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Disciplinary Communication Competence Among Teaching Assistants: A Research Agenda

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One of the primary goals of graduate education is to transform students into scholars of their discipline – scholars who can engage undergraduate students' inquiry in the discipline through teaching. The professional development of teaching assistants (TAs) in graduate programs is a form of socialization that involves learning the culture of their academic discipline. During their doctoral education, TAs learn how to talk, write, and teach like philosophers, geographers or engineers, and develop disciplinary communication competence, a form of communication competence that captures the ability of a new scholar to interact with other members of the disciplinary culture effectively. This chapter draws on the literature in doctoral education, organizational and intercultural communication, and educational development, to propose a conceptual framework for the development of Disciplinary Communication Competence (DCC). First, the chapter establishes the need for DCC and defines the concept. Second, it illustrates TA competencies in each domain of the DCC conceptual framework, and describes how TAs acquire and use DCC during their graduate career. Third, the chapter presents a research agenda for systematically investigating the development of DCC, the outcomes of the DCC learning process, and the impact of TA training programs designed to facilitate the development of DCC. Finally, the chapter argues that the effectiveness of TA training programs will be significantly increased by the inclusion of learning activities that enable TAs to develop disciplinary and interdisciplinary communication competence.

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Academic disciplines are communities of scholars with their own language, norms, and values. Each discipline is a unique culture, whose members share a common understanding of appropriate ways of communicating, behaving, and doing research in the discipline (Becher & Trowler, 2001). Doctoral education transforms graduate students into junior scholars who know how to interact with members of the scholarly community using the distinct discourse, methods, and stylistic norms of communication that guide scholarly activity in that particular disciplinary culture (Austin, 2002; Turner, Miller & Mitchell-Kernan, 2002, Golde, 2005). During their graduate program, students are gradually socialized to the culture of their discipline. They learn what is considered good teaching and how to conduct research, and they observe expectations that members of their department, discipline, and university share about appropriate and inappropriate ways of networking, presenting papers, or interacting with undergraduates (Becher, 1981; Gardner, 2008, Turner & Thompson, 1993; Weidman, Twale & Stein, 2001).

The process of socialization into an academic profession is a form of culture learning, or acculturation (Golde, 2005; Boyle & Boyce, 1998; Berry, 1997; Kim, 2001), that is very similar to the process of learning about the norms of another culture overseas (Dimitrov, 2008). When individuals interact with members of a new culture and learn to communicate effectively with members of that culture, they develop intercultural communication competence (Wiseman, 2001; Deardorff, 2009a). As graduate students are socialized into a disciplinary culture, the outcome of the learning process is disciplinary communication competence (Dimitrov, 2008), a form of communication competence that captures the ability of a new scholar to interact with other members of the disciplinary culture effectively. One of the goals of teaching assistant (TA) development is to facilitate the socialization of new teachers to the culture of teaching in their discipline (Austin & McDaniels, 2006; Austin & Wulff, 2004; Golde, Walker & Associates 2006), and to facilitate the process of acquiring disciplinary communication competence in the teaching context.

This chapter proposes a theoretical model of Disciplinary Communication Competence (DCC), based on a conceptualization of graduate education as a form of culture learning (Dim-

itrov, 2008) and drawing on research in doctoral education (Kiley, 2009; Austin, 2010; Baker & Lattuca, 2010), organizational communication competence (Wellmon, 1988), intercultural competence (Deardorff, 2009a), and teaching assistant development (Nyquist, Austin, Sprague & Wulff, 2001). The first section of the chapter establishes the need for DCC and defines the concept. The second section illustrates TA competencies in four domains of the proposed DCC conceptual framework, and describes how TAs acquire and use DCC during their graduate career. The third section presents a research agenda for systematically investigating disciplinary communication competence in the disciplines, the process of DCC development, the outcomes of the DCC learning process, and the impact of TA training programs designed to facilitate the development of DCC. Finally, an argument is presented that the effectiveness of TA training programs will be significantly increased by the inclusion of learning activities that enable TAs to develop disciplinary and interdisciplinary communication competence.

What is Disciplinary Communication Competence?

We all know intuitively when a doctoral student sounds like a scholar and can talk the talk of economists, biochemists, or historians, and we can also tell when they have not yet mastered that intangible quality that distinguishes a student from a junior faculty member. Researchers who have explored components of this quality have called it *doctorateness* (Trafford & Leshem, 2009), or defined it as a crossing of major conceptual thresholds on the doctoral journey (Kiley, 2009; Wisker & Robinson, 2008) using the threshold concepts framework (Land, Meyer & Smith, 2008). During these "rites of passage," students "learn the language not merely of the subject area but of graduate research study, and learn to act as a graduate researcher with the rigour and conceptual levels of thinking that is expected of them" (Kiley, 2009, p. 293). By the end of their doctoral education, most students cross the fine line that that separates students from scholars, and are able to apply successfully for faculty positions because they are perceived by their peers as independent scholars and colleagues in their discipline.

The ability to "pass" as an independent scholar goes beyond subject expertise and ingenuity in research, and includes the ability to present and publish research effectively as well as the ability to form meaningful collaborative relationships with members of the disciplinary community (Boden, Borrego & Newswander, 2011). The proposed disciplinary communication competence model conceptualizes this additional layer of "doctorateness," and allows us to understand the process of socialization more thoroughly and articulate the learning outcomes of doctoral student socialization to the discipline more clearly.

