"Leave Your Discipline At the Door": Matching Expectations for Interdisciplinary Collaboration among Faculty Members

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This study explores why interdisciplinary collaborations succeed or fail. We used Tannen's (1993) discourse method of frame analysis to uncover individuals' implicit assumptions toward interdisciplinary collaboration and mapped these expectations to one of three stages in Amey & Brown's (2004) model of interdisciplinary team development. In analyzing meetings between an established team and four potential collaborators, we found that potential collaborators who interacted with the team at their current stage of development engaged in long-term collaborations, while others interacted at an earlier stage and were not asked to join the team. The findings can guide academic researchers in becoming better interdisciplinary collaborators.

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Introduction

Despite being organized primarily along disciplinary lines, higher education institutions and their faculty members are increasingly required to work in more integrative, cross-disciplinary modes. Institutions seek to increase ratings and competitiveness by emulating research universities (Aldersley, 1995), impacting faculty members, for example, through increased pressure to publish (Henderson, 2011; O'Meara & Bloomgarden, 2011). Emphasis on increasing external funding levels has resulted in a proliferation of new structures such as organized research units, including interdisciplinary research centers (Bunton & Mallon, 2007; Corley, 2005). In fact, the sharpest increases in institutional funding rates in recent decades have been linked to interdisciplinary research centers (Stahler & Tash, 1994). These emphases change the nature of faculty work (Boardman & Bozeman, 2007; Bunton & Mallon, 2007; Corley, 2005), forcing many faculty members to collaborate across disciplines and engage in new modes of knowledge production (Boardman & Bozeman, 2007; Nowotny, Scott, & Gibbons, 2003), often with limited guidance. The net result is scientometric evidence that research is indeed becoming more interdisciplinary, as defined by integration of knowledge from multiple disciplines (Leydesdorff & Rafols, 2011; Porter & Rafols, 2009; Wagner et al., 2011).

Despite a proliferation of publications describing first-hand the challenges of interdisciplinary collaboration, the theory base describing the nature of these challenges and how interdisciplinary teams overcome them is underdeveloped and underutilized. To begin to fill this gap, we present an analysis of one interdisciplinary faculty team's experiences seeking new collaborators, which combines a developmental stage model of interdisciplinary collaboration with methodology from linguistics. We explore the broad question of why do some interdisciplinary collaborations succeed while others fail? Our purpose is to better understand how expectations for interdisciplinary collaboration, as revealed through discourse events, impact collaboration success or failure. In exploring a process for observing these potential links, we also attempted to operationalize theoretical claims through discourse analysis methods; in this way, this study is a methodological exploration of combining theories. With results from this case study, we propose a model of communication and collaboration, and we offer initial observations about the nature of discourse and team-building. The results will augment the interdisciplinary collaboration skills of faculty members and other researchers in academia by more clearly explaining how differing perspectives, if not navigated carefully, can lead to failure in collaboration.

The challenges faculty experience when attempting interdisciplinary collaboration are often attributed to disciplinary differences in language (Fry, 2001; Salter & Hearn, 1996), culture and/or epistemologies (Bromme, 2000;

Gooch, 2005). However, at least part of the problem may arise from assumptions about how one's own disciplinary perspective will contribute to, if not guide, an interdisciplinary project. To understand and explain differing expectations for interdisciplinary collaboration, we employ Amey & Brown's (2004) three stages of faculty interdisciplinary collaboration emphasizing a shift from individual contributions of expertise to adaptive modes of approaching problems. In this stage model, individual behaviors lead to "conceptual" (as opposed to "instrumental") collaboration in which participants integrate disciplinary perspectives (Amey & Brown, 2004; Salter & Hearn, 1996). Building on this model of teaming behaviors, our study examines patterns in conversations in which speech is used as a means to understand individuals' expectations of interdisciplinary collaboration and their impact on team-building decisions. We specifically explore differences in terms of the depth of disciplinary integration at which individuals are willing to engage.

Focusing on an existing interdisciplinary team seeking to expand its membership, we have systematically analyzed speech patterns that may have played a significant role in team building. Specifically, we examined an interdisciplinary team's conversations with four potential collaborators, two of whom were later asked to join the team and two of whom were not. Frame analysis was used to track how individuals expressed their expectations of interdisciplinary teamwork. Amey & Brown's stages of interdisciplinary behaviors were used to compare these expectations and determine whether they aligned with the collaborative dynamics of the team.

