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## Disciplinary Knowledge Making and Academic Discourse

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This chapter starts by outlining, in broad terms, the relationship between disciplinarity and academic discourse, discussing how dominant knowledge-knower structures found in different disciplines may shape the rhetorical and discourse strategies used by members of these disciplines in academic communication. It then presents the findings of six recent studies on cross-disciplinary differences in various aspects of academic discourse and rhetorical practices and relates these findings to disciplinary epistemologies. By way of conclusion, the chapter discusses pedagogical implications that follow from the findings of the reviewed studies and proposes pedagogical strategies for socializing students into the academic discourse of their chosen disciplines.

Keywords: academic discourse, English for academic purposes, rhetorical practice, disciplinarity, epistemology, knowledge-knower structure

### INTRODUCTION

As a result of academic socialization, research training, and scholarly communication, members of an academic discipline share deep-seated epistemological assumptions and practices (Cohen, Manion, & Morrison, 2011). One set of such assumptions concerns the very nature of the reality to be investigated. Such assumptions are known as ontological assumptions. Ontological assumptions about research address fundamental questions such as: “Is reality external to us, that is, independent of the influences of our mind?” or “Is reality the very product of our cognition, i.e., created by our consciousness?” Other assumptions address the nature of knowledge, the forms that knowledge can take, and the means of obtaining knowledge. These are known as epistemological assumptions and deal with important questions such as “Is knowledge explicit, objective, and capable of being communicated in a tangible form from person to person?” or “Is knowledge of a soft, subjective, unique nature that has to be personally experienced?” They also address the question of whether research should aim to discover universal laws that can be used for explanation and prediction or just to interpret and understand how different individuals create, shape, and interpret the world in which they find themselves. Finally, there are assumptions about how research should be conceived and conducted, that is, how research can best capture the object of

study. These methodological assumptions address important questions of whether the researcher needs to be as detached from the researched as possible (using objective research designs to uncover the truth out there) and whether only unbiased observations of independent reality can give rise to scientific knowledge.

Different combinations of the aforementioned assumptions have evolved to undergird different disciplines of scientific inquiry. As can be seen in Figure 1, these configurations of assumptions have given rise to different disciplinary cultures and knowledge-making practices, including the preferred rhetorical and discourse strategies for scientific communication or, in the words of Hyland (2011, p.12), “the distinctive ways disciplines have of asking questions, addressing a literature, criticizing ideas, and presenting arguments.”

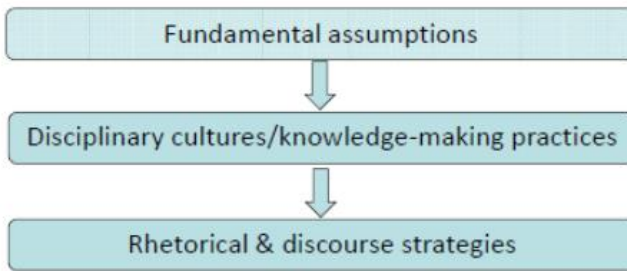


Figure 1. Relationship between fundamental assumptions, disciplinary culture and academic discourse

## **DISCIPLINARY KNOWLEDGE-KNOWER STRUCTURES**

British sociologist Basil Bernstein (1999) points out that different structures underlie academic knowledge produced by different disciplines. He divides these structures into two broad categories: hierarchical and horizontal knowledge structures. Hierarchical knowledge structures are characteristic of the natural sciences, which aim to create “very general propositions and theories” and integrate knowledge across “an expanding range of apparently different phenomena” (Bernstein, 1999, p.162). Horizontal knowledge structures, on the other hand, are characteristic of the humanities and the social sciences, where knowledge is produced by “specialized modes of interrogation” and represented in “specialized languages” (Bernstein, 1999, p.162). Since knowledge in different disciplines takes different forms and is organized differently, hierarchical and horizontal knowledge structures in essence privilege different ways of knowledge accumulation and growth. For a discipline dominated by a hierarchical knowledge structure, knowledge growth takes the form of theory development; that is, a more general inclusive theory will integrate a previous theory which may be more particularistic. This can be

visualized as a triangle in Figure 2, where the tip represents a small number of general theoretical propositions and the base represents the wide range of empirical phenomena covered by the propositions. By contrast, in a discipline characterized by a horizontal knowledge structure, there exist multiple codes of legitimation used to make and justify knowledge claims. These specialized languages “make different and often opposing assumptions, with each language having its own criteria for legitimate texts, what counts as evidence, and what counts as legitimate questions, or a legitimate problematic” (Bernstein, 1999, p.163). Thus, as Figure 3 indicates, a horizontal knowledge structure produces knowledge by introducing new languages. In Bernstein’s words, a new language “offers the possibility of a fresh perspective, a new set of questions, a new set of connections, and an apparently new problematic, and most importantly, a new set of speakers” (p.163).