Developing disciplinary communication competence (DCC) is important for graduate students because their ability to communicate the value of their work within the discipline is a necessary (though not sufficient) condition of their effective participation in a scholarly community. No matter how well they know the theories in their field or how original their ideas are, they will only succeed in *teaching* if they can communicate key concepts of the discipline clearly and are able to engage students with teaching approaches that match the learning needs of students in that discipline. Moreover, they will only succeed in *research* if they can communicate the value and originality of their work to colleagues in their field through conference presentations, publications, or other means. In sum, effective and appropriate disciplinary communication helps make graduate students' scholarly accomplishments visible. In order to help doctoral students transform into successful junior scholars, we need to be able to clearly articulate the outcomes of the doctoral learning journey, operationalize them, and suggest ways in which doctoral students can learn to achieve these outcomes. The DCC model, and research on the development of DCC, will provide tools and data that will further our progress towards these goals.

Components of Disciplinary Communication Competence

Disciplinary communication competence (DCC) is defined by three key characteristics in four domains of academic interaction:

1. Disciplinary communication competence is the ability of graduate students to communicate in ways that are perceived as *effective in reaching desirable objectives* (Spitzberg,

1988) in an academic context. In the case of teaching assistants (TAs), reaching desirable objectives includes, for example, the ability to present complex concepts in a way that promotes student learning (objective 1) and results in high teaching evaluation scores (objective 2).

2. Graduate students who develop disciplinary communication competence are able to establish *meaningful relationships* with members of their disciplinary culture (Hammer, 1989; Deardorff, 2009; Spitzberg & Hecht, 1984). Establishing meaningful relationships may include the ability to seek feedback on one's teaching from a professor or a peer, co-teaching a course, collaborating on research, or networking with scholars at academic conferences successfully over time.
3. Doctoral students who have successfully developed disciplinary communication competence are able to communicate in a way that is *appropriate to the context* in which the interaction is occurring (Spitzberg & Cupach, 1989). For example, effective communicators can shift their communication style and use of language from classroom interaction to a curriculum committee meeting to a conference on teaching. Effective communicators use more formal language during a conference presentation than in the classroom, or adhere to Robert's Rules of Order (Robert, Honemann, Balch, Seabold & Gerber, 2011) when it comes to turn-taking in a university senate meeting.

DCC is made up of a complex set of cognitive and behavioral competencies that scholars use in four domains of academic interaction, demonstrating 1. *instructional,* 2. *interpersonal*, 3. *organizational,* and 4. *interdisciplinary* communication competence within a discipline. The conceptual model of disciplinary communication competence draws on elements of interpersonal communication competence (Spitzberg, 1988), intercultural communication competence (Wiseman, 2001; Spitzberg & Cupach, 1989; Deardorff, 2009a), instructional communication competence (Worley, Tisworth, Worley & Cornett-DeVito, 2007) and organizational communication competence (Wellmon, 1988) previously identified in the literature, and combines these in

a single framework that allows us to examine key domains of communication interaction in academic settings.

Domain 1: Instructional communication competence in the discipline. Instructional communication competence in the discipline enables a teaching assistant to communicate effectively with undergraduates, faculty, and peers – in the classroom, the laboratory, office hours, online, or in any other situation in which teaching is done or discussed (such as in an academic job interview). Key ways in which TAs may demonstrate instructional communication competence include the ability to articulate clear learning objectives, explain complex concepts effectively, give constructive feedback to promote learning, and seek and incorporate feedback from students (Weimer, 1990; Worley et al, 2007). Instructional communication competence also includes the ability to articulate a coherent approach to teaching and describe the rationale behind a selected approach to teaching, for example, in a teaching philosophy statement or new course proposal document.

As defined earlier, disciplinary communication is the ability

Figure 1. Four domains of disciplinary communication competence.

of graduate students to communicate in ways that are perceived as effective in reaching desirable objectives, such as obtaining funding or getting a faculty position. TA positions are sometimes contingent upon high scores on student evaluations of teaching, so instructional communication competence can enable TAs to receive high student evaluation scores which may in turn lead to renewed funding. During academic job searches, candidates are increasingly asked to teach a class during campus visits as a way of testing their instructional communication competence, so an effective teaching presentation can contribute to success during job search as well. Instructional communication skills are also explicitly tested among international TAs (ITAs). A number of universities require ITAs to pass English-language tests (such as the SPEAK test) before they can receive a teaching assistantship.

New TAs learn about the teaching culture of their discipline at departmental orientation sessions, as well as from their course supervisors, peers (Boyle & Boice, 1998), and sometimes senior undergraduate students who are already familiar with departmental practices (Nyquist & Sprague, 1992). In the last decade, there has been a shift from teacher-centered to student-centered learning, a more frequent use of inquiry-based methods, and an emphasis on active student engagement (Austin & Wulff, 2004; Austin, 2010), so new TAs are expected to be familiar with student engagement strategies. There is an expectation that new instructors understand student diversity and its implications for learning (Austin, 2002). Graduate students are expected to engage in formal professional development to prepare for future faculty careers in addition to learning-by-doing during their teaching assistantship. Britnell, Brockerhoff-Macdonald, Carter, Dawson, Doucet, Evers, Hall, Kerr, Liboiron-Grenier, McIntyre, Mighty, Siddall & Wilson (2010) found that almost 60% of new faculty at Canadian universities have participated in formal preparation for teaching during their graduate education. As a result, an increasing number of new faculty candidates demonstrate a high level of instructional communication competence and are able to describe how they have prepared for a faculty career through their teaching assistantship. They can articulate a clear teaching philosophy and provide evidence of teaching innovation during

the TA years. As these changes suggest, developing instructional communication competence does not only contribute to the success of TAs during their graduate education, but it may also contribute to their success on the job market.

