearing before an administrative judge on May 24, 2011, at which time POM Wonderful will present its argument that the FTC order violates the company’s constitutional free speech rights. The court has invited public comment.
(3) Reading Guide and Homework Preparation


**Background:** This article can’t be fully understood by non-specialists (you and me) because we aren’t its intended audience. As non-expert readers, we can’t understand the technical aspects of the biochemistry or the methods of statistical analysis. However, we can understand the main gist of their research.

**Prereading Overview:**
1. Note that the article was published in a peer-reviewed scientific journal *Medicine & Science in Sports & Exercise.* Note also the fields of the researchers and their academic affiliations (footnote immediately under the title). Finally, note that the research was funded by a grant from POM Wonderful (top of p. 498).
2. Look at the 33-item reference list at the end. These articles have been read by the researchers and constitute the “current state of knowledge” that the researchers want to add to. Much of the introduction reviews the relevant findings of these articles, identifying what is currently known and still unknown about the question they are investigating. Each of these articles is cited somewhere in the article—primarily in the introduction and the “discussion.” *Question set 1: How many of these studies do you think were also sponsored by grants from POM Wonderful (read over the titles of the 33 cited sources)?*

**Reading like a “flying ant”:**
3. “Crawl” like a regular ant over the title of the article and the abstract. The title actually summarizes the main finding from the experiment. The abstract gives you a big picture overview of the whole article (“bird’s eye” view). The title gives you two key words/concepts that will recur throughout the article—“ellagitannin” and “eccentric exercise.” A quick google search will help you understand both terms. “Ellagitannin” is a plant-produced antioxidant belonging to larger category of “polyphenols.” An “eccentric exercise” is one in which the exerciser resists a force aimed at elongating a muscle. Apparently this kind of exercise produces the most soreness.
4. “Crawl” over the introduction (page 493), trying to understand the basic gist of each paragraph. This introduction reviews the previous research literature (hence all the numbers in parentheses referring to numbered bibliographic entries at the end) and explains what the researchers are trying to discover through their experiment. The purpose of their research is stated explicitly in the last paragraph on p. 493 and top of 494. *Question set 2. In your own words, how does this research build on or go beyond earlier research on vitamins E and C, tart cherry juice, or non-steroid, anti-inflammatory drugs (NSAID’s—e.g. ibuprophen)? What were the purposes of the study?*
5. “Crawl and fly” over the METHODS section. Crawl over the parts you understand, but if you get lost over the material requiring scientific background, fly over it. Here is an overview of the territory: Basically, the researchers are trying to determine if doses of POMX pomegranate extract work better than a placebo at improving recovery and reducing soreness from physical exercise. The experiment involves two 9-day periods with a 14 day “washout” time between the two experimental sessions. The “crossover experimental design” means that each subject will drink the POMx during one of the sessions and then drink the placebo during the other session. “Double blind” means that neither the research subjects nor the researchers know who is on placebo versus POMx during either of the sessions. “Randomized” means that the research subjects are randomly placed into the initial placebo or POMx group. With this background, see if you can answer the following questions: *Question set 3. How many research subjects participated? How did the researchers make sure that each participant received the same kind of exercise? Why was the exercise period conducted on day 5 rather than day 1 of each session? How much “juice” (POMx or Placebo) did they drink on each day? How did the researchers measure the baseline strength of each subject before starting the exercise? How did they measure strength at each interval after the exercise? How did they measure “soreness” at each interval after the exercise? What was the point of taking blood samples at each interval after the exercise?*
6. Mostly “fly” over the RESULTS section, landing to crawl on those sentences that seem understandable. These sections are aimed at insiders with expert knowledge of experimental design, statistical methods, and technical jargon. Basically, though, see if you can answer these questions: *Question set 4: Was there any statistically
MAJOR PROJECT
ANALYZING A SCIENTIFIC CONTROVERSY OF YOUR CHOICE

Part 1: Exploratory essay
This major project begins with a 5-7 page exploratory research paper that describes chronologically your own search for a personal answer to your chosen question from the three options below. The paper should start with a reflection on where you stood on this issue before you began your research. (Being confused or uncertain is OK.) Then write a first-person, reflective narrative of your thinking process as you investigated your question by researching the professional literature, talking with classmates, and, if relevant, drawing on your own personal experiences, memories, and observations. By the end of your essay, sum up how your ideas evolved during your process of research and reflection. You will be rewarded for the quality of your exploration and thinking processes. In other words, your goal for the exploratory essay is not to take a stand on this issue, but to report on your process of wrestling with it.