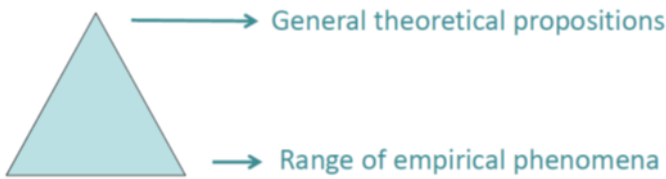


Figure 2. Hierarchical knowledge making



Figure 3. Horizontal knowledge making

Karl Maton extends Bernstein’s theorizing of knowledge structures to include a knower dimension. Maton argues that apart from the epistemic dimension of knowledge, there is also a social dimension of knowledge production and organization because “social power and knowledge are intertwined, but irreducible to one another; knowledge comprises both sociological and epistemological forms of power” (2000, p.149). As in Bernstein’s conceptualization of knowledge structures, Maton distinguishes between hierarchical and horizontal knower structures “by the degree to which they integrate and subsume new knowers” (2010, p.164). A hierarchical knower structure can be portrayed as a pyramid of knowers, where the ideal knower occupies the pinnacle position and new knowers are integrated into the existing structure and occupy the lower levels of the pyramid. A horizontal knower structure, by contrast, de-emphasizes the biological or social

backgrounds of the knowers and allows for more equal and independent relationships among them. Furthermore, Maton combines the knowledge and knower dimensions and proposes that each disciplinary field is characterized by a distinct knowledge-knower structure. Generally speaking, the hard sciences integrate hierarchical knowledge structures with horizontal knower structures. The humanities, on the other hand, combine a horizontal knowledge structure and a hierarchical knower structure. These two contrasting types of knowledge-knower structure represent a knowledge code and a knower code respectively. Disciplines dominated by a knowledge code have a more structured hierarchical body of knowledge that is verified against established scientific principles and procedures (Maton, 2014). In such disciplines, the backgrounds of the scientists or “knowers” are largely irrelevant to knowledge-making. By contrast, disciplines operating with a knower code depend more on the distinct individual characteristics of academics constructing disciplinary knowledge. Knowledge claims tend to be legitimated by appealing to knowers’ personal voice, expertise, experience, and authority. Depending on the particular combinations of specific knowledge and knower orientations, disciplines can be located on a continuum ranging from the knowledge code at one end to the knower code at the other (Maton, 2014). Figure 4 from Cao and Hu (2014, p.28) is a visual representation of three disciplines on this continuum. Psychology is the most knowledge-oriented, whereas applied linguistics is the most knower-oriented, with educational research falling in between.

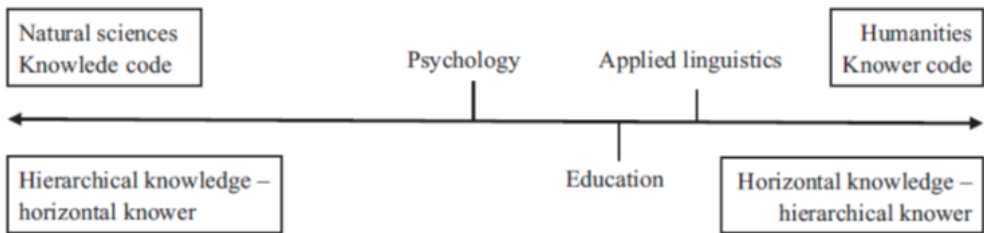


Figure 4. Three disciplines’ relative positions on the continuum of knowledge-knower structures

### **CROSS-DISCIPLINARY DIFFERENCES IN ACADEMIC DISCOURSE: SIX EMPIRICAL STUDIES**

Different knowledge-knower orientations underlie discipline-specific academic discourse (Hu & Liu, 2018). This is borne out by several research projects that my collaborators and I have completed in the last few years to investigate different aspects of academic writing.

## **Disciplinary and Intertextual Practices**

The first project reviewed here found disciplinary influences on academic discourse in an area that is probably least expected. Hu and Lei (2012) conducted a study to investigate Chinese EFL students' knowledge of and attitudes toward two prototypical forms of plagiarism widely recognized as such in the Anglo-American academic world: unacknowledged copying (henceforth "blatant plagiarism") and unattributed paraphrasing (henceforth "subtle plagiarism"). Participants in this study were 270 Chinese undergraduate students from two universities in China. They majored in four different disciplines: computer engineering ( $n = 64$ ), mechanical engineering ( $n = 63$ ), English language studies ( $n = 64$ ), and business studies ( $n = 79$ ).

One of the research questions we hoped to answer was whether students' disciplinary background would relate to their ability to recognize the two forms of plagiarism. To address the research question, a plagiarism detection instrument developed by Wheeler (2009) to study Japanese university students' perceptions of plagiarism was adapted and used to collect the data for this study. The adapted instrument included three rating tasks. In Task 1, the participants were asked to use a rating scale of 0-10 points to evaluate a short English text on Christmas celebrations in the USA and China. They were also asked to explain their ratings in writing. The text was titled "Christmas is different in America and China," dated 26 May, 2006, and said to be a homework assignment handed in by a fictional student named Yang Min. It was a well-structured passage written in correct, fluent, and idiomatic English. After they completed Task 1, the participants' task sheets were collected immediately, and the second rating task was administered. In this task, the participants were given two English texts. The first one was a short passage titled "Christmas differences: The United States and China." It appeared to be authored by someone named John Smith and was published in a journal in June, 2002. The second text was the same one Yang Min submitted as his homework assignment. A cursory comparison of the two texts would reveal that Yang Min's passage was virtually a verbatim copy of John Smith's journal article without any acknowledgement. Thus, it would be seen as a clear case of blatant plagiarism in Anglo-American academia. The participants were instructed to read John Smith's journal article first and then reevaluate Yang Min's passage. They were asked to give written explanations of their ratings. Upon completion of Task 2, their reevaluations of Yang Min's passage, together with their written justifications, were collected before Task 3 was administered. In Task 3, the participants were again instructed to read John Smith's journal article before they proceeded to evaluate another short English text purportedly written by another fictional student named Li Yun. Once again, they were asked to justify their ratings. Li Yun's text was an unacknowledged close paraphrase of John Smith's journal article and, thus, was a prototypical case of

subtle plagiarism in Anglo-American academia.