Domain 2: Interpersonal communication competence in the discipline. The interpersonal domain of DCC focuses on the ability of TAs to establish productive collaborative relationships with their students, faculty, and peers, as well as their ability to resolve conflict (Adrian-Taylor, Noels & Tischler, 2007), seek mentorship, and mentor others (Dimitrov, 2009). Interpersonal communication competence enables graduate students to join learning communities in their department, and this skill continues to be central in their acculturation to the discipline as new faculty members later in their career as well.

In the classroom, TAs rely on their interpersonal communication competence when they 1. respond to student questions in a way that promotes inquiry and encourages students to ask more questions and rather than just give the "right answer;" 2. respond constructively to students who approach them with grade complaints; 3. provide support to students in crisis; and 4. give constructive feedback to students (verbal and nonverbal) (Nyquist & Wulff, 2004). Effective TAs with a high level of interpersonal communication competence are able to establish clear boundaries with their students, and know how to adapt their level of formality and informality to people with different levels of power such as staff, faculty, and administrators (Hockey, 1996; Dimitrov, 2009). All of these types of interaction require the ability to demonstrate competence in various areas of interpersonal communication, such as interaction management, appropriate self-disclosure, expressiveness, immediacy, cognitive flexibility, empathy, and perspective taking (Spitzberg, 2003).

Domain 3: Organizational communication competence in the discipline. Understanding the goals of the university as an institution and recognizing the connections between the needs of individual students, faculty, and administrators is an important but neglected component of disciplinary communication competence (DCC). Doctoral students on the path to the professoriate focus so intently on their research and teaching that they are rarely aware that service is a component of faculty life (Theall,

Mullinix & Arreola 2009), or that once tenured they may serve on university-wide committees, work as administrators, and become involved in strategic and budget planning (Corcoran & Clark 1984). Developing organizational communication competence, and demonstrating what Austin and McDaniels (2006) call *institutional citizenship*, becomes important in faculty interviews where potential candidates are assessed on their ability to fit into the department and contribute to the work of the institution through service. Components of organizational competence (Wellmon, 1988) that have also been highlighted in the graduate student professional skills literature (Gilbert, Balatti, Turner & Whitehouse, 2004) include leadership, the ability to self-reflect, awareness of the organizational context, and the ability to speak effectively to a variety of audiences (staff, faculty, administrators, students, alumni, donors), as well as the ability to see the "big picture."

Organizational communication competence in the discipline includes, for example, the ability to be part of a teaching team and support the lead instructor's teaching goals; the ability to understand how a course fits into the undergraduate curriculum and supports the mission of university; and the ability to communicate expectations related to university wide policies and values to undergraduates (e.g., communicate the value of academic integrity). TAs may also need to navigate a complex political landscape created by TA union regulations as well as departmental and graduate school policies. TAs who effectively navigate the discipline as an organization take the initiative to find out how they can get more independent teaching assignments, network to find teaching resources, and volunteer on departmental committees that allow them to learn about faculty life and provide them with insight into the workings of academia (e.g., hiring committees, curriculum review committees, or award committees).

Organizational communication competence in the discipline also includes awareness of how rules are perceived within the institution and the ability to judge when rules are flexible and when they are not, as well as an awareness of acceptable ways of negotiating for support or resources with the administration. For example, during their graduate years, future faculty are

likely to learn that complaining about lack of research funds or asking for teaching release time would be regarded as out of place at a teaching-focused university or liberal arts college, but appropriate at a research-intensive university. At the same time, negotiating for more TAs, purchasing instructional technology, or supporting service learning would match the culture of a teaching-focused institution.

The organizational dimension of disciplinary communication is difficult for TAs to master because accidental norm violations often pass without feedback, and all a graduate student notices is that they will not receive another TA assignment or will not be reappointed to a committee. Yet they do not know why. Graduate students who seek feedback when they do not succeed gain surprising insight into disciplinary culture. One graduate student, for example, learned that he "failed dinner" during an interview for a faculty position because he was not interested in discussing anything but his research, and was not really able to take part in informal conversation with members of the hiring committee during meals. Thus they could not see him as a future colleague, and his narrow focus on research did not match the culture of the department. A mismatch between new scholar expectations and departmental culture also has significant impact during the graduate program itself – it has been found to correlate significantly with doctoral student attrition (Golde, 2005).

Domain 4: Inter-disciplinary communication competence. In the past five years, the number of interdisciplinary graduate programs and conferences has increased dramatically (Boden, Borrego & Newswander, 2011) so TAs frequently teach in related disciplines or support faculty in interdisciplinary courses (for example, TAs from Biology and Geography facilitate tutorials in Environmental Science or in Environment and Sustainability Programs). Therefore, even before TAs are completely socialized into their own discipline, they need to collaborate with students and faculty from other fields, or receive feedback and engage in dialogue about teaching across disciplines at campus-wide TA training events. In these contexts, inter-disciplinary communication competence includes the ability to communicate with scholars who use different teaching methods, rely on different epistemological assumptions, theoretical paradigms, and disci-

plinary language in their teaching. Effective inter-disciplinary communication requires openness to different perspectives (Austin, 2002), and the ability to withhold judgment until one understands the disciplinary context of communication. It also requires a strong need to reduce jargon and take into account the diverse levels and types of knowledge among audience members. Interdisciplinary communication competence is highly valued by employers who "look for researchers who can communicate and integrate knowledge across traditional disciplinary boundaries" (Harman 2008, p. 180).