Literature Review

In this review of literature, we describe some of the challenges of interdisciplinary research in higher education, followed by a summary of Amey & Brown's developmental model, which was constructed to describe stages of interdisciplinary collaboration. We then describe two more theoretical frameworks, Tannen's discourse analysis approach that focuses on frames of expectations, and Öberg's (2009) conceptualization of "common ground" that proposes the solution of uncovering implicit assumptions in interdisciplinary collaborations. These frameworks form the basis of our inquiry and closely inform the methods used in this study to explore how teams use communication in interdisciplinary settings.

Challenges of Interdisciplinary Research in Higher Education

While the ambitions of institutions place pressures on faculty members to publish (Henderson, 2011; O'Meara & Bloomgarden, 2011), affiliate with interdisciplinary research centers (Bunton & Mallon, 2007; Corley, 2005), and

otherwise engage in new modes of knowledge production (Boardman & Bozeman, 2007; Bunton & Mallon, 2007; Corley, 2005; Nowotny et al., 2003), faculty reward systems have not always kept pace with these new demands. The challenges typically cited arise from the additional time necessary to work across disciplines, the demands of working across two organizations (as in a joint appointment), and the disciplinary orientation of review criteria and peer reviewers. Interdisciplinary scholarship often takes more time due to communication and negotiation with collaborators and reviewers (Committee on Facilitating Interdisciplinary Research, 2004; Pfirman, Collins, Lowes, & Michaels, 2005a). When faculty are jointly appointed across two organizations, there may be a high administrative expectation for faculty meetings and committee work, as well as expectations for "face time" in each department (Pfirman, Collins, Lowes, & Michaels, 2005b). Finally, review committees are often composed of individuals representing various disciplines, who may devalue contributions outside the discipline and question contributions to team projects (Payton & Zoback, 2007). The resulting conventional wisdom is that interdisciplinary endeavors should be delayed until tenure (Mallon, 2006). While enthusiasm for interdisciplinary scholarship is high, and a handful of publications offer best practices for mitigating the early career risks (Committee on Facilitating Interdisciplinary Research, 2005; Payton & Zoback, 2007; Pfirman et al., 2005b), there are few empirical studies describing how successful interdisciplinary researchers overcome these challenges.

The intellectual (as contrasted with organizational) challenges faculty experience when attempting interdisciplinary collaboration are often attributed to disciplinary differences in language (Fry, 2001; Salter & Hearn, 1996), culture and/or epistemologies (Bromme, 2000; Gooch, 2005) as researchers attempt to integrate knowledge from disparate domains to produce new insights (Boix Mansilla & Duraisingh, 2007; Lattuca & Knight, 2010; Repko, 2008). The constructive advice for overcoming these challenges is dialog focused on developing common ground, which includes uncovering implicit assumptions (Öberg, 2009; Olson & Olson, 2000). Yet very few qualitative, long-term studies exist to understand how common ground forms in interdisciplinary teams, and those that do support claims that interdisciplinary collaboration is particularly arduous and not always successful (Amey & Brown, 2004; DuRussel & Derry, 2001; Gooch, 2005). The explanations offered are variations of a common ground argument (i.e., lack of common ground led to misunderstandings and weakened trust). Amey & Brown (2004), to our knowledge, offer the only stage model that may explain how common ground develops over time in interdisciplinary faculty teams.

Stages of Interdisciplinary Collaboration

Based on their long-term observations of an interdisciplinary faculty research team, Marilyn Amey and Dennis Brown (2004) present a developmental model comprising three stages of interdisciplinary collaboration (Table 1).

Table 1
Three-stage Model of Interdisciplinary Collaboration and Faculty Work. After Amey & Brown (2004, p. 13)

	Stage One	*Stage Two*	*Stage Three*
Discipline Orientation	Dominant	Parallel	Integrative
Knowledge Engagement	Expert	Coordinated	Collaborative
Work Orientation	Individual	Group	Team
Leadership	Top-Down	Facilitative, Inclusive	Web-like, servant leadership

In Stage 1 of the model, faculty view themselves as individuals more than as members of a team. Leadership is based on a hierarchy, with senior, tenured members directing the project from the top down. Other collaborators have little stake in the ultimate goals of the project and are viewed (by all) more as expert consultants than team members. Efficiency is a key value in this stage, as work is completed in an assembly line fashion with minimal interaction. Individuals receive assignments that map to their specific domain expertise and then pass their completed work on to the next collaborator. Differences between disciplinary approaches are viewed as roadblocks to accomplishing a task rather than building blocks that enrich the outcome by understanding alternative perspectives. Individuals in Stage 1 are often unwilling or unable to see problems through any other than their own disciplinary lens, and as a result, the ability of the group to accept potential limitations of one method or approach and the possible advantage of another is hampered (Amey & Brown, 2004, p. 27).