To find out if there was a relationship between disciplinary background and the ability to identify cases of blatant and subtle plagiarism in the actual English writing samples, we first examined the written explanations the participants gave to justify their evaluations in Tasks 2 and 3. If a participant gave a plagiarism-related explanation for his/her rating in Task 2 or Task 3, he/she was regarded as recognizing the form of plagiarism in question. Next, we conducted two logistic regression analyses on the data collected from Tasks 2 and 3 respectively. The logistic regression analyses allowed us to determine if a student's disciplinary background would be a good predictor of whether s/he would recognize plagiarism in the passage concerned. The statistical analyses revealed that of the various variables investigated, disciplinary background was indeed the most important predictor of the students' ability to detect plagiarism. The first logistic regression analysis indicated that the students from the disciplines of English language studies and business studies were 2.21 times more likely than the engineering students to detect blatant plagiarism. The result of the second logistic regression analysis was even more striking: The students of English language and business studies were 12 times more likely than the engineering students to recognize subtle plagiarism.

These findings can be attributed to disciplinary cultures, that is, the knowledge-knower structures underlying the engineering sciences and the disciplines of English language and business studies. As pointed out earlier, a knowledge code characterizes hard sciences such as engineering. Such a code prioritizes the use of established scientific principles and procedures to generate and verify knowledge but downplays the individual characteristics of scientists in the knowledge construction process. By contrast, a knower code dominates the humanities and the social sciences, where scholars' personal voice, expertise, experience, and authority play an important role in legitimating knowledge claims. These differences in the underlying knowledge-knower structures entail a greater epistemological separation of ideas and language in the engineering sciences than in the humanities and the social sciences (Flowerdew & Li, 2007). Thus, language or originality of language tends to play a more important role in the construction of meaning in the writings of the humanities and the social sciences than in the writings of the engineering sciences. Disciplinary knowledge-knower orientations can also lead to differences in the focus and amount of training that students from different disciplines typically receive. Rinnert and Kobayashi (2005), for example, have noted that training for science students tends to focus on doing experiments and interpreting empirical results, whereas training for students of the humanities and the social sciences tends to involve working with multiple texts. Such disciplinary variations can lead to different practices in source use and varying competence in source attribution, which in turn can shape the

ability to recognize plagiarism.

### **Disciplinary Background and Perceptions of Plagiarism**

In a related study (i.e., Hu & Lei, 2015) involving the same 270 Chinese undergraduate students, we aimed to find out if those students from the soft disciplines (i.e., English language and business studies) differed from those from the hard disciplines (i.e., the mechanical and computer engineering students) in their perceptions of plagiarism. We administered a questionnaire written in Chinese to the students. The questionnaire comprised 52 questions that were designed to elicit the students' knowledge of improper source use (e.g., blatant and subtle plagiarism), their perceptions about the likelihood of different causes of plagiarism (e.g., inadequate academic ability, pressures of various kinds, low risk of plagiarizing), their ratings of the acceptability of plagiarism induced by different causes, and their attitudes toward plagiarism in general. Our statistical analyses revealed the following differences between the students from the soft and hard disciplines. First, these two groups of students differed significantly in their knowledge of blatant plagiarism, with students from the soft disciplines ( $M = 3.70$  on a 5-point Likert scale) consistently knowing more about blatant plagiarism than students from the hard disciplines ( $M = 3.12$ ). Second, a similar difference was also found in their knowledge of subtle plagiarism, with students of the soft disciplines scoring markedly higher ( $M = 2.70$ ) than their counterparts from the hard disciplines ( $M = 2.26$ ). Third, students from the soft disciplines ( $M = 4.50$ ) were significantly more likely to see slack attitudes as a cause of plagiarism than students from the hard disciplines ( $M = 4.18$ ).

The observed disciplinary differences can be explained in terms of distinct epistemological assumptions, the nature of scientific language, and disciplinary practices characteristic of the hard and soft disciplines. As pointed out by several scholars (e.g., Bouville, 2008; Flowerdew & Li, 2007), there is a greater epistemological separation of ideas and language in the hard sciences than in the soft disciplines. Soft disciplines depend vitally on the use of language to construct ideas and originality, but what matters in the hard sciences are "facts and theories, not words" (Bouville, 2008, p. 314). As one scientist in a published study (Shi, 2012, p.141) explained, "It doesn't matter to me whether the person changed someone's words or not" because "the idea is important, not the words." Related to this epistemological difference is the recognized formulaic nature of scientific language (Flowerdew & Li, 2007). To many hard scientists, this formulaic nature justifies the reuse of others' language in some parts of a research paper, for example, the introduction or the method section. Another factor contributing to the observed disciplinary differences in perceptions of plagiarism could be the differences in the type and amount of academic training that students from different disciplines typically



receive. In the process of their disciplinary enculturation, students of hard and soft disciplines tend to have varying exposure to source use practices and, consequently, develop different conceptions of acceptable textual borrowing practices (Hu & Lei, 2016). Furthermore, the greater knowledge that students from the soft disciplines had of plagiarism and strategies for avoiding plagiarism (e.g., thorough paraphrasing or summarizing of a source text with acknowledgement) would facilitate their understanding that the avoidance of plagiarism was a laborious undertaking requiring considerable vigilance and much effort. Such an understanding would make it more likely for them than their counterparts from the hard disciplines to see plagiarism as a result of inadequate attitudes and effort.

