The Disciplinary Literacy Discussion Matrix: A Heuristic Tool for Initiating Collaboration in Higher Education

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Abstract: In this article, I address the issue of collaboration between content lecturers and language lecturers or educational researchers. Whilst such collaboration is a desirable goal for disciplinary learning in monolingual settings, I suggest it takes on extra significance when two or more languages are involved in teaching and learning a discipline. Drawing on work in the area of scientific literacy, I make a case for the concept of disciplinary literacy as a useful vehicle for such collaboration, with the Carnegie Foundation's notion of the scholarship of teaching and learning (SoTL) being used as the overarching motivation. I argue that input from peers in other disciplines can help content lecturers, make informed decisions about the particular mix of communicative practices that are needed to develop disciplinary literacy in their courses. Clearly, this mix will be different from discipline to discipline and indeed vary within a discipline depending on the local linguistic environment and the nature of the course under discussion. As an aid to collaboration, I present a simple heuristic tool for initiating inter-faculty discussion—the Disciplinary Literacy Discussion Matrix. Using the matrix, content lecturers can discuss the disciplinary literacy goals of their teaching with other professionals, making their own decisions about the particular mix of communicative practices desired and the most appropriate methods for promoting these. [1]

Undergraduate learning is a complex process that has been likened to cracking an intricate disciplinary code (Middendorf & Pace, 2004). In this respect, Säljö (2000) suggests that many of the problems experienced by undergraduate students actually relate to difficulties in interpreting and using specialised disciplinary communicative practices that are not readily encountered in everyday life. Thus, I argue that content lecturers, as disciplinary insiders, have an important role to play in disambiguating these disciplinary communicative practices for their students. Unfortunately, this process of disambiguation has been shown to be particularly problematic for content lecturers. Northedge (2002) for example, suggests that content lecturers are often unaware that meanings they take for granted may be impossible to construe from outside the specialised discourse of the discipline.

In an ingenious illustration of this "taken-for-grantedness" Tobias (1986) invited humanities and social science professors from the University of Chicago to attend and critique a specially arranged

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series of introductory lectures given by experienced faculty from the physics department. The observations of these non-physics professors highlighted numerous instances where the physicists believed they had unambiguously unpacked their subject matter, but had, in fact, simply left their audience frustrated and perplexed. In the spirit of Tobias's work, Jacobs (2007) claims that by asking the questions a novice would, peers from outside the discipline may be able to help content lecturers uncover the tacit rules that govern their disciplinary discourse.

Here, I argue that discussions with either language lecturers or educational researchers will be particularly useful due to the tools available to these professionals to analyse discourse and/or learning potentials. Such discussions have the distinct possibility to help content lecturers in the task of disambiguating the communicative practices of the discipline for their students. This is clearly important for disciplinary learning in monolingual settings, but takes on extra significance when two or more languages are involved in teaching and learning a discipline. In such settings, research suggests that content lecturers may not have fully problematised questions like: which course should be given in which language, how code-switching should be treated in the classroom and, most importantly, the focus of this paper, namely what the desired level of disciplinary communicative competence in each of the languages is and how this will be developed and tested within the course (Airey, 2009).

In this paper I propose a heuristic tool for the initial structuring of discussions between content lecturers and language lecturers or educational researchers, based around the concept of disciplinary literacy. But I will begin by suggesting that an appeal to the scholarship of teaching and learning may function as a lever when attempting to initiate such peer discussions.

The Scholarship of Teaching and Learning

In 1990 in his seminal work for the Carnegie Foundation, *Scholarship Reconsidered* Ernest Boyer suggested that the work of university faculty consists of four scholarships; discovery, integration, application and teaching. It is Boyer's fourth category, the scholarship of teaching—later recast as the scholarship of teaching and learning (SoTL)—that underlies the collaboration argument I put forward in this paper. One of the main thrusts of SoTL is that faculty ought to treat their teaching in the same way as they treat their research. Teaching, it is argued, should not be an isolated, individual activity, but rather, should be grounded in the work of others. Further, just as research is published and peer-reviewed, knowledge about teaching and learning should also be openly shared and critiqued. For language lecturers or educational researchers, it can be argued that a major part of SoTL involves the sharing of pertinent research findings with content lecturers. Similarly, for content lecturers, SoTL involves being informed about research results with relevance for teaching and learning of their discipline. Thus, I argue that SoTL can provide a natural lever for collaboration in higher education.