As groups continue to work together, they may increase their level of trust and responsibility, thus moving to Stage 2. This transition occurs as team members begin to recognize the potential benefits that different disciplinary lenses offer. While individual disciplinary perspectives can persist, they compete less with each other and coexist, often facilitated by the group developing "intellectual neutral space" or "a demilitarized zone" (p. 44) where disciplinary perspectives can peacefully "exist parallel to each other" (Amey & Brown, 2004, p. 42). Leadership in Stage 2 focuses on enabling collaboration among group members. Teams meet more frequently for thinking and discussion than

accountability checks (p. 35). They begin to engage in "more dialoging and less debating" (p. 47) which is important, since this is how teams create shared visions and work processes. However, this stage is also when individuals become worried about their status within the larger institution and fear potential penalties for wandering too far from the norms and values of their home discipline.

Movement from Stage 2 to Stage 3 occurs when team members accept multiple perspectives. In this stage the variation between different disciplines becomes indistinct; "disciplines [do not] compete for dominance" but rather seek to "complement each other" in an effort to address the research problem (p. 50). Leadership roles are dictated by the demands of the task. While one individual may carry an administrative leadership title, in Stage 3 the team as a whole is involved in "setting the agenda, reviewing the work, and developing future tasks and direction" (Amey & Brown, 2004, p. 53). Stage 3 team members value "the philosophy of collaboration," (p. 52) and are "open to the free uninhibited debate of issues." (p. 53) Debate and disagreement are no longer viewed as potential roadblocks to success but rather as opportunities to better understand the issues at hand (p. 55). An important note about the movement from stage two to stage three is that it does not require team members to abandon their existing disciplinary lenses but rather allows them to take on "adaptive lenses" (Amey & Brown, 2004).

Discourse Frame Analysis

This study combines frame analysis, a discourse theory and method, with Amey & Brown's model to examine ways in which group dynamics are dependent on individual expectations of interdisciplinary collaboration. Theoretically, frame analysis explores the concept that individuals use prior experiences to structure, or *frame*, their expectations and understanding of events (Tannen, 1993). Based on these expectations, individuals engage in "presentation of self" (Goffman, 1959) by using systems of linguistic choices in discourse events such as meetings. As a simple example, consider the discourse event of a waiter serving a customer in a restaurant, in which the customer and the waiter may have different and similar ways of framing the event. They each expect a certain order of events (waiter brings water, tells about specials of the day, takes order, brings food, etc.), and the customer may, for example, expect quick service and a certain quality of food, while the waiter expects a generous tip but is accustomed to a slow cook. The ways that the waiter and the customer negotiate their expectations may affect the outcomes. For example, if the waiter informs the customer that the kitchen is slow and then offers advice on what to order, the customer may adjust her expectations. If the waiter does not communicate this information, the customer may be dissatisfied and leave a poor tip.

Importantly, individuals usually employ frames unconsciously, and different individuals in the same group often employ different frames. For example, frames can overlap yet still be different enough to preclude collaboration or cause conflict. These differences are often implicit, yet can be gleaned through detailed discourse analysis. Since the expectations that individuals hold for interdisciplinary collaboration are often implicit, discourse frame analysis is employed to systematically uncover the linguistic evidence of expectations. Discourse analysis is the study of context-specific language that uses linguistic features to reveal human interaction as "both a reaction to the world and an intervention in it" (Johnstone, 2002, p. 196). In other words, during conversations people are both conforming to social conventions and contributing to specific instances of making meaning. Frame analysis proposes that people bring different expectations and attitudes to conversations, which then affect how meaning is co-constructed. As they interact linguistically they navigate expectation structures, or *frames* (Tannen, 1993). These negotiations are analyzed linguistically by coding speech at a very detailed level.

