DRIVING STUDENTS TOWARDS THEIR BEST – AN INTEGRATED APPROACH TO SCIENCE REPORTS

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Background

The ability to accurately and logically write up experimental findings in report form is considered to be an essential skill for working scientists (Office of the Chief Scientist, 2014; Robertson, 2011), yet it is a skill that many students find difficult to master. Thus, finding ways to enhance the scientific literacy of science students has become a focus at many universities (e.g. Brownell et al., 2013; Coil et al., 2010; Gopen and Swan, 1990; Lee, 2013; Quitamano and Kurtz, 2007). However, many instructors report that students often resist engaging with supplementary help resources, or do not provide adequate drafts for feedback (Manske, 2010; Sturtridge, 2013). Consequently, many students often aim for 'satisfactory' rather than 'excellent' in such written assignments – a position that is usually in directly opposition to that of their instructors.

Aims

Here we report on an integrated approach that aimed to:
(i) better engage Diploma level tertiary science students in the scientific report writing process, and
(ii) encourage students to write reports of a high (rather than a satisfactory) standard.

Design and methods

Short written activities were embedded before, during and after a practical laboratory exercise that later formed the basis of a longer, more formal scientific report.

Students were required to conduct preliminary research prior to attending a practical laboratory class at James Cook University, Queensland. Students collected experimental data in a laboratory, and reported their methods, discussions and conclusions in short answer form. Students received formative feedback on their laboratory work from peers and lecturers and the revised work was then directly incorporated into a formal report framework. The students then expanded on this work and submitted it as a formal, 1500 word scientific report, worth 25% of their overall grade.

To encourage students to aim for a high level of work, a minimum grade of Distinction (75%) was necessary in order for them to receive a grade for the assignment. Students who received less than 75% were not given a grade but were permitted to resubmit their reports on the proviso that they:
(i) attended a 15-minute consultation to discuss their report submission, and
(ii) submitted a written paragraph outlining how they had responded to feedback on their original report.

Results

The quality of work submitted was greatly improved on previous semesters where students were asked to submit a draft for grading and feedback prior to submitting their final scientific report. Student engagement with online help resources was also much higher. Whilst marking time was substantially increased for the first report submission in comparison with drafts marked in previous semesters, marking time for the final report was greatly reduced.

Conclusions

Setting a high initial grading standard for students, withholding less than excellent 'draft' grades and integrating a stepwise writing approach to science report writing resulted in significantly higher student grades and resource interaction than previous, more traditional approaches.

References

Brownell SE, Price JV, Steinman L. (2013). A writing-intensive course improves biology undergraduates' perception and confidence of their abilities to read scientific literature and communicate science. Advances in Physiology Education.,37, 70–79.

Coil, D,.Wenderoth, M.P., Cunningham, M., and Dirks, C. (2010). Teaching the process of science: faculty perceptions and an effective methodology. CBE Life Science Education, 9, 524–535.

Gopen, G., and Swan, J. (1990). The science of scientific writing. American Scientist, 78, 550–558.

Lee, S.E. (2011) Writing Activities Embedded in Bioscience Laboratory Courses to Change Students' attitudes and Enhance their Scientific Writing. Eurasia Journal of Mathematics, Science & Technology Education. 7, 193-202

Manske, B. (2010). That's not Biology..Or is it? Changing students' perceptions of writing in the sciences. Retrieved 8 November 2010, http://mendota.english.wisc.edu/~WAC

Office of the Chief Scientist. (2014). Australia's STEM workforce: a survey of employers. Retrieved from http://www.chiefscientist.gov.au/wp-content/uploads/DAE_OCS-Australias-STEM-Workforce_FINAL-REPORT.pdf

Quitadamo, I.J., and Kurtz, M.J. (2007). Learning to improve: using writing to increase critical thinking performance in general education biology. CBE Life Science Education, 6, 140–154.

Robertson, R. (2011). Employer expectations of professional writing and publishing graduates: Executive Summary and Recommendations. Retrieved from http://www.capstonecurriculum.com.au/wp/wp-content/uploads/2015/02/Employer-report.pdf

Sturtridge, J. (2013). Too Many Papers: Two Solutions. The Teaching Professor. Retrieved from http://www.magnapubs.com/newsletter/the-teaching-professor-2907-1.html

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