The Nature of Cultural Differences of Communication Across the Disciplines

The importance of developing Interdisciplinary Communication Competence has grown significantly in the past decade, and is expected to be a critical skill for new scholars in the coming years (Boden, Borrego & Newswander, 2011), yet we can still distinguish relatively clear lines between what Becher (1989) calls "academic tribes." In order to understand how new graduate students may navigate an increasingly interdisciplinary landscape and use inter-disciplinary communication competence as they cross these tribal boundaries, it is important to examine some of the concrete ways in which disciplinary cultures differ from each other, and how these differences may impact the socialization of teaching assistants. It is equally important to explore how teaching assistants develop and apply interdisciplinary communication competence in their interactions across disciplinary boundaries. In the following sections, I will summarize a few in the use of technology in teaching, the use of language, the emphasis on collaboration versus competition (Benninghoff & Sormani, 2008), and the relationships between faculty and graduate students. The cultural differences described below are generalizations based on observations of disciplinary cultures. They represent *central tendencies* of communication behavior in the culture (Gravetter & Wallnau, 2007; p. 72), which means that they are common practices shared by the majority but not by all members of the disciplinary culture. Therefore the patterns are informative, but may not predict individual behavior. The observations below are based in part on the teaching literature

in the disciplines and on observations of the teaching behavior of over 1000 faculty and TAs each year for the past seven years. These faculty and TAs came from over eighty disciplines and were observed during faculty and TA development programs at the current author's institution by the author and members of the TA development team.

Some academic cultural norms and values are shared by most disciplines at North American universities (such as principles of academic integrity or the value of original research)(Boden, Borrego & Newswander, 2011), while other norms vary by institution and by discipline (Golde, 2005), such as the balance of teaching and research, or the amount of collaboration expected among faculty and graduate students in the department (Gardner, 2008; Austin, 2002). Disciplinary cultures vary across major disciplinary groupings (STEM fields versus arts and humanities versus health sciences) as well as across subfields within disciplines (e.g., pure versus applied math, Musselin & Becquet, 2008; or macro- versus microeconomics, Leijonhufvud, 1973).

Technology in teaching. Cultural differences among disciplines are apparent as soon as we step into a classroom. In business schools, research or teaching presentations rarely happen without power-point slides. In fact, presenting without slides may communicate that the speaker is unprepared. In English literature, reading from the text and speaking eloquently without the help of slides is valued and expected of new instructors, while in pure math, we find that working on the board is still the main tool of instruction. Teaching without the use of technology is common practice in these contexts. It is important to address discipline-specific expectations for the use of technology in campus-wide TA training programs where TAs observe and give feedback on the teaching of peers from other disciplines, because TAs may inadvertently judge the presentation of TA from a different disciplinary point of view. TAs who make judgments based on their own disciplines may offer overly harsh feedback on their perceived overuse or underuse of technology.

Language. Norms of disciplinary culture guide the language we use in the classroom, at department meetings, in academic articles, and the ways in which we give presentations at job talks or research colloquia (Jacoby, 1998). Graduate students spend

the first few semesters of their program on becoming fluent in the language of the discipline, learning acceptable and unacceptable ways of speaking and writing about research (Parry, 1998). Within a few months, our new students casually speak of *epistemological assumptions, multiple regression, naturalistic inquiry, intercoder reliability, postmodernism*, and fluently use other theoretical and research terms with which they were previously unfamiliar. Using disciplinary language allows them to be perceived as credible by other scholars (Kiley, 2009) and by the undergraduate students they teach, and helps them start to develop a scholarly identity (Ibarra, 1999; Baker & Lattuca, 2010).

Learning new terminology is the first phase of socialization (Boyle & Boyce, 1998), while other norms related to language are less easily observed and acquired. For example, among physics, astronomy, or earth science scholars, a clear expectation exists for them to be able to explain their work both in highly technical language and in lay terms when they work with undergraduate students or give outreach presentations to the general public (Liverman, Van Der Flier-Keller & Vooden, 2010). Public outreach has been identified as an important form of service for scientists by a number of national and international organizations in science, which provide their members with communication training to help them interact effectively with the public and the media. As a result, physicists tend to be very good at describing their research using vivid images, metaphors, and analogies, and are often called on to discuss their work to the general public in the media. The ability to switch between technical and plain language, and define terms is also a strong expectation in the medical sciences (Faulkner, 1998) and in nursing (Chant, Jenkinson, Randle & Russell, 2002), where scholars navigate interaction with physicians and patients on a daily basis. By contrast, among scholars in comparative literature or critical theory, fluency in the highly specialized language of literary theory is highly valued, but there is not a strong expectation for scholars to communicate their work through public outreach. TAs who demonstrate interdisciplinary communication competence are aware of differences in disciplinary language, can carefully define and clarify their terms, and can switch registers when needed.