Many common types of linguistic evidence are used by researchers conducting discourse analysis; they can include examples of word choices, tone, pauses, and body language. Both the detailed level of speech and the broader level of frames must be examined together; as Tannen explains, "all these levels of knowledge structures coexist and must operate in conjunction with each other to determine how the events […] will be perceived and then verbalized" (Tannen, p. 22). By examining frames and speech in concert, researchers can better understand how expectations are revealed in interactive communication.

Common Ground

Finally, we use the concept of *common ground* to orient our discourse analysis of interdisciplinary expectations in relation to Amey & Brown's stage model. *Common ground,* is defined, beyond the cliché, as "a collaborative process in which the participants mutually establish what they know so conversation can proceed" (Olson & Olson, 2000, p. 157). Creating a common ground of valuing integrative collaboration is essential for interdisciplinary teams (Kockelmans, 1979), yet common ground can be difficult to build, in part, due to unconscious assumptions (Öberg, 2009). In exploring the process of creating common ground, we propose the model depicted in Figure 1, where the varying sizes of circles indicate differing priories, awareness and strength of expectations.

Figure 1
Establishing common ground for interdisciplinary research

Individuals enter into discourse events with both differing and similar frames of expectations. In order to reach common ground for interdisciplinary collaboration at Amey & Brown's Stage 3, participants must negotiate their frames of expectations through interactive communication within each discourse event. It is no coincidence that this foundation of common ground does not fully develop until the third and final stage.

Method

Setting and Participants

This study was set at a large public research university on the east coast of the United States. The core team that forms the subject of this study consisted of five members (Table 2) and was formed two years prior to this study for the purpose of teaching an interdisciplinary project course. We chose this team due to their frequent and explicit discussions concerning their teaming philosophy, which focused on working across disciplinary boundaries by dropping assumptions and being open to learning new ways of teaching and conducting research, hence their mantra of "leave your discipline at the door."

Table 2
Team Members and Potential Collaborators.

Pseudonym	Role	College	Rank
Brad	Team Member	Architecture	Professor
Belinda	Team Member	Business	Associate Professor
Ted	Team Member	Engineering	Associate Professor
Nate	Team Member	Architecture	Associate Professor
Matt	Team Member	Architecture	Professor
Chris	Potential Collaborator – did not join team	Liberal Arts	Assistant Professor
Jan	Potential Collaborator – joined team	Architecture	Assistant Professor
Sean	Potential Collaborator – joined team	Engineering	Assistant Professor
Robin	Potential Collaborator – did not join team	Engineering	Assistant Professor

Throughout our data collection, this team sought to expand its membership and expertise. In these initial meetings with potential collaborators, the team articulated their underlying values and how they worked together, explicitly establishing their teaming philosophy and expectations for interdisciplinary work. Of the weekly team meetings observed by the authors, three particular meetings were chosen for this analysis because these were the initial meetings with four potential collaborators (Table 2), and discourse frame analysis revealed individuals' expectations for collaboration. The team was working on a series of research and educational projects that revolved around industrial safety grants and grant proposals, and was seeking team members to write, conduct research, and design curriculum (We limited the details of their research area to protect the identities of the participants.). In each meeting, one team member introduced a potential collaborator(s) to the rest of the team. The newcomer proposed a research idea to the team; they discussed the potential project and then adjourned. Belinda introduced Chris, a university research center administrator, to provide additional information about an internal proposal process as well as to discuss potential opportunities to collaborate. Brad introduced Jan, a colleague in his department, to propose a research idea and to discuss specific grants that should

be targeted. Ted introduced Sean and Robin, two assessment experts, who proposed ideas for an interdisciplinary course project. From these three meetings, two of the four potential collaborators, Jan and Sean, engaged in long-term interactions with the team while the other two, Robin and Chris, did not.

The authors attended both weekly private and potential collaborator meetings over a 19-month period where they took observational field notes, supplemented by audio recordings that were later transcribed verbatim. The data collection for this study was approved through human subjects (IRB) review. Each participant was assigned a pseudonym.

Data Analysis

The first two authors used NVivo qualitative analysis software to code all three transcripts in detail using Tannen's (1993) sixteen types of linguistic features. They cross-checked their results for consistency, and when inconsistencies were noted they were discussed and transcripts were reexamined for that specific code, with the third author also reading the transcript and helping to make a judgment. In this stage of analysis, patterns emerged in which seven types of linguistic features were differentially used by participants who eventually collaborated with the team and those who did not (Table 3).

