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## **Incorporating Writing into a General Education Historical Geology Course**

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It has often been stated that you never realize how little you know about a subject until you try to explain that subject to another person either orally or in writing. In a similar manner it has been said that if you want to learn something, teach it to another person. If the subject matter is in the student's major, it is easy to motivate the student to learn not only the content, but also the relationship of the content to the whole subject field. What if the content area is not in the student's major, but part of the college's general education requirements? As a faculty person who strongly supports the concept of general education requirements, I have given a great deal of thought as to how I might get students to not only learn the content, but to develop a broader understanding. I believe that one way to accomplish this goal is to have students read non-text materials and then to have them write about what they have read.

Sometimes it is difficult to know how to write about something, unless you know how other people have accomplished the same task. In the exercises that will be described in this paper, I have students in a lower level, general education class entitled Historical Geology read three different kinds of scientific writing. Although I don't expect them to emulate any one particular style, I believe that by having them read three different styles in which scientific concepts are presented, they might come to recognize that not only are there different audiences for a particular subject area, but also that

there are different approaches to reaching each group of readers and that they might be able to apply some of these techniques in their own writing.

Although there are more than three types of scientific

writing, I concentrate on three forms: articles by scientists on their own results for peers in their disciplines, articles by journalists or scientists reporting about science in scientifically oriented journals, and articles about science by scientists or journalists that appear in newspapers or newsmagazines. Typically the first type would be found in the journals published by scientific groups, e.g., *Science* published by the American Association for the Advancement of Science. The second type would be found in magazines such as *Scientific American* or *Discover* magazine. The last would be found in newspapers such as the *Boston Globe* or news magazines such as *Newsweek* or *Time*.

The format of each exercise is approximately the same. The students are given an exercise sheet, usually on a Monday. The sheet specifies the type of article to be read, a series of questions the student should think about as he/she reads it and which should form the basis of the two to three page essay to be turned in on the following Monday. I ask that the student make a Xerox copy of the article and that the copy be turned in with the essay. I do this for a number of reasons. First by asking them for a Xerox copy, the student will not tear an article out of a journal for his/her own use. Secondly, when I read the article and compare it to what has been turned in, I can see how much sense the student was able to make of it. Lastly, as most of the articles are from current issues, the exercise keeps me abreast of what is going on in the field.

All articles used in the class are chosen by the stu-

dents themselves. I feel there needs to be a follow-up to the search techniques learned either in the library component of the Introduction to the Academic Community course or the English Composition course, or perhaps both if the student has had both by the time they take the Historical Geology class. Occasionally when students really get stuck I will either give them an article or go through the search process with them. I can tell when they are having such problems, because before they ever begin writing I ask to see the article or at least the title and journal of the article.

The questions to be considered vary depending upon the type of article. For example, for the scientific report, I ask the following:

1. What hypothesis or hypotheses were being tested?
2. What assumptions were made by the scientists?
3. What kinds of tools, material or mathematical, were used by the scientists?
4. What were the main findings of the report?
5. What specific pages or sections of their own text considered the topic, and if the concept or concepts were in the text, were there discrepancies between the article and the text?
6. What aspects made the article difficult to read? If it was the vocabulary used, then list those words. Could you tell the meaning by context, or did you have to look them up in your own text or a dictionary of scientific terms?

For the scientific report I ask them some of the same questions, but in addition ask them to compare the scientific report to the previous paper. For the last exercise I ask most of the same questions, but now the comparison is amongst all three types of articles.

Students find the first exercise, reading and writing about a scientific paper, the most difficult. First, they

have difficulties identifying a scientific paper, which I describe to them as when a scientist reports upon his/her own research. Typically most students initially bring in articles in which a scientist or journalist describes a series of researches dealing with a particular topic. At this point I tell them to save the article for the next exercise and to go back to the library to search some more. What is interesting is that in oral and written directions I specifically tell them to only look for articles that appear in the last section of *Science* magazine. Apparently, they either don't listen to me or cannot read my prose, or perhaps didn't even believe I meant what I said. In any case, about 50% get it right the first time, 35% the second time, and 15% the third time. Secondly, the vocabulary and often even the subject matter is way beyond their comprehension. Rather than tell them to choose a new article I tell them to persevere and to look for the major points. Often the problem is that they have only read the article once. I mention that even in my own reading of journal articles, I often have to re-read an article to make sense of it. I also urge them to use their textbook as a reference source. The difficulties that they have initially with this exercise imply to me that with most of their reading requirements, they feel they only need to read the material once and that perhaps this exercise is a good lesson to dispel that myth. Many students mention that the 'aha' feeling comes after a third or fourth reading.

I have tried reversing the first assignment, the scientific article, and the last exercise, the newspaper/news magazine article, but there are a few reasons why I don't usually do it that way. One of my main reasons for starting with the most difficult task first is that it helps students to self-select the class. This exercise is given before the drop period and if students find it

too difficult, I encourage them to drop the class before they flunk it. Secondly, by the time we get to the newspaper exercise, it is towards the end of the semester and things seem to be piling up. Having done the two previous exercises and knowing what I expected for each, most of the students have little difficulty in finding a newspaper article and writing about it.

When it comes to grading, my philosophy is that each student must complete a set number of requirements. If they complete all requirements in a satisfactory manner, they will get a grade of C for the class. One of these requirements is to do all the writing exercises. When I read what they submit for this component, I grade the work as either satisfactory or not. If it is the latter, the student has to re-do his/her paper. On the first exercise, this typically amounts to 50% or more of the class. On some occasions, I have even had a student take four times to get through the first exercise. Typically by the last exercise, few if any have to re-do their essay. I used to make all students read three books, keep journals on what they read, and write essays about each book. Because of a change in testing methods, I moved to the three exercises described in this paper and use extra books and essays as a way for a student to achieve a grade higher than a C for the class. Interestingly enough, few students opt to do the extra work required to get a grade higher than a C. Usually on the day that the students pass in their work, I ask each student to summarize his/her article for the rest of the class. This has a multiplier effect for science content and also forces the student to orally indicate his/her understanding of the topic of the article.

Do the students know more about historical geology after they have completed this component of the course? This is hard to determine as I have never formally

assessed the outcomes. I do know that by the time the students turn in the third exercise, they have learned to follow directions and their essays read much better and make more sense. The students complain about the workload, but when I remind them that in the real workplace there are no multiple choice tests, but only position papers, memos, precis, reports, etc., they usually reluctantly nod their heads in agreement.

The method I described above to incorporate writing into a general education course may at first glance seem to be a lot of work for me, but it really isn't. The papers are all very short. I read them mostly for content rather than grammar and structure, although I tell the students that I will quit reading a paper if the spelling, grammar, etc., is too atrocious. Having to read the articles along with the essays may also seem like more work for me, but I would have to read the articles anyway if I wanted to keep up with what is happening in the field and often I have already read the article and thus only need to skim through it.

Although much effort goes into the making of a modern day textbook, if the only knowledge a student has of a subject field is through what they have read in the text, they will not have a full understanding of that subject area. Conversations with my students, after they have completed the three exercises, indicate to me that they have gained a better understanding of not only the content of science, but also the way in which that content is communicated to scientists, non-scientists who enjoy science, and the general public. At the same time they also have a better understanding of the limitations of textbooks as vehicles for communicating the 'general education aspects' of a general education science course.