Disciplinary Literacy

If we accept SoTL as an appropriate motivation for initiating collaboration in higher education, the next question we face is one of what to collaborate around. Here, I suggest that a suitable basis for collaboration between content lecturers and language lecturers or educational researchers can be found in the content lecturer's disciplinary learning goals. These goals will of necessity be both explicit and tacit. My aim in this paper, then, is to present a heuristic tool that can be used to aid content lecturers in articulating and interrogating these goals through a process of discussion with professionals from other areas.

Although not explicitly mentioned in the curriculum, I have previously argued that the overarching goal of Swedish undergraduate science can be viewed as the fostering of scientific literacy (Airey, 2009; Airey & Linder, 2011). In this paper I develop and extend this theme, claiming that the concept of disciplinary literacy may function as a useful shorthand for the goals of any undergraduate degree programme. Clearly for this claim to make any sense I will need to define what is meant by disciplinary literacy. Here, I take as my starting point James Paul Gee's definition of literacy.

Gee (1991) suggests that we have one primary discourse—the oral language we learn as a child—and many secondary discourses—specialised communicative practices used in other sites outside the home. Gee defines literacy as control of these secondary discourses. The first observation I would like to make here is that, in Gee's terms, literacy refers not only to reading and writing, but all manner of communicative practices. By implication then, disciplinary literacy involves more than simply learning to read and write the discipline—listening, speaking and other forms of disciplinary communication are included. I will return to this so-called multimodal approach later.

Building on Gee's generic definition of literacy I define disciplinary literacy as follows:

Disciplinary literacy refers to the ability to appropriately participate in the communicative practices of a discipline.

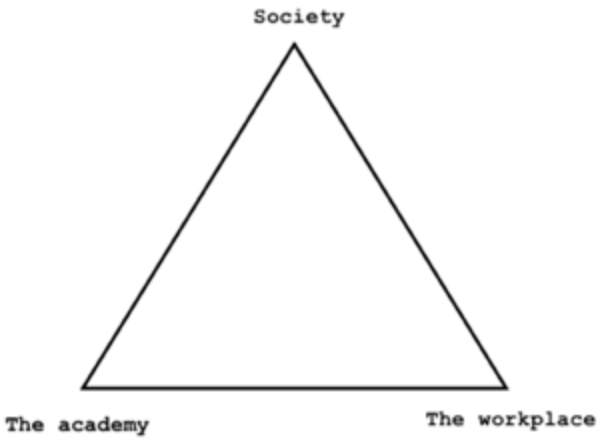
The second observation I would like to make about Gee's definition of literacy is that it is context dependent—there are multiple literacies, each specialised for a particular site outside the home. Disciplinary literacy then, will need to say something about the contexts in which these communicative practices are to be enacted. On the face of it, this question appears trivial—disciplinary literacy clearly involves appropriate participation in disciplinary communicative practices within the academy. However, I would argue that the picture is more complex than this. First, as I mentioned earlier, I would like to draw a direct parallel between the term scientific literacy and disciplinary literacy. Roberts (2007) suggests that when we use the term scientific literacy we are, in fact, referring to literacy in two particular sites—the academy and society. The goals of any degree programme will reflect a particular mix of these two. Thus, disciplinary literacy can be argued to refer to communicative practices both within the academy and in society at large. Second, in their discussion of communities served by various disciplines, Petersen and Shaw (2002) identify four potential communities—the international disciplinary, the local disciplinary, the international professional and the local professional.

