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Interaction: Language and Science by Terry L. Powell. Glenview, IL: Scott, Foresman & Co., 1990. 290 pp.

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Interaction: Language and Science, by Terry L. Powell, is not a book on the discourse of science, as one might expect from its title. It is actually a reading textbook for students of English for Science and Technology (EST). Two criteria relevant to evaluating such a textbook are the extent to which the author has responded to schema theory and attended to material authenticity. While the book

does not rate high with regard to these criteria, it nevertheless does have some value, though, unfortunately, for only a very limited range of students.

The book is divided into six thematic groupings: biology, energy, statistics and economics, computers, tools, and new technology. Each grouping contains several units each of which revolves around a passage of approximately 500 words. Totalling thirty in all, these units are organized in an identical way and, as the author suggests in the preface, need not be taught sequentially. Each unit begins with a "Before You Read" section that asks the students to preview a reading passage by examining its title, subtitles, and figures. In the passage which follows, all technical terms, those specific to the subject, appear in bold print, while a list of what Powell calls "subtechnical terms" (i.e., "words that are common to a wide variety of scientific books") are defined at the end of the passage. After each reading passage is a section called "Understanding Vocabulary" which includes exercises on the technical and subtechnical vocabulary as well as exercises on relevant word parts. The next two sections are "Using Information," consisting of tasks which have the students scan and organize information from the passage, and "Understanding Structure," containing explanations of and practice with grammar that is supposedly common in scientific and technological writing. The book ends with an answer key and a glossary of all the subtechnical vocabulary.

The pre-reading exercises at the start of each unit are certainly consistent with reading schema theory, which holds that if a reader has certain expectations about a text prior to actually reading, he or she will understand that text more easily than if background knowledge was not activated in advance (Carrell & Eisterhold, 1983). Clearly, previewing skills are useful, and therefore taught in many ESL reading textbooks (e.g., Casanave, 1986; Latulippe, 1987). However, as Carrell & Eisterhold also note, previewing involves not only looking over a passage but also teaching a concept or raising an issue relevant to the passage. Content schemata, in fact, have been shown to be more important to comprehension than formal schemata (Carrell, 1987). Yet Powell has no exercises to orient a reader unfamiliar with a particular topic. One explanation for this oversight may be an assumption on the author's part that students already possess the appropriate background knowledge. Still, some content orientation exercises would likely benefit many students, especially undergraduates just

starting out in science and technology.

The passages themselves, because they are not acknowledged, appear to have been written specifically for this textbook. They resemble excerpts from technical textbooks as opposed to academic journal articles, which further suggests hat the supposed audience for this book is a student at the early stages of a scientific education. Nevertheless, many of the topics are relevant primarily to an engineering major, as is the case in the unit on the internal combustion engine and the one on control systems. However, Powell notes that any non-scientist can easily teach from the book, in part because all the field-specific technical words (e.g., spark plugs, isotope, hypothalmus, bellows, nebula) are defined in the clearly and simply written passages.

The subtechnical vocabulary defined at the end of each passage appears to be a good representation of words used across scientific and technical fields, although there is no indication what Powell's source is for determining this class of vocabulary. Some researchers have claimed that such a subtechnical vocabulary exists and indeed may cause difficulties for EST students (e.g., Trimble, 1985). The vocabulary tasks that follow are standard multiple-choice and fill-in-the-blank exercises.

The exercises in the "Understanding Information" sections are more innovative, however. In addition to scanning exercises, many units have students organize information from the passage using charts and tables. These information transfer exercises provide the students with an alternative to outline writing, a type of exercise which is often cumbersome and which rarely works well with short passages. Together with these kind of exercises, which help students extract meaningful information from the texts, there are also several thought-provoking discussion questions that ask the students to relate what they have read to real-world knowledge.

Finally, while the grammar sections provide a useful review of what might be troublesome linguistic structures for intermediate students, the exercises are rather mechanical and uninspired. The explanations cover, for example, passives, noun compounds, infinitives of purpose, connectors showing contrast, and clause reduction, all of which are used (and not overused) by Powell in the passages. However, research has not conclusively determined whether these features are actually more common in scientific writing than in other types of discourse. Furthermore, whether grammatical exercises focusing on such points will actually improve a student's reading ability is an open question.

How this book relates to authenticity of reading materials for EST is worthy of discussion. Clearly, the passages are non-authentic in that they are not taken from any source nor do they appear to have been adapted. Powell must believe that some aspects of authenticity are important, however, for he states that he has tried to use grammatical structures and the lexicon of science in the passages. Why then did he not choose passages from actual scientific texts? While he does not say, it might be that having decided on a length limit for the passages (for reasons also not explained), Powell found that collecting a set of self-contained passages of this length was too difficult.

But despite Powell's orientation to the authenticity of grammar and lexicon, Phillips & Shettlesworth (1987) have claimed that syntax and lexis are not necessarily the most important elements in controlling written discourse. They stress that what the text is used for as an activity is more important for fostering authenticity. And thus, perhaps the test of a book such as this is whether it has students use the passages as a scientist, or at least a science undergraduate, might actually use them. To his credit, Powell does ask students to apply the information from the passages to new situations, forcing them to go beyond mere decoding and comprehension. However, because the passages are so short, it seems it would be difficult to simulate in the classroom what science majors or scientists actually do with readings in their field.

Does such a textbook, then, have a place among authentic materials in an EST class? Brinton et al. (1989), in their discussion of content-based materials, argue for supplementing authentic materials with commercial textbooks. However, they warn "that these materials be selected carefully for their relevance to course objectives" (p. 92). Given the discussion above, it seems that this type of non-authentic text, even if not ideal, could be beneficial as a supplementary textbook for improving vocabulary and reading fluency.

With this caution in mind, for what types of learners and course can this book be used? The preface describes the book as an intermediate-level text for ESL or EFL students "who are planning to be specialists in a scientific or technical field" and who "need to read and understand technical textbooks and source materials." Yet, with the exception of a few units, the book is not appropriate for a general university EST class because of its many engineering and economics passages, although it may be useful for a class population in a technical or engineering school with a more restricted

range of majors. Certain sections of the book would be relevant to the needs and interests of ESL learners in particular specialized academic disciplines, for example, the biology section to biologists or the economics section to economists. But how often does a general ESL/EST teacher have only biology or only economics students? In a mixed EST class, a biology student would probably not want to read about an internal combustion engine, nor would an economics student want to read about biomes and food webs. And even with a specialized class population, most teachers would not ask their students to purchase a book from which only a limited number of units will be exploited. However, Powell also states that the book can be used for self-study, and therefore could be a worthwhile addition to a learning lab where students could choose those sections of the book they were interested in.

A major flaw of this book is its misleading title which does not suggest that it is a reading textbook but seems, rather, to imply that the book is about the language of science. Furthermore, most people think of "science" as biology, chemistry, and physics, not engineering and economics. And finally, the word "interaction" is used in the title because, according to Powell, reading is an interactive process and the student must be actively involved with the text, the teacher, and other students. However, with the exception of the discussion questions, the contrary is true about the approach to reading taken by the book: *Interaction: Language and Science* is a better book for self-study because for most of the exercises the teacher and other students need not be involved. If the discussion questions are not used, there is little "interaction" with the text.

In sum, *Interaction: Language and Science* is well organized, clear, and contains some apparently beneficial exercises. However, it is probably less useful for a mixed university EST class and more relevant to a group of students at a technical or engineering school. Given the right population of learners, then, the book is appropriate for either self-study or as supplemental material in a reading class, but not as the principal text in an EST class.

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