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| Author(s) | Seah Lay Hoon |

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The Rationale and Conditions for Teaching Disciplinary Literacy in Science: A Brief Introduction

By Seah Lay Hoon



Introduction

WHAT KNOWLEDGE AND skills do reading and writing science entail? Recent research has thrown new light on this question by shifting our focus from content knowledge to include the language and literacy demands that are unique to the discipline. This has led to the emergence of the notion of disciplinary literacy. In this write-up, I will briefly introduce the notion of disciplinary literacy and how it is related to the concept of “scientific practices”. Some implications for pedagogy and future research are also discussed.

Disciplinary Literacy

Various definitions of disciplinary literacy abound depending on the scope of the term “literacy”. For some researchers and educators, the notion is confined to reading and writing whilst others have a broader perspective that includes oracy and/or thinking skills (see ELIS Research Digest Vol 1, Issue 1 for a concise review). Whatever its reach, this notion fundamentally “emphasizes the unique tools that the experts in a discipline use to participate in the work of that discipline” (Shanahan & Shanahan, 2012, p. 8). One unique tool of science that sets it

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apart from other disciplines is language. Scientific language involves not just the use of linguistic resources but a wide array of representations such as diagrams, graphs, tables, and charts. I will however focus mainly on the distinctiveness of the linguistic resources used in science.

Scientific Language is Unique

Studies utilizing the functional grammar framework have examined the language of science and unpack its distinctive features at different levels. At the lexicogrammatical level, scientific language is characterized by its vast specialist vocabulary, the use of grammatical metaphors (including nominalizations) and the unique use of other grammatical items such as prepositions, conjunctions, and pronouns (Fang, 2005). These lexicogrammatical resources are then put together in ways that fulfill the linguistic norms and requirements of various science genres (Unsworth, 2001). Scientific language also differs from everyday English and other disciplinary languages in features such as its high lexical density and its preference for passive over active voice (Fang, 2005).

Why Focus on Disciplinary Literacy?

It is important to note that the distinctive features of scientific language are not arbitrary but have evolved to meet the specific needs of the discipline. Understanding the form-function relations of scientific language enables one to better understand and appreciate how the language operates to construe scientific meanings. It is true that not all proficient readers and writers of science necessarily

have explicit knowledge of how scientific language originated. Nonetheless, providing access to such knowledge *about* scientific language can help learners who are struggling with the language be better equipped with the means to unpack scientific texts. Empowered with such tools, they stand a higher chance of developing into independent and critical readers and writers in science.

Relation to Scientific Practices

The ability to use the language of science is crucial if students are to be proficient in engaging in the various literacy practices of science. The latter can be considered as a sub-set of scientific practices, that is, established processes scientists engage in as they construct models and theories to explain the natural phenomena in the physical world. For example, among the list of scientific practices highlighted in the Next Generation Science Standards (NGSS) developed in the United States, “asking questions”, “constructing explanations”, “engaging in argument from evidence” and “obtaining, evaluating, and communicating information” directly invoke the use of scientific language. Indeed, some researchers would assert that ‘nothing resembling what we know as western science would be possible without

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– *Seah Lay Hoon,*
Learning Sciences Lab, NIE

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[scientific] text”, and that “reading and writing do not stand only in a functional relationship with respect to science” but are ‘constitutive parts of science’ (Norris and Phillips, 2003, pp. 224–226).

Pedagogical Implications

In light of the importance and uniqueness of scientific language, there is a need for science instruction to focus not just on learning science through language but also learning the language of science (i.e. the reading and writing of science) as well as learning about the language itself (such as its form-function relations). Engaging in the three modes of learning does not necessarily entail different learning tasks and activities. It is more important that teachers consider the language demands as well as the kinds of opportunities their learning tasks and activities afford in helping learners to see the relations between the language used and the scientific meanings/practices construed by it. Certain tasks and activities have greater potential for generating discussion about the form-function of scientific language than others, which in turn could deepen students’ integrated understanding of both the content knowledge and representational means of science. Such tasks would usually entail the elicitation of students’ use of language and provide opportunities for students themselves to compare and evaluate the different ways in which language is used by them and the scientific community.

Future Research

As disciplinary literacy is a relatively new area of research, more work is required to identify the principles for designing such integrated learning

tasks and activities. Executing such tasks would also demand more of the teachers’ knowledge and skills than they are currently trained for. Such knowledge would include knowledge about scientific language, knowledge about students in terms of their use of language and knowledge about strategies for teaching disciplinary literacy. Further research about what these various domains of knowledge constitute and how they shape teachers’ instruction would be crucial if we are to leverage on the notion of disciplinary literacy in empowering our students to become more proficient and critical readers and writers of science.

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About the Speaker

Seah Lay Hoon is a Research Scientist with the Learning Sciences Lab, a research centre under the Office of Education Research at the National Institute of Education, Singapore. Her current research work focuses on students’ use of linguistic resources in science classrooms and how teachers can enhance students’ use of the scientific language.