> The relative importance of the four depends on a variety of factors, including the nature of the discipline. In "pure hard" disciplines like physics, the international disciplinary community dominates. In "pure soft" disciplines such as history or language studies, the local disciplinary community—and hence publication in L1—is very significant (Ammon, 1989). In applied disciplines, hard or soft, input from the community of professionals (cf. Becher, 1989, p. 147) and discussion with it is essential. (Petersen & Shaw, 2002, p. 368-369)

Building on these two sources, I therefore suggest that the disciplinary literacy developed in undergraduate programmes is designed to function in three particular sites: the academy, the workplace and society. Each of these sites has the potential to be divided into a local and an international form. The international forms will almost certainly involve English, whilst the local forms may involve one or more other languages. The relationship between the three sites is represented in Figure 1. Disciplines are located somewhere within the triangle according to the emphasis placed on literacy for each of the three sites. A discipline that values all three sites equally would thus be located equidistant from each of the three apexes of the triangle. Primarily academic

studies such as theoretical physics or pure mathematics would then be located closer to the 'academy' apex, whereas vocational degrees such as nursing and teacher training would be located nearer the 'workplace' apex.

Figure 1



The disciplinary literacy goals of an undergraduate course refer to three different sites, the academy, the workplace and society. Disciplines are located at some point within the triangle according to the emphasis placed on communicative competence within each of the three sites.

Clearly, the emphasis placed on communicative practices will vary from course to course within a particular degree programme, in fact, it is highly unlikely that one course alone could encompass all the desired aspects of disciplinary literacy. Rather, one would hope that the communicative practices developed in each of the separate courses of a degree programme would together constitute disciplinary literacy. Thus, I argue that for each new course and disciplinary concept that students meet, content lecturers ought to be clear about: the extent to which they wish students to access this knowledge to communicate in each of the three sites, which language(s) this will entail, and how the communicative practices developed in the course relate to the overarching disciplinary literacy goals of the entire degree programme. By extension, this also means putting in place mechanisms for developing and assessing the desired communicative competence.

Here, it may be interesting for the reader to note that the majority of students in my studies of Swedish undergraduate physics were actually able to give explanations of physics concepts in both English and Swedish. Although explanations in the students' second language (English) were markedly slower and exhibited a much higher level of hesitations and false starts, they contained essentially the same information from a disciplinary point of view. This, despite the fact that parallel language use was not mentioned as a goal in the course syllabus (Airey, 2010).

Before I move on I would like to briefly address the question of who should make decisions about disciplinary literacy. Returning to my own definition of disciplinary literacy, we can imagine that it is theoretically possible to document, classify and to some extent explain the multiple communicative practices of a discipline, in the three sites, but what of appropriate participation? Who decides what is appropriate? This, I believe depends on a (mostly tacit) consensus among those working in a discipline—what Gee (2005) describes as pulling off participation in a Discourse. Thus, I assert that it is content lecturers, rather than their discussion partners in languages or educational science, who must make the final decisions about the particular mix of communicative practices that is needed to

achieve disciplinary literacy. The goal of the discussions envisaged in this paper is to inform and guide content lecturers in this task by attempting to make the tacit explicit.

Multimodal Literacy

So far I have limited my discussion of disciplinary literacy goals to the use of languages in various settings. However, as I mentioned in the previous section, there are in fact many more communicative practices than simply reading and writing the discipline. Gee gives us the following example: "Think of all the words, symbols, deeds, objects, clothes and tools you need to coordinate in the right way at the right time and place to "pull off" (or recognise someone as) being a cutting edge particle physicist…" (Gee, 2005, p. 27).

Whilst one might question the desirability of faculty dictating student dress codes, the point that other modes of communication than language are involved in disciplinary literacy is an important one. In my own doctoral work in the area of university physics it quickly became clear to me that language was an insufficient unit of analysis to explain the richness of the data I was collecting. Language seldom appeared alone in undergraduate science—other modes of representation such as graphs, diagrams, mathematical formulae, hands on work with experimental apparatus, etc. were all clearly important parts of disciplinary literacy (Airey, 2009). Thus, I suggest that it is important to include communicative practices other than language in any discussion of disciplinary literacy goals. Here it is also important to recognise that each of these 'non-language' modes involve two forms of control: interpretive (cf. reading a text) and generative (cf. writing a text). It is therefore important for lecturers to decide if interpretive control of a given mode is sufficient or whether generative control is also necessary.