Part 2: Your Argument
Option A: Should hospitals allow nurse-healers to practice therapeutic touch on consenting patients?
You are a staff nurse at a large urban hospital. Recently the hospital became embroiled in a major controversy when several nurses were discovered to be practicing “therapeutic touch” (TT) on patients without the permission or knowledge of their supervisors or of attending physicians. The hospital governing board reprimanded the nurses and issued a general statement forbidding the practice of TT, which they called "non-scientific quackery." Research the professional literature on TT looking especially for evidence-based studies. Then write a 3-4 page argument, addressed to the hospital governing board, supporting or attacking the board's decision to forbid the practice of TT. Support your position with reasons and evidence based on the professional literature.

Option B: Are pro-life advocates on solid scientific ground when they say that an abortion increases a woman’s chances for getting breast cancer?
In its webpage on “Abortion’s Physical Complications” (see attachment), the National Right to Life Committee argues that abortion increases a woman’s risk of getting breast cancer. You are a researcher for a public affairs organization devoted to responsible use of science in public decision-making. You have been asked to research the scientific literature on possible links between abortion and breast cancer. Depending on what you conclude, write a 3-4 page argument to either (a) the executive director of the National Right to Life Committee asking them to remove (or substantially revise) their claims about the links between abortion and breast cancer or (b) the executive director of NARAL prochoiceamerica.org asking them to add a fair statement of these risks to their website (which currently denies any linkage).

Option C: Does listening to classical music (particularly Mozart) or learning to play an instrument lead to improved intelligence or cognition?
Some scientific research has shown that some aspects of intelligence can be temporarily improved by listening to Mozart (the Mozart effect). Although other studies have questioned this claim, the original Mozart effect study has ignited a firestorm of interest in the connections between listening to (or playing) classical music and intelligence. You are the science editor for a parenting magazine. One of the readers of your magazine—a young woman who is four months pregnant—has sent you a letter from her mother, who is a fan of the website “mozarteffect.com.” The mother has been begging her daughter to play Mozart while she is pregnant, and then continue to play it for the newborn child. She also wants her daughter to promise to give her baby piano lessons as early as possible. The mother’s motivation is not love of Mozart or classical music so much as improved intelligence and cognitive abilities. You decide to write a 750-1000 article for your magazine that will argue either for or against the mother’s advice.
Excerpt from Allison’s Exploratory Paper on Therapeutic Touch

During the library session I could not find a good article that was anti therapeutic touch so I resorted to a Google search back in my dorm room. I did not think that I would have much luck, as valid scholarly articles are rare in a database like Google, but I actually came across a peer reviewed journal article by Rosa, Rosa, Sarner & Barrett (1998) that argues against therapeutic touch and claims that it is pure quackery. Rather than testing the effects of TT on patients, these researchers tested twenty-one practitioners of TT to see if they could truly detect an energy field above human bodies. The investigators placed one of their own hands above either the practitioner’s left or right hand and, without being able to see anything, the practitioner was asked to determine which hand had the investigator’s located above it. The practitioners should have been able to locate the correct hand every time; chance alone would have given them a 50-50 probability. The average score, however, happened to be slightly less than random chance at 44%. The researchers resolved that therapeutic touch could not be a legitimate practice if the practitioners could not even locate a so-called human energy field. They also concluded that there is simply no evidence to prove that therapeutic touch is effective due to the absence of a detectable energy field.

I was very surprised after I read this article because the only pieces of research I had read before it praised the effectiveness and viability of therapeutic touch. It would make sense that practitioners of TT would be able to consistently locate a human’s energy field considering that they are supposed to manipulate this field to reduce pain. These results would suggest that the effectiveness of TT stems from the placebo effect in which patients are psychologically convinced that they feel better.