Another frequently observed language-related cultural dif-

ference is the definite versus tentative nature of language. Social scientists use tentative language to describe ambiguous social phenomena without establishing direct causality (e.g., "there is a likelihood" "there may be a correlation" "there is a tendency to"), whereas natural scientists and engineers tend to describe theories in their field in more concrete and definitive language (e.g., "must be," "will be," "if x equals 2, then 2x is 4"). As a result, science students who take courses in the social sciences are often frustrated because their TAs do not give them *the* answer, while engineering TAs may sound overly deterministic from the perspective of social science or humanities scholars. TAs have an important role in introducing undergraduate students to the language of the discipline when they give feedback on the language students use in written assignments and presentations.

Collaboration, competition and relationships. Disciplinary cultures vary depending on the balance of competition and collaboration that is seen as desirable in the discipline (Gardner, 2010; Anderson & Swazey, 1998; Benninghoff & Sormani, 2008). Significant differences can be observed in how hierarchical their administrative structures are; how much power distance exists between students, faculty, and administrators (Hofstede, 1991; Dimitrov, 2009); and whether they are oriented towards masculine or feminine values (Sallee, 2011).

Turner, Miller and Mitchell-Kernan (2002), for example, distinguish between collaborative and lone-scholar disciplinary cultures, depending on the amount of independent scholarship or collaborative research and teaching that is expected in the field. Collaborative cultures tend to be organized around laboratories and collaborative research groups (e.g, chemistry, physiology, bioengineering), while in "lone-scholar disciplines" like history or comparative literature doctoral candidates spend many days writing and researching alone in archives and are more likely to teach independently. Competition and individualism are prominent in lab based sciences, where Benninghoff and Sormani (2008) documented the "everyone for himself/herself" approach in biology and physics labs. Their study also found evidence for high power distance in the culture of the lab. The author observed on many occasions graduate students and postdoctoral fellows

as they downplayed their own contribution to research and augmented the supervisor's role through discourse.

Significant disciplinary cultural differences exist in norms for faculty-student relationships in graduate supervision as well (Musselin & Becquet, 2008). For example, in the social sciences and humanities, if a doctoral candidate collaborates with his or her supervisor on all publications and discusses the work of the supervisor frequently during a faculty interview, this behavior may be interpreted as being too dependent and will be perceived negatively (Turner, Miller & Mitchell-Kernan, 2002). By contrast, in the collaborative research culture of sciences and engineering, the research of most graduate students is closely tied with that of their supervisors. Graduate students virtually inherit the professional network of their advisor, so it is imperative that the student communicates close ties with the work of their faculty advisor as they are applying for faculty positions.

Cultural differences also exist in terms of how open or closed supervisory relationships are. Some departments expect graduate students to have multiple mentors and encourage graduate students to approach faculty members in the academic community for advice (Gardner, 2008; Golde, 2005). In other departments, students are expected to rely primarily on their supervisor, and approaching another faculty member with questions is perceived negatively, particularly in highly competitive departments where the research of professors has commercial applications and student work is frequently patented (Tuunainen & Knuuttila, 2008).

Formality and informality. There are also differences in the degree of formality and informality acceptable in the relationship between students and faculty. In small departments and in highly collaborative disciplines, students and faculty spend a significant amount of time interacting with each other during field courses in remote locations (e.g. geoscience, biology, anthropology). This results in a greater degree of informality between students and faculty, making their relationships similar to what Hockey (1996) termed "comradeship" relationships. The high degree of informality and the frequent interaction between instructors and their students in social settings may be seen inappropriate by members of a larger department with more formal structures,

where the relationship of TAs and faculty is a "contractual" employee-employer relationship (Hockey, 1996).

Acquiring Disciplinary Communication Competence

The implicit norms, beliefs and values of disciplinary communication are part of what Gilbert (2009) refers to as the "hidden curriculum." Teaching assistants learn implicit norms by observing the behavior of administrators, faculty members, and senior graduate students. TAs listen to their peers and observe institutional policies in action (Baker & Lattuca, 2010; Gardner, Austin & Mendoza, 2010). For example, students are observant of faculty members' willingness or reluctance to take on committee work or curriculum renewal projects, and infer values of the disciplinary culture and reward system from the ways in which faculty communicate about their work (Austin, 2002; Golde, 2005). Unspoken norms are articulated only on rare occasions when someone accidentally violates them and receives feedback on the behavior. New TAs learn by imitating the communication patterns of senior scholars and peers. According to Kiley (2008), "it is not uncommon for learners, prior to full understanding, to mimic the language and behaviors they consider appropriate … at the research education level mimicry is often adopted explicitly as a way of inducting learners into their new environment, for example, through engagement in seminar where they can learn how to ask questions and pose issues in ways which are appropriate to the level and discipline" (p. 296). Jacoby (1998) documented the process of learning through mimicry, feedback, and revision in a physics lab where senior scholars gave feedback on new TAs' mock conference presentations as a way of introducing them to disciplinary norms.

For TAs who choose to pursue the path to the professoriate, the ultimate test of disciplinary communication competence often comes during the interview for a faculty position, when their potential for joining an academic department as a colleague is assessed. "Scholarly identity – for example, that of a mathematician or sociologist – is conferred upon those individuals who prove themselves to be skilled and knowledgeable practitioners in the field" (Baker & Lattuca, 2010, p. 813). Increasingly, interviews for academic positions include both a teaching session

and a research presentation, so candidates have an opportunity to demonstrate their familiarity with the language of learning outcomes, curriculum design, and student engagement, as well as their knowledge of research methodologies and theory in the discipline. Interviews provide an opportunity for assessing competence in all of the four domains of DCC.