### **Disciplinary Knowledge Making and Evaluative Language**

In the third study (i.e., Hu & Choo, 2016) to be discussed here, my collaborator and I turned our attention to teachers rather than students. We were interested in investigating whether secondary school teachers from the hard and soft disciplines differed in their use of evaluative language to mark different attitudes in written feedback on students' project work. Evaluative language merits research attention because it can shape the focus of teacher feedback, mediate the manner in which feedback is communicated between teacher and student, express teachers' attitudes and judgments, and affect students' reception of and engagement with teacher feedback (Higgins, Hartley, & Skelton, 2001; Hyatt, 2005; Sutton, 2012). We collected written evaluative reports on students' project work from 84 teachers in a top secondary school in Singapore. Forty of these teachers were from hard discipline departments and 44 teachers from soft ones. The teachers with a hard disciplinary background came from departments of Math, Biology, Chemistry, Physics, and Physical Education. The teachers with a soft disciplinary background were from departments of Home Economics and Art, English Language and Literature, History, Geography, Mother Tongues, and Philosophy.

To analyze the teachers' use of evaluative language in their written reports, we drew on appraisal theory as our analytic framework. Appraisal theory (Martin & White, 2005) divides evaluative language resources into three semantic domains—that is, *attitude*, *engagement*, and *gradation*. Because our study focused exclusively on resources for construing teachers' attitudes in their feedback, it may be useful to outline the attitude component of appraisal theory here. *Attitude* is concerned with language resources that are used to communicate “emotional reactions, judgements of behaviour and evaluation of things” (Martin & White, 2005, p.35). In appraisal theory, *attitude* consists of three sub-systems: *affect*, *judgment*, and *appreciation*. *Affect* is concerned with evaluative resources for registering positive and negative emotional reactions. Four broad categories of emotions are distinguished. The category of

inclination-disinclination communicates a desire for something or a mental process of avoidance. The category of happiness-unhappiness covers positive emotions of cheer and affection as well as negative emotional reactions such as misery and antipathy. The category of security-insecurity comprises positive feelings of confidence, peace, and trust as well as negative emotions of anxiety, disquiet, and surprise. Finally, the category of satisfaction-dissatisfaction is concerned with “feelings of achievement and frustration in relation to the activities we are engaged in, including our roles as both participants and spectators” (Martin & White, 2005, p.50).

The sub-system of *judgment* is concerned with attitudes toward human behavior and dispositions, “which we admire or criticise, praise or condemn” (Martin & White, 2005, p.42). It comprises five types of evaluation in reference to institutionalized norms: normality, capacity, tenacity, veracity, and propriety. Normality covers positive and negative judgments of how customary or special someone or their behavior is. Capacity deals with how capable or incapable someone is. Tenacity involves positive and negative evaluations of how dependable, resolute or persevering a person’s behavior or psychological disposition is. Veracity includes positive and negative judgments of how truthful someone or their behavior is. Propriety covers positive and negative judgments of morality or legality, that is, how ethical or reproachable someone’s behavior is.

The last sub-system of attitude—*appreciation*—comprises positive and negative evaluations of objects, products, processes, states of affairs, and entities rather than human behavior. It can be further categorized into reaction, composition, and valuation. Reaction comprises positive and negative assessments of the impact or quality of an object, product, process, etc. Composition involves positive and negative assessments of an artifact, object, product or process in terms of makeup, balance, and complexity. Valuation includes positive and negative evaluations of a thing in terms of its worth and in relation to current social values.

Did the teachers from different disciplinary backgrounds use these evaluative language resources differently to communicate different attitudes? Our statistical analyses revealed two important differences. First, the teachers from the soft disciplines as a group ( $M = 0.96$  per 1,000 words) used more instances of satisfaction than the teachers from the hard disciplines ( $M = 0$ ). Second, the teachers from the hard disciplines ( $M = 21.17$ ) made more frequent use of positive tenacity than their counterparts from the soft disciplines ( $M = 15.91$ ).

Once again, these findings could be explained in terms of disciplinary characteristics concerning core knowledge, epistemology, valued dispositions, and knowledge-making practices. As Becher and Trowler (2001, p.36) point out, soft disciplines such as the humanities and pure social sciences, which are

“concerned with particulars, qualities, complication,” tend to be “personal, value-laden,” and aim to develop personal understanding and interpretation. Consequently, the teachers from the soft disciplines were likely to communicate their personal reaction or interpretation by revealing their satisfaction with students’ project work. The hard disciplines, by contrast, which are “concerned with universals, quantities, [and] simplification,” strive to be “impersonal, value-free,” and seek discovery and explanation. Given such disciplinary characteristics, it was natural for the teachers from the hard disciplines to be impersonal in their feedback and focus on content of work, knowledge involved, and criteria of performance rather than on personal reactions such as satisfaction or dissatisfaction.

