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Position vectors, homologous chromosomes and *gamma rays*: Promoting disciplinary literacy through Secondary Phrase Lists

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ABSTRACT

The pedagogical approach of Disciplinary Literacy has been gaining recognition in secondary schools internationally. It shares much with English for Specific Purposes, though as yet there have been few interdisciplinary connections. This paper draws on ESP corpus research to produce innovative resources for developing disciplinary literacy, i.e. the *Secondary Phrase Lists*, a set of discipline-specific lists containing content word phraseology across multiple subjects. The current study builds on two recent trends in wordlist research. Firstly, there has been a debate over the extent of a general academic vocabulary, which has led to a focus on discipline-specific pedagogical wordlists. Secondly, there has been a movement toward capturing phraseology. The SPL combines these two trends. Furthermore, the paper contributes to theory as well as practice. The extent of a general academic vocabulary has been questioned by previous research that has found vocabulary and lexical bundles vary so much by discipline that a discipline-specific approach to vocabulary instruction should be adopted. The current study explores content word phraseology (e.g. *gamma rays*) and reports disciplinary variation greater than previous phraseological research into lexical bundles, suggesting limited general academic vocabulary for phrases of this kind, thereby supporting the need for discipline-specific resources that capture them.

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1. Introduction

Interest in disciplinary literacy as a pedagogy and research area has been rapidly spreading across educational systems worldwide. Disciplinary literacy has been particularly impactful in secondary education (Shanahan & Shanahan, 2017), and shares much in common with English for Specific Purposes (ESP), where the focus has been more on tertiary education. For example, both fields have generated an evidence base suggesting effective instruction needs to take into account the different language practices of the disciplines, and both have challenged the construct of a general academic literacy and vocabulary, emphasizing discipline specificity instead (Hyland, 2017). This paper draws on recent advances in ESP corpus research on discipline-specific phraseology and adapts them to produce innovative resources for promoting disciplinary literacy at

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secondary school. Content words and their patterns of use provide access to conceptual knowledge across many subjects, and a pedagogical resource that has been proven particularly useful in isolating them has been corpus-derived discipline-specific wordlists (Greene & Coxhead's 2015). However, as yet no phraseological resources have been produced outside the ESP tertiary context, yet the importance of concept-bearing phrases being as important as single words is explicit in disciplinary literacy research, e.g., Shanahan and Shanahan (2017) state: "vocabulary words differ from subject to subject… In social studies, for instance, words may be ideological in nature (affirmative action, reverse discrimination, Civil War, War Between the States, economic value, human capital)" (p.16). Note how the 'words' they highlight are all examples of concept-bearing phrases. On the one hand, previous corpus research has produced pedagogical phrase lists but these have largely been for tertiary education and focussed on lexical bundles rather than the more conceptual phrases that combine content words. On the other hand, discipline-specific wordlists of single vocabulary miss much vocabulary crucial to conceptual development in a discipline. This paper therefore reports on the development of *Secondary Phrase Lists* (SPL), discipline-specific phrase lists of noun–noun, adjective-noun, noun-verb, verb-noun, and verb-adverb phrases for eight secondary subjects: Biology, Chemistry, Economics, English, Geography, History, Mathematics, and Physics.

Two recent trends have occurred in the long tradition of corpus-derived wordlist research and development. The first is that the usefulness of general academic wordlists has been questioned in the context of debates over whether there is a core academic vocabulary (Durrant, 2016; Hyland & Tse, 2007), resulting in a movement toward discipline-specific pedagogical wordlists (Lei & Liu, 2016; Watson Todd, 2017). The second trend has been to move beyond single word resources to develop pedagogical material such as the PHRASE List (Martinez & Schmitt, 2012) and the Academic Formulas List (Simpson-Vlach & Ellis, 2010). The current paper combines these two trends. The current resources consist of discipline-specific two word phrases vetted for usefulness via metrics such as frequency, dispersion, ratio, mutual information (MI), and accompanied by teacher evaluations. They contain part of speech information and are controlled to content word combinations. Durrant (2009), for example, developed a list of 1000 academic two-word bigrams, of which 763 were lexical words combined with function words. He notes that teachers might find this disappointing if they are looking for the more concept-carrying phrases, e.g., *economic development* or *gravitational fields*. With respect to this, such phrases are captured by the SPL. The paper also contributes to theory as well as practice. The debate over the extent of a general academic vocabulary has been important to ESP/EAP (Dang, Coxhead, & Webb, 2017), with evidence indicating substantial variation in academic language across disciplines. This paper reports that when the distribution of lexical word phrases is analysed, the disciplinary variation in academic language is much more marked than previous studies have found with regard to lexical bundles and single words (e.g., Hyland, 2008).

2. Bringing together disciplinary literacy and English for Specific Purposes

Disciplinary literacy has been defined as "learning how to read, think about, write, communicate, and use information like each discipline's experts" (Zygouris-Coe, 2012, p. 36). In the classroom, disciplinary literacy entails seeing each subject area as a community of practice in which the teacher facilitates entry for students by helping them understand how to use language to access its conceptual knowledge and discourse practices. To gain expertise in a discipline, a student must acquire the concept-bearing words of that discipline, some of which are technical and some of which display less obvious discipline specificity, such as *process* being used more frequently as a noun in science and as a verb in the humanities (Hyland & Tse, 2007). The disciplinary literacy approach has been adopted in secondary schools in the United States, Norway, New Zealand, Singapore, Australia and elsewhere (Shanahan & Shanahan, 2017; Wilson, Madjar, & McNaughton, 2016), demonstrating its growing impact on international education.

Shanahan and Shanahan (2008, 2017) argue that literacy has three developmental trends, with disciplinary literacy being the desired final outcome. Firstly, students learn a vocabulary that is general. Secondly, learners build academic fluency by focussing on the vocabulary, grammar and registers needed for schooling. Finally, students acquire the specialized language patterns of the subjects and become disciplinary literate. The attainment of disciplinary literacy allows a student to succeed in a discipline (Gillis, 2014). Shanahan and Shanahan (2017, p. 20) note that this increasing specialisation requires well-designed pedagogical material graded for different year levels: "not until about middle school do texts become technical and specialized enough to profit from a disciplinary approach… [and] secondary school should lay out the disciplinary core ideas". Given the readership of this journal, it is likely clear from the above discussion that disciplinary literacy shares much in common with English for Specific Purposes, despite these being ostensibly different fields of research in different educational contexts. Shanahan and Shanahan's (2017) model for literacy development parallels Nation's (2016) view, from the tradition of corpus-based ESL research at the tertiary level, that a well-planned vocabulary curriculum should progress from general words such as the new GSL (Brezina & Gablasova, 2013), to general academic words such as the AWL (Coxhead, 2000), to discipline-specific/technical words, and finally to low frequency words.

ESP, using the tools of corpus linguistics, has advanced the methodologies for investigating discipline-specific language, yet there has been little cross-fertilization so far with disciplinary literacy in secondary education. Perhaps this is because of a certain academic fragmentation between researchers in Education and Applied Linguistics, tertiary and secondary education, and native and non-native speaker contexts. This is, however, starting to change, as evidenced by Greene and Coxhead's (2015) recent Middle School Vocabulary Lists which adapted the methodology of the Academic Word List (AWL) to produce discipline-specific wordlists for middle-school Maths, Science, English and Social Studies. Pedagogical resources informed by corpus methodology developed in the context of ESL educational research are increasingly relevant to the secondary sector. As Wingate (2012) states, there has been somewhat of a "failure to recognise that both native- and non-

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