The next step was to compare patterns of language use. Researchers counted individual features and examined the ways in which the features were used and responded to by others in the discourse. Finally, these patterns were mapped to characteristics in Amey & Brown's model to determine how potential team members may or may not align in their approaches to collaboration. Specifically, the way that individuals used linguistic features in context was mapped to Discipline Orientation, Knowledge Engagement, Work Orientation or Leadership in Table 1, which was characteristic of one of more of Amey & Brown's stages.

Results

In this section we first describe the core team in terms of Amey & Brown's stage model, finding that they were operating at Stage 3. Then, we present our analysis of discourse events indicating the stage expectations of each of the four potential collaborators.

Collaborative Development of the Core Team

We used observational data to determine that the interdisciplinary team under study was operating at Stage 3 of Amey & Brown's model of interdisciplinary collaboration. The team took an integrative approach to both their research and

Table 3

Evidence of Expectations. These seven types were used in different ways by collaborators who did and did not join the team.

Linguistic Feature	Description of speech	Effect	Example
Backtrack	To return to an earlier topic in conversation.	Can indicate a realization that an expectation is not being met.	Sean: 'I think there's a distinction here, because I've sat in with industrial design people before, and 'acceptable to the user' is not just that it will work.'
Hedges and Hedgelike Words and Phrases	To qualify or modify a statement as to permit withdrawal.	Can indicate uncertainty of other's expectations or openness to different perspectives.	Sean: 'And, and we'll do--some product, like a report or a, or a proposal or something.'
False Start	To begin a statement and then stop or change the content of the statement.	Can indicate an adjustment of meaning in expectation that one's statement should link coherently with the preceding one.	Jan: 'you know, it would, I can't, they- I can't see them voluntarily buying an additional technology that would then reveal that they're exposing their employees to something'
Interpretations	To make a statement that cannot be verified from immediate observations.	Can indicate an attempt to explain another's meaning, work, or behavior in terms of one's own expectations.	Ted: 'How do we know that's acceptable?' Robin: 'How do you know? It's some kind of performance test.'
Repetition	To repeat a point immediately or later using either identical or varied wording.	Can serve to reinforce a specific point or set of expectations that a speaker would like to emphasize; or can indicate that a statement is unexpected.	Chris: 'But the actual delivery has been difficult because of how do we implement this?...So delivery is a problem. I mean how, how do you actually get the training.'
Generalization	To use one instance to apply or define other instances.	Can indicate an attempt to make different things seem similar based on structures of expectations.	Chris: 'People assume that we are not high tech, but we are high tech, with some problems, but we are high tech.'
Modals	To indicate one's attitude toward the reality of a statement, i.e., 'should' 'would' 'could' 'may'.	Depending on the modal, can indicate whether or not something is possible or desirable based on structures of expectations.	Jan: 'I have some ideas that I could share with you guys.'

their teaching collaborations. For example, in terms of Discipline Orientation (Table 1), each member learned a component of the other's discipline: the engineer learned methods for teaching marketing and value propositions; the business professor learned to teach design principles, and the architecture professor learned how to write computer programming code. In terms of Knowledge Engagement, each member of the core team and members who worked with the team served not as content consultants, but rather as facilitators who helped the entire team write proposals and conduct studies. For example, a safety engineer who worked with the team not only offered knowledge about current applications, but also brainstormed technical solutions and marketing approaches. The Work Orientation of the team was collaborative and conducted for general goal attainment versus individual progress; all members took responsibility for the team's outcomes. For example, the team carefully examined each project goal for its worthiness to the entire team, order of authorship was rotated for each publication and each article and proposal was co-written with contributions by all members and drafts changing hands multiple times. Finally, the Leadership model was "web-like." For example, leadership rotated according to who had time, connections, or initiative to spearhead a particular project. In the course that the members co-taught, they created the syllabus and calendar together and actually co-taught each class with each member in the classroom whenever possible. The leadership ethos was one of servant leadership. The team had frequent open discussions of how interdisciplinary work might impact promotion and tenure, and senior members prioritized team decisions that would put focus on how a project could help junior members in their career development. The team often joked that whichever member was absent at one weekly meeting be the team "leader" for the next week. Overall, as stated above, the team adopted the motto of "leave your discipline at the door"—that is, their expectations of team members was for everyone to contribute their expertise, but (more importantly) be ready to think outside the structure of their discipline to find new and creative ways of conducting research and teaching design.