Similarly, the more frequent use of evaluative language to mark positive tenacity in the feedback provided by the teachers from the hard disciplines could also be accounted for in terms of disciplinary culture. As Neumann, Parry, and Becher (2002) point out, knowledge-making in the hard disciplines involve effort, perseverance, and meticulousness, all of which are manifestations of positive tenacity. By contrast, research activities in the soft disciplines “are less competitive and less demanding in commitment” (Neumann et al., 2002, p.411) but value fluent expression, critical thinking, and originality of opinion. Consequently, it is understandable that the teachers from the hard disciplines valued positive tenacity in their evaluation of student work more than their colleagues from the soft disciplines, who placed a higher value on students’ ability to make original interpretations, “develop defensible stands on controversial issues” (Nilson, 2010, p.226), engage in critical reflective thinking, and play an active part in the shaping of knowledge.

### **Citation Practices in Different Disciplines**

The influences of disciplinary culture on academic writing can also be seen in published research articles, arguably the most important genre of scientific communication. Hu and Wang (2014) investigated such influences on just one aspect of academic discourse – citation practices. Citation is a direct and explicit means of intertextuality whereby information of various types (e.g., concepts, terminology, data, and methods of inquiry) is attributed to sources external to the text. Although modern citation practices did not start to develop until the 19th century, citation has evolved into an enormously complex discursive phenomenon, and the number of citations per research article has witnessed an upward trend across disciplines. Citation can serve multiple cognitive, epistemological, and rhetorical functions, such as establishing intellectual linkages, demonstrating paradigmatic allegiance, contextualizing research, enhancing persuasiveness, and managing interpersonal relationships. One of the research questions we wished to address in our study was whether research articles written by academics from different disciplines would differ in

the use of citations. To answer this question, we constructed a corpus of 84 research articles. Half of these articles were written by medical researchers and half by applied linguists.

We identified all the citations in these articles and examined them according to an analytic framework developed by Coffin (2009) for an integrated analysis of the forms and functions of citation in academic writing. The framework focuses on citation features that enable a writer to engage with sources in either a dialogically expansive or contractive way, that is, “mak[ing] allowances for dialogically alternative positions and voices” or “act[ing] to challenge, fend off or restrict the scope of such” (Martin & White, 2005, p.102). As can be seen in Figure 5, these citation features as dialogical resources operate on three dimensions: writer stance, textual integration, and author integration.

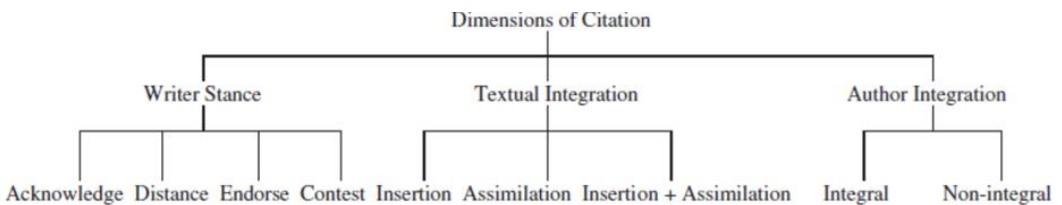


Figure 5. Dimensions of dialogic engagement in citation

The first dimension, writer stance, characterizes a number of positions that the citing writer can take in relation to the voices, viewpoints, and ideas of the cited authors. Four types of writer stance are discernible: *acknowledge*, *distance*, *endorse*, and *contest*. *Acknowledge* is a type of stance in which a writer adopts a neutral position and makes no evaluative judgment on the cited proposition. As illustrated by the following example from our dataset, the writer simply cites propositions strategically to show their familiarity with the relevant literature without passing any evaluative judgment:

*Other conceptualizations include experiential knowledge (Wallace, 1991), pedagogic content knowledge (Shulman, 1987), local knowledge (Allwright, 2003), and pedagogical knowledge base (VanPattern, 1997).*

*Distance* expresses a position whereby the citing writer builds distance between himself/herself and the cited proposition, hence avoiding being held responsible for its reliability. This is evident in the following example:

*In his conceptualization of the Ideal L2 Self, Dörnyei (2009a) claims that mental imagery, that is, the ability to imagine oneself as a successful L2 user, is core to the construct.*

In the above example, the citing writers withhold commitment to Dörnyei's conceptualization of the "Ideal L2 Self", which is not borne out by their empirical results. Both *acknowledge* and *distance* citations allow for alternative perspectives and voices, although to varying extents, and thus are dialogically expansive.

*Endorse* communicates a type of stance whereby the writer supports or agrees with the cited proposition. As illustrated by the example that follows, *endorse* represents a cited proposition as authoritative, trustworthy, or convincing.

*Previous reports of greater risk of mortality ... among patients undergoing dialysis<sup>4,5</sup> established the possibility that FGF-23 may be a novel predictor of adverse outcomes in patients with kidney disease.*

By contrast, *contest* is a type of stance in which the writer indicates a negative attitude toward the cited source by direct critique or rejection. In the following example of a *contest* citation, the writers explicitly criticize a previous study by Hirsh and Nation for a perceived methodological limitation.