Multimodal Teaching and Learning

So far I have discussed disciplinary literacy in terms of the communicative practices content lecturers would like their students to learn to control. There is, however, another aspect to these communicative practices—one that content lecturers are often much more interested in—namely their affordances for learning the content at hand. As Halliday & Martin (1993, p. 9) point out, communicative practices do not passively reflect pre-existing disciplinary concepts; on the contrary, they are actively engaged in bringing such concepts into being. Mastering content, therefore, depends on mastering the communicative practices with which the disciplinary knowledge is construed (Lemke, 1990).

My observations of undergraduate physics teaching and learning led me to theorise that there is a critical constellation of communicative practices that students must learn to control in order to be able to appropriately understand any given disciplinary concept (Airey & Linder, 2009). Two questions lead out of this assertion. First, what happens if students have not yet learned to control the critical constellation of communicative practices necessary for understanding the concept at hand? Here I suggest that students imitate the disciplinary discourse (cf. Bakhtin's (1953/1986) "ventriloquation," diSessa's (1993) "learning slogans," and Northedge's (2002) "fuzzy meaning"). The second question is how do students develop control of these communicative practices? Here I suggest that this is done through repetitive practice—what Linder and Marshall (2003) call purposeful repetition.

There are a number of important recommendations stemming from this work. For example, I suggest that content lecturers need to identify the particular constellation of communicative practices that can afford access to a given disciplinary concept. Next, I argue that students need to be given the

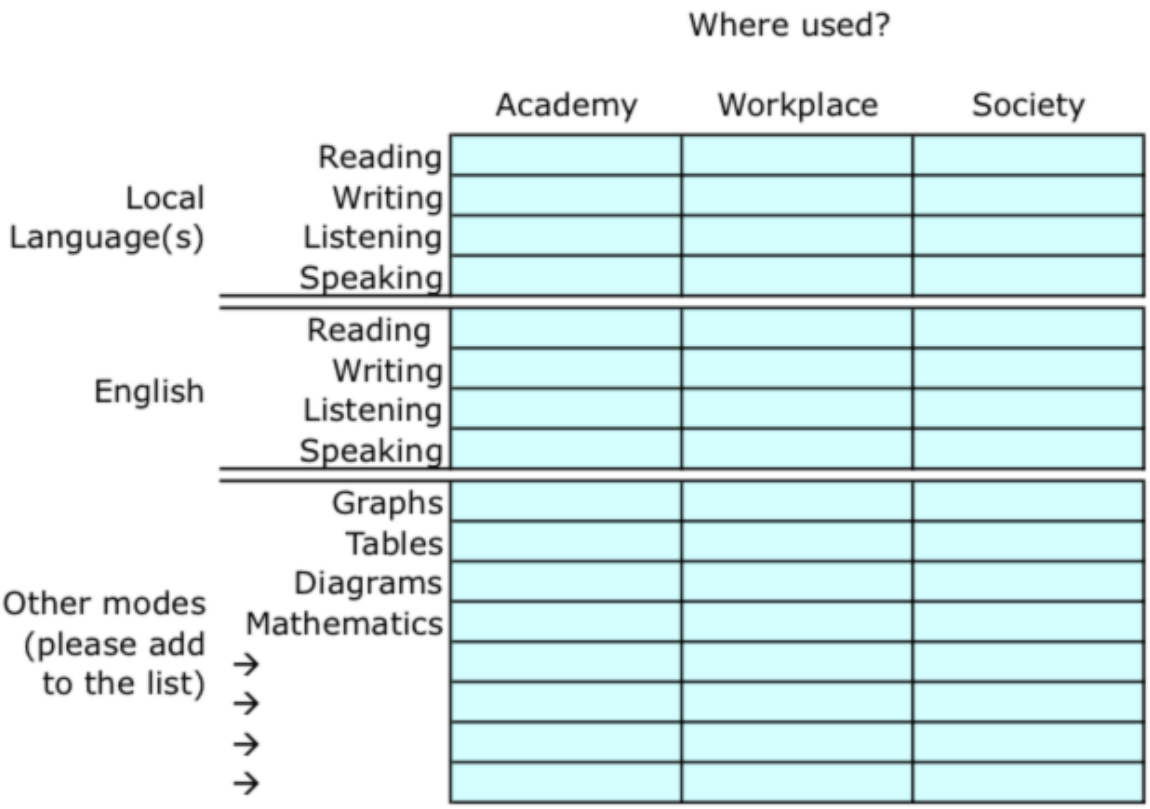
opportunity to repeatedly use this set of disciplinary communicative practices in a structured way as an integral part of their courses. Here, it has also been claimed that translation between modes may help students in their learning (cf. Duval, 2006, 2008; Stern, Aprea, & Ebner, 2003). Similarly, since students are known to strategically place a higher value on learning for examinations, I have also proposed that these too should be multimodal.

