Explicit Instruction in Primary Literature to Enhance Student Writing and Scientific Understanding

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Introduction

Why teach primary literature? Students struggle to comprehend it and use it effectively in writing, but...

- It is a key window on the scientific process.
- It is the gold standard of evidence in science (Nose, 2002)

More introductory science classes require students to use it, at Cornell and elsewhere.

Previous work focused on senior students and majors (e.g., Jarvis-DuBois, 1997; Hermain, 1999; Smith, 2001; Hoskins, Latino and Stevens, 2011).

- Comparison between reading primary scientific literature and writing not previously explored.

Project Goals

Primary Goal: Develop a series of workshops that would help students locate, read, and use primary scientific literature effectively in writing.

Secondary Goals:

- Increase student awareness of evidence in science
- Increase student self-efficacy and self-awareness in writing

Methods

A series of 4 primary literature workshops were run as part of two writing-intensive classes.

The Classes

<table>
<thead>
<tr>
<th>Class Title</th>
<th>Sustainable Earth, Energy, and Environmental Systems</th>
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<tbody>
<tr>
<td>Semester</td>
<td>Fall 2011, Spring 2012</td>
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<tr>
<td>Majors/Non-Majors</td>
<td>Majors</td>
</tr>
<tr>
<td>Final Project</td>
<td>Literature review on topic of student’s choice</td>
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</tbody>
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Scientific proposals on topics of student’s choice

Assessment of Goals

- Surveys of student attitudes towards primary scientific literature, confidence in writing, and knowledge of scientific process.
- Analysis of student drafts for increases in sophistication of use of primary literature.
- Analysis of cover letters (in which they reflect on the writing process) and student evaluations as insight into student thinking.

Results

Discussion/Conclusions

- First-year students can do extremely well with primary literature if guided.

- Students become significantly more confident in synthesizing scientific literature, and this correlates with greater effectiveness in their writing.

- Step-by-step work is key to agreement (Link and Tromba, 2011).

- Primary literature has fit to its overall course design.

- Endpoint to which students are working is extremely important: Proposals seem to be more effective as a final product of the course.

- Students made fewer gains in understanding the nature of science, though non-majors reported more confidence with scientific dialogue.

Future Directions

- Continue instruction in primary literature with gradually increasing complexity.

- Include critique skills earlier in the semester.

- Weave workshops to teach students about nature of science.