*However, one limitation of the Hirsh and Nation study was that the texts used were novels written for teenagers and adolescents.*

As can be seen from the examples, both *endorse* and *contest* citations are dialogically contractive in that the citing writer indicates a "personal investment in the viewpoint being advanced and accordingly increases the interpersonal cost for any who would advance some dialogic alternative" (White, 2003, p.271).

The second dimension of the analytic framework, textual integration, captures the extent to which a cited proposition is integrated into the citing sentence. Specifically, it is concerned with whether the words of a cited source are separated from the wording of the citing text. There are three options: *insertion*, *assimilation*, and *insertion+assimilation*. When *insertion* is deployed, the writer quotes the cited proposition directly. In the case of *assimilation*, the writer paraphrases or summarizes a cited proposition. The last option, *insertion+assimilation*, combines the first two options and presents a cited proposition by both quoting and rewording.

The third dimension, author integration, incorporates a distinction between *integral* and *non-integral* citations. In an *integral* citation, the name of the cited author occurs as part of the citing sentence. A *non-integral* citation, on the other hand, presents the cited author in parentheses or via a superscript number leading to a footnote, endnote or bibliography. A cited proposition, when assimilated into the text and presented in the *non-integral* form, “is more likely to be perceived as an established fact, thus creating dialogic contraction” (Coffin, 2009, p.174). By contrast, a direct quotation, particularly when presented in the *integral* form, gives greater emphasis to the cited proposition as the viewpoint of a single source and, consequently, tends to open up a dialogic space to alternative viewpoints.

We compared the medical and applied linguistics articles in terms of these citation features and identified several cross-disciplinary differences. First, the applied linguistics research articles ( $M = 0.54$  per 1,000 words) used *distance* citations much more frequently than the medical research articles ( $M = 0.27$ ). Second, no *insertion* citations were found in the medical research articles, though such citations occurred with some frequency in the applied linguistics research articles ( $M = 0.52$ ). Third, *insertion+assimilation* citations were also extremely rare in the medical research articles ( $M = 0.02$ ) but were markedly more frequent in the applied linguistics research articles ( $M = 1.16$ ). By contrast, the medical research articles ( $M = 7.64$ ) used *assimilation* citations more frequently than the applied linguistics research articles ( $M = 6.15$ ). A marked cross-disciplinary difference was also found in the use of *integral* citations. Such citations were about five times as frequent in the applied linguistics research articles ( $M = 3.83$ ) as in the medical research articles ( $M = 0.78$ ). There was also a significant difference in the frequency of *non-integral* citations, with the medical researchers deploying such citations markedly more frequently ( $M = 6.89$ ) than the applied linguists ( $M = 4.00$ ).

These results revealed different types of dialogic engagement between the two disciplines. There was greater dialogic expansion in the applied linguistics research articles due to a higher incidence of dialogically expansive citations (i.e., *distance*, *insertion*, *insertion+assimilation*, and *integral* citations) and a lower incidence of dialogically contractive ones (i.e., *assimilation* and *non-integral* citations). Conversely, greater dialogic contraction characterized the medical research articles because of the higher frequency of dialogically contractive citations and the lower frequency of dialogically expansive ones. These cross-disciplinary differences in the nature of citation-based dialogic engagement can be attributed to the dominant knowledge-knower structures underlying the two disciplines. Knowledge in the soft disciplines is personal, subjectively meaningful, holistic, value-laden, subject to contextual dynamics, and contingent on argumentation rather than universally shared criteria for verification. The communication of such knowledge requires an academic

discourse that foregrounds human agency at the very heart of knowledge construction, recognizes the multiplicity of interpretations, and opens up the space for dialogue. Dialogically expansive citations cohere very well with such an argument schema and academic discourse. By contrast, in medical sciences and other hard disciplines, the ideal means of inquiry consists in adopting an inductive-deductive approach to testing systematically and cumulatively derived hypotheses in rigorously controlled experimental conditions. The hypothesis testing is facilitated by utilizing procedures, methods, and measurement tools that are standardized and precise. Scientific discourse communicating knowledge thus obtained is expected to increase “the weight of a statement” (Latour & Woolgar, 1986, p.84) or enhance “the ‘facticity’ of a statement” (p.76) whenever possible. By framing cited propositions as more or less factual information, downplaying the role of human agency in knowledge construction, and closing down the space for alternative viewpoints and interpretations, dialogically contractive citations serve this rhetorical intent well and contribute to a discursive style of objectivity, impersonality, and certainty.

### **Disciplinary Variation in the Use of Interactional Metadiscourse**

Clear disciplinary variation in research articles has also been found in academics’ use of interactional metadiscourse. In the fifth study (i.e., Hu & Cao, 2015) summarized here, my collaborator and I were interested in whether academics from three disciplines – that is, psychology, education, and applied linguistics – would differ in the use of interactional metadiscourse in the post-method sections of their published research articles. We adopted Hyland’s (2005) model of interactional metadiscourse, which defines interactional metadiscourse as a variety of linguistic resources for writers to make “explicit interventions to comment on and evaluate material” (p.44) and to involve imagined readers collaboratively in textual construction. The model divides such linguistic resources into five categories: hedges, boosters, attitude markers, self-mentions, and engagement markers. This section briefly defines and illustrates only the two categories of interactional metadiscourse for which we found disciplinary variation, namely, boosters and engagement markers. Boosters are linguistic devices that can increase writers’ degree of certainty about what is said. They are typically realized by epistemic modal verbs (e.g., *must*), lexical verbs (e.g., *demonstrate*, *prove*), adjectives and adverbs (e.g., *undisputed*, *undoubtedly*), nouns (e.g., *fact*, *certainty*), and other emphatic expressions (e.g., *without a doubt*). As illustrated by the examples, boosters “allow writers to close down alternatives, head off conflicting views and express their certainty in what they say” (Hyland, 2005, p.52). The appropriate use of boosters in academic writing can not only communicate writers’ epistemic stance but also promote solidarity with readers. Engagement markers

