

Chapter 76

Language Focus for Genetics and Molecular Biology Students

Brett A. Lidbury

Australian National University, Australia

ABSTRACT

This chapter examines the role of scientific language comprehension and confidence for senior undergraduate students in Genetics and Molecular Biology, and the impact of language-centred learning strategies to assessment outcomes. A number of online and tutorial language exercises and strategies are described that were designed to promote scientific language competence and subsequent genetics learning. The effect of these interventions was analysed through grade and assessment performance comparisons with earlier traditionally taught Genetics cohorts. While no significant grade improvements were found for cohorts taught via language, deeper statistical analysis revealed that motivation to adopt new learning strategies was crucial for best student performance. Language was found to be most influential for middle range performing students. Despite at least a year of tertiary education, students still had difficulty interpreting some everyday words in a science context. The study also encourages a greater evaluation of student motivation in adopting new learning techniques.

INTRODUCTION

The majority of the study described and discussed within this volume concerns the experience of first year science undergraduates in the fields of biology, chemistry, physics and statistics, and the consideration of a role for field-specific language competence in performance for the first contact

of students with tertiary science education. The studies conducted identified language difficulties and then set about addressing such difficulties via particular teaching and learning interventions focused on language. The importance of language to science education has been discussed and studied previously (Wellington & Osborne, 2001). One earlier study suggested that first year university biology students encounter more new words than their counterparts studying foreign languages in

DOI: 10.4018/978-1-4666-3604-0.ch076

their first year (Yager, 1983; Wandersee, 1988). Given this evidence, the centrality of language to successful science learning has not been generally embraced, and is at best an auxiliary issue.

This chapter examines the role of language in learning in the advanced undergraduate subject of *Genetics* (with some reference also to the associated but separate subject *Molecular Biology*). The students involved in these studies were experienced university students with at least a year of tertiary level study when they entered *Genetics*. Also different to the other studies contained here, language support had been introduced three years earlier than for first year biology, chemistry and physics, and as such was a standard aspect of teaching once the formal study began (Zhang & Lidbury, 2006). This chapter describes the language interventions used in teaching genetics, the results of language comprehension (and confidence) testing using everyday words that also have usage in science (the same analysis as for first year biology, chemistry and physics, described in other chapters) and a statistical analysis of student data to reveal which learning factors, including language, are associated with student performance in undergraduate Genetics.

LANGUAGE METHODS EMPLOYED TO SUPPORT LEARNING IN GENETICS

Paper-Based Methods and Tutorial Activities

Language focused methods adopted for teaching genetics did not rely solely on technology, but actively borrowed approaches from foreign language education. The primary idea was to enhance genetic language comprehension, but also diversify and energise tutorial sessions and lectures provided during the semester of teaching. “Traditional” and transmissive styles of teaching

were used in teaching genetics and molecular biology until 2005, after which language-centred teaching was developed and embedded routinely into subject instruction. Traditional/transmissive tutorial styles involved, generally, a reading or a set of statistics problems and so on, with the expectation that students would do the pre-reading and/or problems and then bring them to the tutorial for discussion. The subsequent tutorial often had the tutor or lecturer speaking most of the time with little engagement from the students, who often did not prepare adequately, often due to not understanding the content.

Group Language Mix and Match

To energise the group and shift the focus from the lecturer/tutor/professor to student-directed learning, “warm-up” exercises were employed based on language comprehension associated with a topic covered in lectures. The warm-up used a “mix and match” approach (inspired by a *Hot Potatoes*TM exercises - see next section), with each student given a word or term that then required a “match” to another student holding the correct word or term. This exercise was performed at the very beginning of the tutorial and was given 5 - 10 minutes. It forced students from their chairs and into the wider group to speak with other students, and furthermore through language, primed the group for the tutorial topic. An example is based on the concepts of plasmid cloning of recombinant DNA and the *polymerase chain reaction* (PCR), a laboratory technique used to specifically amplify a DNA sequence. The words/terms employed were:

- **Plasmid (DNA cloning) exercise:** *Ori*, MCS, Amp^R, transcription control region, *EcoRI*, Restriction Enzyme, buffer.
- **PCR Exercise:** Primer 1, Primer 2, *Taq*, target sequence, dNTPs, MgCl₂, thermo-stable DNA polymerase (interchangeable with *Taq*).

18 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/language-focus-genetics-molecular-biology/76129

Related Content

Cash Note With High Performance Security

Lingamallu Naga Srinivasu and Kolakaluri Srinivasa Rao (2019). *International Journal of Applied Research in Bioinformatics* (pp. 20-35).

www.irma-international.org/article/cash-note-with-high-performance-security/231588

Machine Learning Based Program to Prevent Hospitalizations and Reduce Costs in the Colombian Statutory Health Care System

Alvaro J. Riascos and Natalia Serna (2018). *International Journal of Knowledge Discovery in Bioinformatics* (pp. 44-64).

www.irma-international.org/article/machine-learning-based-program-to-prevent-hospitalizations-and-reduce-costs-in-the-colombian-statutory-health-care-system/215335

The Health Care Factory

Massimo Ancona, Walter Cazzola, Sonia Pini and Marco Frascio (2012). *Pharmacoinformatics and Drug Discovery Technologies: Theories and Applications* (pp. 202-219).

www.irma-international.org/chapter/health-care-factory/64073

E-Health Project Implementation: Privacy and Security Measures and Policies

Konstantinos Siassiakos and Athina Lazakidou (2010). *Biocomputation and Biomedical Informatics: Case Studies and Applications* (pp. 281-286).

www.irma-international.org/chapter/health-project-implementation/39619

The Genetic Code, Hadamard Matrices, Noise Immunity, and Quantum Computers

Sergey Petoukhov and Matthew He (2010). *Symmetrical Analysis Techniques for Genetic Systems and Bioinformatics: Advanced Patterns and Applications* (pp. 115-131).

www.irma-international.org/chapter/genetic-code-hadamard-matrices-noise/37899