The last study I examined, Coakley & Duffy (2010), incorporated both measurable factors (cortisol and NKC levels) as well as participant reports of pain levels. The researchers wanted to know if therapeutic touch had an effect on pain level in participants recovering from vascular surgery. To do this, Coakley & Duffy measured cortisol and NKC (natural killer cells) levels before and after a TT treatment. Higher levels of cortisol are found in those who are stressed and NKC’s increase in the body to destroy harmful cells. Participants who received TT treatments had lower cortisol levels and higher NKC levels after the treatment, indicating that they were less stressed and had an increase in immune function. The patients also reported that they had less pain after therapeutic touch. I think that since there is both measured physical proof that therapeutic touch lowered stress levels and kicked immune systems into high gear, TT should be considered a valid practice. This article provided solid evidence that convinced me of the benefits of TT on patients with pain due to its empirical findings as well as the patients’ reports on lower pain levels. I was surprised to find out that the researchers actually made a comment about the last study I read by Rosa, Rosa, Sarner & Barrett. They said that the practitioners in the study were not trying to physically help the investigator, which is a key factor required for TT.

After having read these peer reviewed journals and examining the evidence of each, I have decided that therapeutic touch is in fact an advantageous practice and is not merely a form of quackery.
(6) Introduction to Victoria’s Exploratory Essay on Therapeutic Touch

My grandmother and I would often complain about the poor circulation we would get in our hands. She once told me that my father had taught her to concentrate and meditate well enough so that she could direct blood flow to her fingers, thereby warming her hands. I wanted to confirm this with him to make sure it wasn’t just a grandma story, and he affirmed that with the help of biofeedback, people can be trained to control different body systems without a doctor’s help. Being a psychologist, my father often stressed the importance of practicing meditation and other anxiety-reducing techniques, not only for emotionally or mentally disturbed people, but really for anyone undergoing stress. So naturally, the idea of therapeutic touch (TT) interested me as an alternative to Western medicinal practices that I haven’t heard a lot about. However, after starting my library research with a Wikipedia article, I began to second-guess my inclinations towards believing TT would be a scientifically legitimate method of healing.

According to the article, practitioners manipulate a patient’s energy field by placing their hands close to the person’s body, and can redistribute energy or get rid of bad energy by moving their hands over the patient’s body (“Therapeutic Touch” 2011). I now wasn’t so sure what to believe.

I thought it’d be important to just get a basic idea of what Therapeutic Touch was. [Describes introduction to database searching during our session with reference librarian.] The first scholarly article I read was from ProQuest, called “The Efficacy of Healing Touch in Coronary Artery Bypass Surgery Recovery,” and it gave me hope that I needn’t completely reject TT right off the bat. The article focused on a study done with 237 patients undergoing coronary artery bypass surgery for the first time, to see if therapeutic touch could benefit the “body’s natural healing process” dovetailed with conventional care. It randomly divided the patients into three groups: [continues by summarizing the research]

(7) Introduction to Victoria’s Final Argument on Therapeutic Touch

Therapeutic Touch: A Scientifically Legitimate Method of Healing

The hospital board was recently divided on the issue of therapeutic touch, and whether or not it should be practiced in its hospital as a valid method of healing. After having extensively researched scholarly peer-reviewed articles on therapeutic touch, I am writing in support of TT, and believe the hospital board should rescind its ban for three main reasons. First numerous peer-reviewed studies have found that it reduces pain and anxiety in patients, including a study that uses a test for a placebo. Second, other peer-reviewed studies have found actual chemical changes produced by TT in levels of nitric oxide, natural killer cell counts, and cortisol. Third, offering TT would improve the hospital’s reputation because it would be more well-rounded and open to holistic medicinal practices, thus adding significant appeal. It could also make for a better work environment, like the one surveyed at Kendray Hospital, including nurses’ opinions toward TT. Additionally, TT is not an evasive practice and therefore does not harm patients. Even if it only benefits patients emotionally or psychologically, emotional and psychological well-being are extremely important to a person’s health and quality of life.