

Assessment of student writing using a revised general biology 1 writing curriculum

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Objectives

- Assess and revise the General Biology 1 writing curriculum to improve the quality and content of student writing.
- Extend curriculum changes to upper division courses.

Introduction

Effective oral and written communication is a critical 21st century core competency for biology graduates (Vision and Change, 2011). Writing increases critical thinking skills (Quitadamo and Kurtz, 2007; Rivard, 1995) and success in participation in the scientific enterprise.

Senior level students in the department of biology at the University of Minnesota Duluth are not meeting our science writing outcomes. We started revising the writing curriculum in general biology I. Our students previously wrote the separate sections of one laboratory report before revising and turning in a final report. Most students failed to write a successful laboratory report. Additionally, they only wrote one laboratory report during the semester failing to benefit from writing practice leading to cognitive gains (Jerde and Taper, 2004) and improved writing skills (Libarkin and Ording, 2012 and Tessier, 2006).

Analysis of a general biology I writing assessment during fall 2013 identified areas for improvement including: accuracy, completeness, clarity, conciseness, topic sentences and paragraph structure. After extensive curriculum revision, students now complete weekly writing assignments that help develop scientific understanding of each week's lab and hone their ability to communicate that understanding. Additionally, our writing center director trains Graduate Teaching Assistants (GTAs) to teach writing and effectively grade student's work using a rubric and comments. I will present our assessment results documenting student gains in writing from fall 2014.

Methods

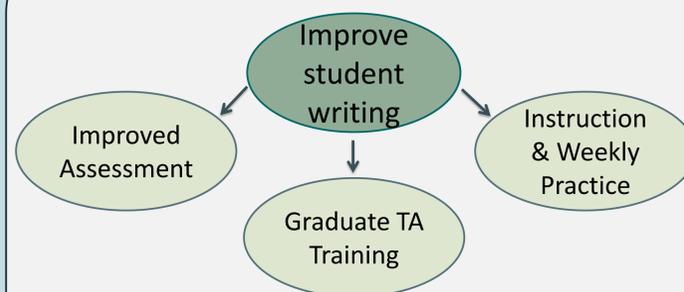


Figure 1. Several curricular changes have been implemented to improve the quality of science writing in general biology 1.

Writing Instruction

GTA Training: GTAs receive two trainings from writing center staff on how to teach the writing discussions and how to grade writing using the rubric.

Student training: The graduate teaching assistants teach two writing based discussions:

1. How to write a scientific paragraph
2. Analysis of different types of scientific writing

Weekly Writing Assignments

- GTAs directly teach writing in lab and discussion sections.
- Students write weekly to practice thinking and writing about the methods and results of their laboratory.
- Graded based on (1) accuracy and completeness of the scientific content and (2) the mechanics, clarity, conciseness and organization of the paragraph.

Example weekly assignment:

In this lab, you were given a solution of sucrose of an unknown concentration. Write a one paragraph summary of your methods and results obtained in determining the percentage of sucrose in your unknown solution.

Assessment Methods and Results

Assessment Assignment

Semester Week 2: Students watched a video describing an experiment studying how lemon ant plant affects neighboring plants. Students use data from the experiment to write one paragraph summarizing the experimental methods and results.
Semester Week 15: Students are given the same assessment and revise their paragraph written in week 2 and describe their changes. Week 2 and 15 assignments were blinded and graded for the five aspects of writing shown in figure 3.

Fall 2014 Assessment Results

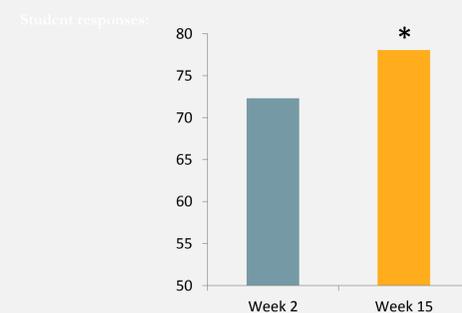


Figure 2. Students total scores on their writing assessment improved from week 2 to week 15. * indicates significance based on a t-test ($p < 0.05$).

Student responses:

- "It is amazing to see how far I have come in writing this semester."
- "I am glad I got to revise this because it allowed me to correct myself and it also allowed me to see how far I have come."
- "This assignment has shown that I have greatly improved my ability to write scientifically and put thoughts onto paper clearly."

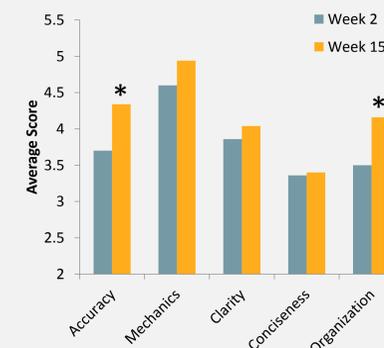


Figure 3. Improvement on individual parts of the student writing assessments from week 2 and week 15. * indicates significance based on a t-test ($p < 0.05$).

Conclusions

1. Students improved their ability to accurately and completely write about their experiments and their ability to write an organized paragraph.
2. GTAs are reporting better success in teaching writing and improved student writing.

Ongoing Departmental Curriculum Development

1. Implement GTA training and continued writing instruction at the general biology 2 level.
2. Planned revision of writing instruction and assignments for 2000 level writing intensive laboratory courses (2015-2016).
3. We've created an online journal and course for advanced students to publish their work. "Duluth Journal of Undergraduate Biology" <http://www.d.umn.edu/lib/d-commons/libpub/journals/DJUB/>

Literature cited

- Brewer CA and Smith D. 2011. Vision and Change in Undergraduate Biology Education: A Call to Action.
Jerde CL and Taper ML. 2004. J. of Coll. Sci. Teaching 33:34-7.
Libarkin J and Ording G. 2012. CBE Life Sci. Educ. 11:39-46.
Quitadamo IJ and Kurtz MJ. 2007. CBE Life Sci. Educ. 6:140-54.
Rivard LP. 1994. J. of Res. in Sci. Teaching 31:969-83.
Tessier J. 2006. J. of Coll. Sci. Teaching 35:25-9.

Acknowledgements

I would like to acknowledge Colleen Belk and Jill Jensen for help in developing this project. I also thank the graduate students who teach the laboratories and discussion sections. Finally, a special thank you to the students who work with us as we develop the course.
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