TAs who begin teaching during their very first semester in graduate school probably acquire disciplinary communication competence on a much steeper learning curve than graduate students who do not teach. From the moment they step in front of the classroom, they are seen as stewards of the discipline (Golde et al, 2006) who need to model the ways of thinking, questioning, and research in the discipline, and guide undergraduate students on their learning journey. While TAs often feel like they are only a few steps ahead of their students in the material, they are still regarded by undergrads as ambassadors of the discipline who can "speak chemistry," explain calculus, or demystify critical theory. TAs are only able to motivate and engage undergraduates in learning if they are competent both in the content and the teaching methods of the discipline (Nyquist, Austin, Sprague & Wulff, 2001) and are able to communicate effectively with students in the classroom.

Research Directions for Disciplinary Communication Competence

A research program that explores the development of disciplinary communication competence needs to address both the process and the outcomes of learning, and should focus on three key areas of inquiry:

1) What are the characteristics of disciplinary communication competence in particular disciplines?
2) How do teaching assistants acquire it, and what are the characteristics of the learning/ developmental process?
3) How can we assess the outcome of the disciplinary culture learning process and measure whether or not, and to what degree TAs have acquired disciplinary communication competence?

See Figure 2 for suggested research analyses and methodologies below. A detailed discussion follows.

Key Research Question	*Data Collection/Preparation*	*Analyses/Methodology*
What are the norms of communication in X discipline?	• Observation of communication episodes at academic conferences, academic job interviews • Observation of communication episodes in classrooms, laboratories, office hours • Interviews with faculty, graduate students, postdocs – articulating shared norms of the discipline	**Critical Incident Method** (Wellmon, 1988) *Disciplie-specific and cross-disciplinary analyses* **Ethnographic Interview** (Spradley, 1978) **Nauralistic Inquiry** (Lincoln and Guba, 1989)
How do TAs acquire disciplinary communication competence?	• Survey research at key stages of TA socialization • Content analysis of learning journals by TAs • Longitudinal observational study of TA teaching (e.g video recorded observation annually for 4 years) • 360-degree assessment of TA competencies (interviews with peers in the TA team, the course supervisor, undergraduate students) • Content analysis of TA training materials for disciplinary norms and feedback on demonstrated DCC skills • Individual and focus group interviews with TAs at major developmental milestones	**Theme analysis of systematic reflection and interviews** (Gardner, Austin & Mendoza, 2010) Coding video recorded teaching using the **Teacher Behavior Inventory** (Murray, 1983, 1997) Documenting change over time using the Approaches to Teaching Inventory (Trigwell and Prosser, 2004) Analysis using **Threshold Concepts Framework**; as applied to doctoral education by Wisker and Robinson (2009) and Trafford and Leshem (2009)
Measuring the outcomes of the socialization process: **How do we determine that teaching assistants have acquired DCC?** **Can we measure the level of their competence?**	• Measuring impact of TA training interventions focused on DCC • Survey based assessment of Communication competence in disciplinary settings • Critical incident based assessment of communication skills • Comparison of cognitive and behavioral adaptation to disciplinary culture by TAs	Quasi experimental studies using pre-and post assessment of DCC with program participants; comparison with control group Measures of communication competence (Spitzberg, 2003) or Communication Competence Assessment Instrument (Rubin, 1985) Measures based on the Collegiate Learning Assessment (Klein, Benjamin, Shavelson & Bolus, 2007) Combination of self-report and observational measures of DCC

Figure 2. Approaches for the study of Disciplinary Communication Competence (DCC).

Research Area 1: What is disciplinary communication competence?

Key questions:

- How do norms of disciplinary communication vary across disciplines?
- How is disciplinary communication competence defined in different disciplines?

Because little previous research exists in the area, norms of communication in particular disciplines can be studied using either the critical incident method (Wellmon, 1988), naturalistic inquiry (Lincoln & Guba, 1989), the ethnographic interview (Spradley, 1978) or other exploratory, qualitative approaches. Using the critical incident method may involve interviews with scholars (faculty or advanced graduate students) during which the researcher asks participants to identify key expectations for communication in their field, to define competence and incompetence in disciplinary communication, and to illustrate these with real cases from their experience (Wellmon, 1988)(see Figure 2). One of the ways of questioning that resulted in rich descriptions of organizational culture in organizational culture studies could involve asking about norm violations in the culture (Wellmon, 1988), such as "Describe a situation in your department when a TA or faculty candidate communicated in a way that was not appropriate for the discipline." Critical incidents could then be analyzed to identify key themes that reflect norms of communication in the discipline. Data from multiple disciplines can be meta-analyzed to identify both academic universals and discipline-specific communication patters.

Research Area 2: The Process of Disciplinary Culture Learning

Key question: How do TAs acquire disciplinary communication competence?

Specifically:

- What activities help TAs learn about disciplinary culture?
- What sources do they learn from and who are their cultural informants?
- Does the process of learning involve salient milestones or stages?
- What are "threshold competencies" for disciplinary communication in the discipline?

Research on the process of learning may borrow its methods from the cultural adaptation studies that examine the development of intercultural communication competence (Deardorff, 2009b; Dinges & Baldwin, 1996; Arthur, 2001; Kim, Laroche & Tomiuk, 2001), as well as from Scholarship of Teaching and Learning studies that focus on the process of learning (Hubball & Clarke, 2010).