I suggest that through discussions with educational researchers, content lecturers may be afforded the possibility to bring into focus these multimodal aspects of the teaching and learning of their discipline.

The Disciplinary Literacy Discussion Matrix

I am now in a position to bring together the discussion of disciplinary literacy presented thus far in a simple heuristic tool—the Disciplinary Literacy Discussion Matrix (Figure 2). The three columns of the matrix correspond to the three sites discussed earlier in which disciplinary literacy may be enacted (academy, workplace and society). The rows of the matrix relate to languages and other communicative practices that students may need to learn to control. Note, that this particular version of the matrix has been designed for use with physics lecturers working in a bilingual environment; the matrix would naturally need to be redrafted for use with other disciplines and contexts. I suggest the matrix (or something similar to it) has the potential to provide structure for an initial discussion about the disciplinary literacy goals of content lecturers.

Figure 2. The Disciplinary Literacy Discussion Matrix



Content lecturers are invited to check those cells they believe students need to master with respect to the course in hand. Collaboration is initiated by discussing each cell of the matrix in turn (including those cells that were left unchecked).

Using the Matrix

Prior to a discussion, the content lecturer (in this case a physics lecturer) simply checks those cells of the matrix that are felt to be important for students to master in the particular course to be discussed. Note, that at this stage content lecturers are also invited to add rows in the multimodal section of the matrix. The completed matrix then forms the basis for a discussion about the disciplinary literacy goals of the course at hand. The discussion proceeds by examining each cell in turn—including those that are not checked. The reason for working through the unchecked cells is the potential for revealing the existence of tacit goals with respect to these aspects as outlined in the introduction to this paper. The discussion of each cell of the matrix should centre around the various 'text' types that students need to control and, for the 'other modes' category, the type of control needed—interpretive or generative. Once a particular communicative practice has been discussed, five possible follow-up questions arise:

1. How will students be given the opportunity to develop the desired control of this communicative practice during the course?
2. How will this development be assessed?
3. How could this goal be included in the course syllabus?
4. How does the development of this particular communicative practice in this particular course relate to the desired development during the undergraduate degree as a whole and the concept of disciplinary literacy?
5. How does this particular communicative practice function together with other communicative practices to mediate disciplinary knowledge? I.e. What constellation of communicative practices do students need to master in order to learn in this course?

At this point I envisage the matrix as having served its purpose—a dialogue should have developed based around the content lecturers' disciplinary literacy goals.

Conclusions

In this paper I have focussed on the development and use of the Disciplinary Literacy Discussion Matrix to initiate inter-faculty discussions centred around the disciplinary literacy goals of a particular undergraduate course. Conceivably collaboration might go no further than this. However, I suggest that once started, these discussions have the potential to lead to deeper collaboration between like-minded individuals. Clearly, another use of the matrix could be as a basis for intra-faculty discussions, potentially enabling lecturers in the same subject area to reach a consensus about the disciplinary literacy goals of a whole undergraduate programme.

The Disciplinary Literacy Discussion Matrix represents a first attempt to initiate a discussion of educational and linguistic aspects in a format that is accessible to content lecturers. Clearly this is a work in progress. The matrix is now being piloted with physics lecturers in South Africa and Sweden. It is my hope that others—be they content lecturers, language lecturers or educational researchers—might adapt some of the ideas presented here for their own ends. Finally, I am convinced that

collaboration around the notion of disciplinary literacy in the spirit of SoTL has the distinct potential to promote teaching and learning in higher education.

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Notes

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