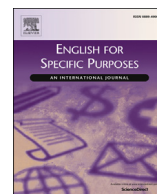


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Using the research article as a model for teaching laboratory report writing provides opportunities for development of genre awareness and adoption of new literacy practices



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ABSTRACT

The retention and success of students from under-represented groups in University science programmes remains a global issue. Despite increased enrolments, these students still have the greatest rate of attrition. One of the factors that affect success is an inability to navigate the specialized literacies required within the culture of science. Here we present an intervention to develop the disciplinary literacy practices and genre awareness of first year biology students, using the pedagogical genre of the laboratory report. This is one of the most common genres in undergraduate biology and is modeled on the genre of the research article. To help students learn to write laboratory reports, we designed an intervention that included a lecture series around the reading of a research article, a quantitative literacy workshop on data communication and a peer-review workshop. Students received feedback on their reports and had several opportunities to rewrite them. To assess the success of the intervention, the first and final drafts of 20 students' reports were compared and a subgroup of these students was interviewed. Analysis of the reports revealed that most students made significant progress in terms of genre acquisition and development of genre awareness. The interview data confirmed that the intervention brought about enhanced understanding of the genre and notably created opportunities for students to adopt new science-relevant literacy practices.

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1. Introduction

Broadening access and increasing the retention and success of students from under-represented groups in Science at a tertiary level is a global issue. All things being equal, it could be expected that the demographics of a university student body should be representative of those of the general population. However, for a variety of reasons, many of which are socio-economic, particular population groups tend to have disproportionately lower participation in higher education. These under-represented groups have been referred to by others as 'non-traditional students' or students from disadvantaged backgrounds (Cross & Carpentier, 2009). While progress has been made with increased enrolment of under-represented minority groups in the US, students from lower socioeconomic backgrounds in the UK and students from groups previously disadvantaged by apartheid in South Africa, these students still seem to have the greatest attrition in the sciences (Eagan,

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Hurtado, & Chang, 2010; Olson & Riordan, 2012). At South African higher education institutions Science degrees and diplomas exhibit low graduation rates, with fewer than 50% of students completing three-year undergraduate degrees within five years and the legacy of apartheid means that these figures are even worse for Black and Coloured students¹ (Council on Higher Education, 2013). The low graduation rates, in the face of low overall participation rates, are a major cause of concern. Therefore, the academic success of Black and Coloured students has become one of the most pressing social justice issues currently facing the country and interventions that seek to understand the reasons for attrition and improve the retention and success of these students in the sciences are imperative.

One reason proposed to account for the high attrition rate among such students is an academic culture in science that often excludes them (Seymour, 1999; Tanner, 2009). Culture can be interpreted in different ways, even within the context of Science education (Parsons & Carlone, 2013). Here we use the term synonymously with Gee's (2008) theory of Discourse (big 'D'), or 'ways of being in the world', as opposed to discourse (little 'd') which refers to language in use, and 'only occurs within specific practices and within specific genres in the service of specific purposes or content' (Gee, 1990, pg. 35 cited in Kirby & Dempster, 2015). In order to be successful within a particular culture or Discourse, one not only needs to embrace the beliefs, principles and ideologies of the culture, but also master the valued practices and activities of the culture. For example, integral to the culture of science, are the culturally specific ways in which it is communicated (Lemke, 2004). For students, particularly those from under-resourced backgrounds who lack experience with the culture or Discourse of science, the challenge of accessing and producing the linguistic, mathematical and visual representations required in scientific writing is formidable. Airey and Linder (2008) warn that without fluency in this critical constellation of modes, which compose the disciplinary discourse, access to knowledge becomes seriously restricted. Additionally, while written work remains the dominant mode of assessment, many of the valued literacy practices required for success are tacit – acting like a gatekeeper with a password only distributed to the chosen few; as Knain (2005, p. 620) puts it, "...those that are able to function according to the tacit rules of the game are offered identities as 'scientists', whereas those budding scientists finding the encounter with school science more problematic become left out". McKenna (2010) refers to the process of learning the tacit literacy practices of a Discourse as 'cracking the code' and convincingly argues that above hard work, motivation and language proficiency, it is this mastery of literacy practices that will determine student success or failure.

Mastery of literacy practices has not always been the goal of literacy interventions at university level. In the past, literacy was thought of autonomously as a generic set of transferable skills – general writing ability and grammar knowledge – especially among students whose first language was not English (Lea & Street, 1998). However, more recently the specialized literacy practices required to communicate effectively within different disciplines, independent of language proficiency, have been acknowledged. Furthermore, the introduction of social semiotics which looks at "...how we make meaning using the cultural resources of systems of words, images, symbols, and actions" (Lemke, 2004, p. 3), has led to more specific projects focused on writing within the disciplines including; Writing Across the Disciplines (Monroe, 2006), Disciplinary Literacy (Fang & Coatoam, 2013) and the Academic Literacies movement (AcLits) (Lea & Street, 1998, 2006). Both our research and teaching is informed by an AcLits approach to writing.

The AcLits framework acknowledges that different ways of knowing and identity influence student writing (Lea & Street, 1998). Similarly, research on scientific writing by authors such as Gardner (2012) suggest that writer identity and disciplinary context must be taken into account when teaching academic writing. These ideas link well with the ideas of culture and Discourse outlined above. In biology, literacy is intertwined with the social practices constituting the Discourse of biology, which include laboratory practices as well as 'ways of behaving, interacting, valuing, thinking, believing, speaking, and often reading and writing ...' (Gee, 2008). One manifestation of this link between literacy and the Discourse in laboratory report writing would be that students need to know what not to include in the report. For example, certain elements of good laboratory practice, e.g. labeling and using clean test tubes and beakers, can be assumed. Another manifestation could be the use of references, which reflects how scientists interact with one another and collaboratively contribute to extending scientific knowledge. Gee (2008, p. 140) argues that a Discourse can only be fully mastered through acquisition. This is a process whereby people acquire a Discourse through natural exposure to, rather than being explicitly taught, the elements of the Discourse and interactions with Discourse communities. Although Gee (2008) juxtaposes this with learning through teaching, he also says that explicit teaching of the elements of a new Discourse 'can facilitate metaknowledge' and improved understanding. This metaknowledge, knowledge about the Discourse, allows students to locate the new, or secondary, Discourse with respect to those they already have, and thus to critique and evaluate the new Discourse. This is of fundamental importance as the greater the difference between the Discourses one has already mastered and those one is trying to acquire, the more challenging that process will be. We would suggest that it is the unsuccessful mediation of this navigation of this process through appropriate scaffolding that contributes to high attrition rates and that only by making both the content knowledge and the literacy practices of the Discourse explicit can we begin to unravel the exclusionary academic culture in

¹ In South Africa, the legacy of apartheid means that disadvantage is often associated with race. During apartheid, people were classified as White, Black, Indian or Coloured (mixed race) and they were segregated not only in terms of location, access to jobs and freedom of movement but also in terms of education. For the purposes of social redress, the categories Black, White, Coloured and Indian are still used today and people are asked to self-identify according to these racial groups. As in other countries, these students are often from lower socioeconomic backgrounds (Hurtado, Eagan, & Chang, 2010; Olson & Riordan, 2012); however, unlike other countries, in South Africa Black and Coloured students are not in the minority, but rather represent majority populations.

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