In this research area it will be important to distinguish between disciplines in which the norms of communication are largely implicit and ones in which they are more formalized, and then examine them in separate studies. In general, disciplinary codes of ethics and normative guidelines are more explicitly taught in professional schools, through courses in professional practice and ethics (e.g., law, architecture) or in disciplines that involve mentoring in clinical settings (e.g., occupational therapy, clinical psychology) or in disciplines in which qualifying exams or licensing procedures are required to practice in the discipline (engineering). These disciplines may provide best practices for making implicit disciplinary cultural norms more explicit, and could be used to improve TA training.

The process of socialization could be the subject of survey research at key stages of the graduate program (the beginning of each year, after comprehensive exams or the first conference, first independently taught course), as well as five or ten years after graduation, as in the work of Nerad, Aanerud and Cerny

(2004). Studies may involve self-reports of learning, questions assessing knowledge of norms, and an attempt to document the types of learning activities TAs participate in (conferences, peer review, formal training, mentorship, Preparing Future Faculty programs). In the sciences, much of student socialization takes place in the lab setting, where students learn how to teach and collaborate on research, get mentored, and engage in group-decision-making. Personal learning journals and systematic reflection (Gardner, Austin & Mendoza, 2010) that identify learning events or ambiguity about norms in the discipline may help us understand the process of learning DCC better.

Other methods could include a 360-degree assessment of TA competencies through interviews with peers in the TA team, the course supervisor, and undergraduate students, conducted each year to highlight the stages of DCC development (see Figure 2). Studies may focus on key turning points in the development of mentoring relationships between the student and "senior" colleagues in the field and explore the identity development of new teaching assistants (Baker & Lattuca 2010), or examine the provisional selves that teaching assistants take on along their path towards the professoriate (Ibarra, 1999). Studies may document how the teaching-self evolves through experimentation and feedback. Once key phases in the development of DCC are identified, we can explore whether certain competencies serve as *threshold competencies* and test how their presence or absence impacts the developmental process. For example, the ability to network appropriately with scholars in the discipline and learn from multiple sources may be one of these threshold competencies (Land, Meyer & Smith, 2008).

The development of instructional communication competence may be measured using longitudinal studies of teacher behaviors using observer ratings of effective instructional communication using the Teacher Behavior Inventory (Murray, 1983, 1997) or measures of TA self-efficacy (Prieto & Meyers, 1999)(see Figure 2). Short-term studies of changes in instructional communication competence have already shown significant increases in the self-efficacy of graduate teaching assistants and decreases in their communication apprehension. Changes in awareness of instructional communication norms as a result of short training

interventions using videotaped microteaching sessions has also been shown (Boman, 2008). However, more longitudinal studies are needed to assess how graduate students incorporate experience gained in the classroom into their conception of instructional communication competence.

Research Area 3: Outcomes of Learning and Assessment of disciplinary Communication Competence

Key questions:

- How do teaching assistants demonstrate that have acquired DCC?
- Can we measure the level of their competence?
- Can we measure change in levels of competence or the ability to articulate norms of the academic community?
- What types of surveys or other instruments can we develop to assess the outcomes of the DCC learning process?

Research methods used to assess learning outcomes in Scholarship of Teaching and Learning (SoTL) research would be the most appropriate to use to examine whether TAs have successfully acquired disciplinary communication (Hubball & Clarke 2010; McKinney, 2007)(see Figure 2). A study may involve assessing the impact of a teaching intervention on the disciplinary communication competence of teaching assistants. An experimental or quasi-experimental study may be designed with pre-and post-tests of knowledge related to norms in the discipline, and administered to three groups of TAs who were randomly assigned to three different experimental conditions. One group could receive formal instruction about the rules of giving conference presentations in their discipline; a second group could receive instruction about strategies they may use to find out the rules of giving conference presentations in the field; and finally a third "no intervention group" could take part only in the pre-and post tests, without taking part in the teaching intervention. All groups would receive information on norms of conference participation *after* the experiment is completed.

Research on DCC could also draw on the research on assessment of undergraduate degree outcomes or generic skills, such as critical thinking or verbal communication, which have relied on critical incident based measures such as the Collegiate Learning Assessment (Klein, Benjamin, Shavelson & Bolus, 2007). Communication and intercultural competence measures (Spitzberg, 2003) may also be used to examine culture learning in the context of graduate education. Based on the findings of research in Research Area 1 (*What is disciplinary communication competence?*), it may be possible to construct a scale similar to the Communication Competence Assessment Instrument (Rubin, 1985) that would reflect the unique challenges of communication in a particular field. In addition, the critical incident method may allow us to examine whether graduate students are aware of the norms of the discipline, and also to find out whether they are able to predict the responses of the other communicator to a communication episode. Such an ability has been identified as key to communication competence in the literature (Wiseman, 2001).

In an assessment of DCC learning outcomes, it will be important to distinguish between cognitive and behavioral learning during adaptation to the disciplinary culture (Ward, Bochner & Furnham 2001). The distinction is important so that we can assess whether graduate students can really "walk the walk of microbiologists" or whether they are only able to describe the norms (cognitive adaptation) but not necessarily apply them on their own (behavioral adaptation). Studies examining the difference between cognitive and behavioral learning in this context may use self-report or observation of communication behaviors in the classroom, in a lab, at academic conferences, or in simulated interaction situations. Ideally, most of the studies conducted would be designed as longitudinal projects that track student growth over the course of the graduate program, and possibly beyond, giving researchers an opportunity to examine potential connections between DCC and knowledge transfer, as well as between the development of DCC and graduate student retention and attrition (Golde, 2005).