“refer to the various ways writers bring readers into the discourse to relate to them and anticipate their possible objections” (Hyland, 2005, p.151). Engagement markers can be further divided into several subtypes. The subtype relevant to the focus here is that of reader references. Reader references acknowledge readers’ presence and address them as participants in knowledge-making by the use of second-person pronouns (i.e., *you, your*), inclusive first-person pronouns (i.e., *we, our*), indefinite pronouns (i.e., *one*), and other reader-referring expressions (e.g., *the reader*).

To answer our research questions, we put together a corpus of 120 research articles in psychology, education, and applied linguistics that were published in top international journals of these disciplines. We then used Hyland’s model as an analytic framework to identify all instances of interactional metadiscourse in the sections of each article that followed the method section. Quantitative analyses were run to compare the three disciplines in the use of each category of interactional metadiscourse. Two marked cross-disciplinary differences emerged from the analyses. First, the applied linguistics research articles ( $M = 2.97$  per 1,000 words) used markedly more boosters than the psychology research articles ( $M = 1.54$ ). Second, the applied linguistics research articles ( $M = 1.00$ ) used significantly more reader references than the psychology research articles ( $M = 0.36$ ). Once again, these disciplinary differences can be explained in terms of the distinct knowledge-making practices found in the disciplines.

The higher incidence of boosters in the applied linguistics research articles seems to be a function of the knower code at work. Knowledge claims in disciplines dominated by the knower code are legitimated by the “unique insight of the knower” (Maton, 2000, p.157), and this makes it necessary to use a language that persuades by stressing the knower’s individual authority and expertise. Boosters assist writers in increasing commitment to their knowledge claims, asserting their authority, and positioning themselves as privileged knowers in their disciplinary communities. Their strong voice helps align readers with their knowledge claims and arguments. In contrast, psychology’s stronger orientation to the knowledge code would mean that knowledge legitimation in the discipline may depend more on empirical authority that results from applying universally accepted principles of inquiry and methods of validation than on personal voice or authority. Thus, procedural adequacy and methodological rigor alone would be persuasive enough to support new knowledge claims. Consequently, there would be less of a need for psychologists to deploy boosters to strengthen epistemic conviction.

The applied linguists’ more frequent use of reader references than the psychologists could also be ascribed to the knowledge-knower structures dominating the two disciplines. Reader references as engagement resources can be deployed to evoke solidarity between writer and reader as knowers. This



solidarity building is necessary in the knower code because the validity of writers' knowledge claims must be approved by disciplinary readers before they are finally accepted. Therefore, reader references, particularly inclusive *we*, not only help applied linguists "predict and respond to their readers' line of thought" but also "encourage particular reactions to their argument" (Hyland, 2001, p.558), leading their readers toward preferred interpretations. On the other hand, the stronger knowledge-code orientation of psychology makes the application of scientific procedures and criteria a primary means of validating knowledge claims, reducing the need to employ solidarity-seeking devices such as reader references as a rhetorical strategy for legitimating knowledge claims.

### **Disciplinary Variation in the Use of Interactive Metadiscourse**

The final study (i.e., Cao & Hu, 2014) to be reviewed in this article was conducted on the same 120 research articles that Hu and Cao (2015) used to study interactional metadiscourse. The focus of our study was on interactive metadiscourse. In academic writing, interactive metadiscourse comprises self-reflective linguistic expressions such as *by contrast* and *therefore* that are used to organize a text in anticipation of readers' needs and to facilitate their comprehension by guiding them through the text.

When analyzing our data, we again adopted an analytic framework developed by Hyland (2005) that classifies interactive metadiscourse devices into five main categories: code glosses, transitional markers, frame markers, endophoric markers, and evidential markers. There are subcategories under each main category. Because of space constraints, only those categories and subcategories relevant to our empirical findings regarding cross-disciplinary variation are defined and explained here. One such category is that of transitional markers. Transitional markers help create textual cohesion by signaling logical links between ideas. One important type of transitional marker consists of comparative transitions. These are expressions such as *similarly*, *in comparison*, *however*, and *by contrast* that indicate comparative or contrastive relationships. As a main category of interactive metadiscourse, endophoric markers are reflexive language used to refer to other parts of a text. This type of metadiscourse is used as a signpost that helps the reader recover the writer's intended meanings. Endophoric markers can be subdivided into linear and non-linear references. Linear references are expressions such as *in the following paragraphs* and *as presented in the previous section* that function as previews, reviews, or overviews in the unfolding text. Non-linear references are expressions such as *see Excerpt 1 for an example* and *as summarized in Table 1* that refer to additional textual materials such as tables, figures, stand-alone examples or extracts. Finally, evidential markers present information from other texts. In academic discourse, evidential markers typically take the form of citations. As made clear in the earlier discussion on the citation study

(Hu & Wang, 2014), two subtypes of evidential markers can be distinguished according to surface forms; *integral* and *non-integral* citations. As discussed earlier, an *integral* citation incorporates a cited source as part of the reporting sentence, while a *non-integral* citation places a cited source within parentheses or via a superscript number leading to a footnote, endnote or bibliography.

Several quantitative differences were found between the disciplines in the use of the interactive metadiscourse resources. First, the applied linguistics research articles ( $M = 2.95$  per 1,000 words) used comparative transitions more frequently than the psychology research articles ( $M = 2.20$ ). Second, the applied linguistics research articles ( $M = 3.95$ ) made more frequent use of endophoric markers than the psychology research articles ( $M = 1.79$ ). Third, the applied linguistics research articles ( $M = 1.06$ ) also used more linear references than the psychology research articles ( $M = 0.33$ ). Last, the applied linguistics research articles ( $M = 1.77$ ) used *integral* citations more frequently than the psychology research articles ( $M = 0.84$ ).

The knowledge-knower structures prevailing in applied linguistics and psychology again provide plausible explanations of these observed differences. Earlier, it was pointed out that applied linguistics has a stronger knower orientation, whereas psychology has a stronger knowledge orientation. The stronger knower orientation of applied linguistics could readily account for its more frequent use of comparative transitions than psychology. As Maton (2010) observes, a knower-oriented discipline “emphasizes *difference from* rather than *similarity with*” (p.54). Consistent with this tendency, the majority of comparative transitions in our corpus expressed contrastive relations (e.g., *however*, *but*) which could be used to emphasize the knower’s distinct voice, align or disalign readers with alternative positions, and create knowledge claims in the knower code.

By the same token, the stronger knower orientations of applied linguistics can account for the more frequent use of *integral* citations and the greater frequency of linear references in the applied linguistics research articles than in the psychology research articles. As Maton (2010) points out, knowers’ personal attributes, in particular their own voice, are given much emphasis in knower-oriented disciplines. In other words, there is greater knower visibility in such disciplines. The visibility of knowers can be metadiscoursally enhanced not only by comparative transitions, as we have just seen, but also through the use of *integral* citations and linear references. By integrating the name of a cited author into the citing sentence, *integral* citations help to foreground individual interpretations, alternative perspectives, and human agency in knowledge construction. Although they do not make direct references to writers themselves, linear references such as *in the following subsection* and *this article* imply the writers’ status as knowers and, consequently, increase knower visibility in the research articles.

## **PEDAGOGICAL IMPLICATIONS**

This article has shared the relevant findings of six research projects conducted to investigate cross-disciplinary differences in various aspects of academic discourse and rhetorical practices. These studies have revealed clear discipline-based differences in university students' ability to recognize instances of plagiarism in samples of English academic writing; undergraduate students' knowledge of various forms of plagiarism and perceptions about its causes; high school teachers' use of evaluative language for construing various attitudes in their written feedback on students' project work; researchers' strategic deployment of citation features to engage their readers; and academics' use of interactional and interactive metadiscourse in their published research articles. These identified differences can be attributed to the distinct epistemologies underlying the disciplines and their prevailing knowledge-making practices.

These findings have important implications for the teaching and learning of English for academic or specific purposes. First, the various linguistic, rhetorical, and discursive features of academic writing are not autonomous, monolithic or homogenous across disciplinary communities. For this reason, a generic pedagogical approach to academic writing, as found in many current undergraduate and graduate programs of writing for academic/research purposes, misrepresents the discipline-specific nature of academic discourse, fails to capture its diversity and complexity, and thus is unlikely to teach academic discourse effectively. A second and related implication is that academic writing as a literacy practice needs to be taught and learned in relation to specific disciplinary contexts (Hu, 2018), that is, with a sound understanding of how its various features are shaped by and serve disciplinary knowledge-knower structures. This can be achieved in discipline-tailored writing courses. Where cost-benefit considerations and resource limitations make it impossible to offer separate writing courses catering to specific disciplines, the same pedagogical objective is also attainable in a general ESP course that explicitly raises students' awareness of disciplinary differences in rhetorical and discourse practices. Such awareness-raising can be achieved through pedagogical tasks that invite students to examine academic writing in relation to disciplinary culture, that is, the knowledge-knower orientations of different disciplines. Third, novice academic writers, especially English-as-a-second language students, can benefit greatly from explicit instruction in how generic and linguistic resources can be used to communicate in a disciplinarily meaningful way, for example, how citation features can be exploited to convey writer stances effectively and how various metadiscourse resources can be used to engage and guide readers to the preferred interpretations. In this regard, it is important to note that because explicit instruction takes time, and given the numerous academic discourse features crucial to effective academic

communication, no writing course can hope to teach all these features to students. This dilemma leads to the last implication to be presented here. That is, ESP programs should equip student writers with useful strategies to explore disciplinary norms in the use of academic discourse. For example, they can be guided to construct their own small-scale corpora using freely available corpus tools and conduct corpus-based analyses of academic discourse features. In the final analysis, student writers must develop the strategic competence to explore and acquire academic discourse as a repertoire of socio-rhetorical resources that serve situated knowledge-making practices.

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