Application: Using Research on DCC to Enhance TA Development Programs

Empirical research on DCC will help enhance TA development programs, and additionally help refine the DCC model itself as we accumulate more data about disciplinary communication in action (see Figure 3 below). Research findings on the attributes of DCC in the disciplines will allow faculty and TA developers to clearly articulate the outcomes of the DCC learning process for TAs, and to develop concrete learning activities and individual development plans that may guide TAs as they progress towards these outcomes. Research on the process of DCC development may provide us with "best practices" already used in various disciplines and provide insight into factors that may help or hinder the development of DCC. After findings on the attributes of DCC and the process of DCC development are incorporated

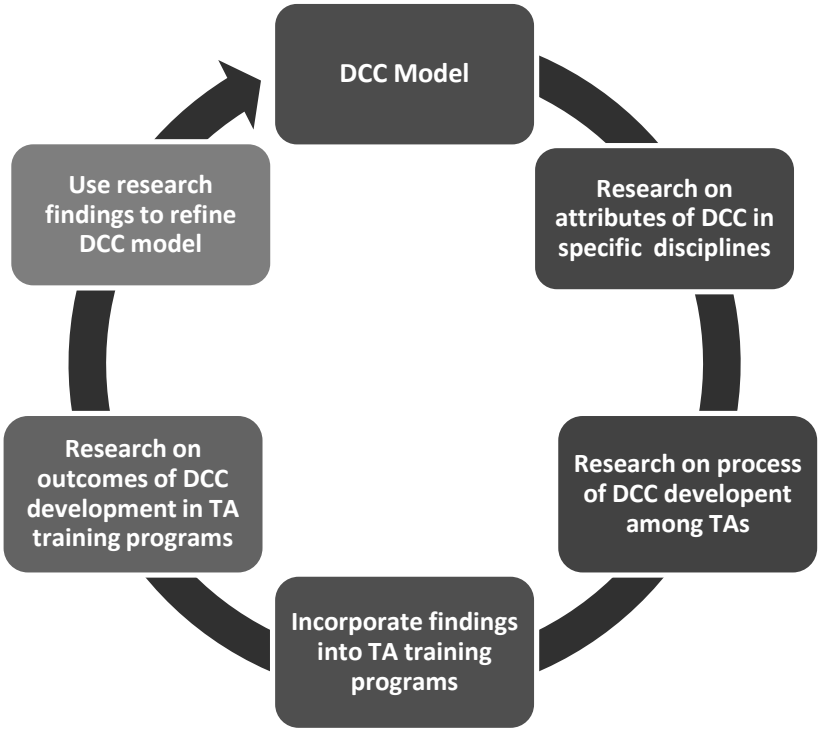

Figure 3. Continuous theory-research-practice cycle for DCC.

into TA training programs, research on the outcomes of DCC development will help refine the DCC model and to inform further research on how disciplinary and inter-disciplinary communication competence enable young scholars to succeed in teaching, research, and other areas of scholarship.

Beyond conducting research in the three areas outlined in the previous section (Figure 2), there is a need to document and collect findings from this emerging body of research so that scholars from a variety of disciplines may access it easily and benefit from its results, without findings being scattered in disciplinary journals. Research on the development of DCC across the disciplines may be documented through comprehensive literature reviews similar, for example, to research on the outcomes of faculty development programs around the world as in Stes, Mim-Leliveld, Gijbels & Petegem (2010). Published research findings could also be documented through online repositories or *wikis* through professional organizations that bring together TA developers and scholars who conduct research on TA development, such as the Professional and Organizational Development Network (POD) in the U.S; the Consortium of TA Developers affiliated with the Society for Teaching and Learning in Higher Education (STLHE) in Canada; the Higher Education Research and Development Society of Australasia (HERDSA); or the International Consortium for Educational Development (ICED).

The findings from this new body of research have the potential to enhance TA and graduate student development programs significantly. The key strengths of a culture learning/communication competence approach to TA development are that 1. It provides a developmental view that allows us to identify common stages during the DCC learning process and articulate the outcomes of the learning process; and 2. It emphasizes the need for participation in a scholarly community - a variable that new graduate students often neglect during their studies. The developmental approach of the DCC framework will enable TA developers and other TA mentors to anticipate the critical transition points at which TAs will encounter difficulties in the acquisition of disciplinary communication competence. Programs designed using the model will help identify TAs who are at risk of not completing their programs or not performing

well in TA roles due to gaps in their DCC, and will also provide a framework for creating individual DCC development plans with at-risk students.

The DCC model has important implications for TA development in general. DCC reinforces the need to combine discipline-generic, campus-wide training programs with discipline-specific preparation for teaching. A combination of these two approaches will allow TAs to become aware of differences in disciplinary cultures, and to develop the ability to step outside of disciplinary silos and interact across disciplinary cultures. In addition, introducing TAs to the concept of disciplinary culture and disciplinary communication competence as soon as they enter graduate school may also facilitate scholarly collaboration and teaching across disciplinary cultures at all stages of their academic career, from graduate school to the professoriate.

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