Analysis of Discourse Events in the Team Meetings

We used the linguistic features listed in Table 4 to guide our analysis. As Table 4 indicates, some features were used more by certain members than others. However, frequency of use is not as important as the way in which a feature was used, so the following sections provide descriptions of each context.

Table 4
Use of Linguistic Features by Participants

Linguistic Features	Use by participants
Backtrack	Used most often by participants who continued with the team. Used to retrace statements and clarify meaning.
Hedges and Hedgelike Words and Phrases	Used most often by participants who continued with the team. Used to create conversational space for negotiation of meaning.
False Starts	Used most often by participants who did not continue with the team. Used to change the direction of sense-making or to control the meaning of a concept.
Interpretations	Used most often by participants who did not continue with the team. Used to represent a situation in terms of their own disciplinary lens.
Repetition	Used by both categories of participants. Continuing members used to foster better understanding. Non-continuing members used to emphasize their own viewpoint.
Generalization	Used by both categories of participants. Continuing members used to find a common area of understanding. Non-continuing members used to over-generalization or stereotype.
Modals	Used by both categories of participants. Continuing members used modals such as “could” and “would” indicate possibility and acknowledgment of contingency. Non-continuing members used modals such as “should” indicated a desire for events to occur according to the speaker’s expectations.

The following results examine the linguistic features of each of the potential collaborators’ expectations of interdisciplinary collaboration, showing that the two eventual collaborators (Jan and Sean) engaged with the team primarily at the level of Amey & Brown’s Stage 2; and that the two who did not continue working with the team (Robin and Chris) approached the meetings with expectations aligning with Stage 1. In each meeting, the potential collaborators presented their qualifications in terms of their experience and knowledge. However, the mode in which each person presented their qualifications varied, and these variations reflected different expectations of what their role in the team project would be.

Stage 1 interactions—Chris. We begin by describing how Chris used *generalization* and *repetition* to indicate his expectations of working with the group as a Stage 1 disciplinary expert, which is a reasonable starting point for a team that was new to him. Unfortunately, this was inconsistent with the group members' Stage 3 uses of *hedges* and *interpretation* indicative of a more integrated, collaborative team.

At the start of the meeting, Belinda introduced Chris, who was already known by reputation to the team. Because of his position on the internal judging panel for grant proposals, Chris was both a potential collaborator and gatekeeper. He presented himself as a scholar and participant in the industry under discussion, and *generalized* his experiences to a substantial sector of this industry:

> Chris: I'm, ah, I'm writing a paper right now on the addressing the digital divide in the […] industry. And, ah, the claim is that most papers that you read about the use of technology and computing the […] industry say the same thing. People assume that we are not high tech, but we are high tech, with some problems, but we are high tech.

Chris presented himself as an expert when he stated that he is writing a paper that disputes a common claim about digital cultures; however, he made no effort to interpret his experiences in terms of collaboration with the team's goals of building a collaborative product. In terms of Amey & Brown's model of interdisciplinary collaboration, Chris's Discipline Orientation was discipline-dominant and his Knowledge Engagement that of expert consultant (Stage 1). Additionally, it can be inferred from his first-person pronoun usage that his Work Orientation was individual (also Stage 1)('*I'm* writing a paper')(When he said '*we* are high tech,' he was extending his expertise to the entire subsector of his industry and not referring to the team he might join.).

Several minutes into the meeting, after Chris summarized the ideas the team has offered, he also *repeated* some of his main points. First, he *repeated* the research that he has done and then, using a negative statement beginning with 'but', pointed out problems with the presence of technology in the industry:

> Chris: But the actual delivery has been difficult because of how do we implement this? How do we go and bring workers to a cave-like environment so they can be in virtual reality? Or how, or even worse, how do we take this cave environment with glove and goggles and everything to the [work] site? So delivery is a problem. I mean how, how do you actually get the training.

From this exchange, the team was given a problem to work out, and the questions did not support integrative problem solving but rather a charge to figure out

something that has not been accomplished yet in the industry under discussion. And since Chris was serving on the review panel, the team did not interpret his statement as an invitation to collaborate but rather as a potential issue to address in a proposal. This exchange further supports the conclusion that Chris's frame of expectations was characteristic of Amey & Brown's Stage 1, in which Work Orientation is individual and Leadership is top-down. His Knowledge Engagement was as an expert consultant offering a problem to be solved, and his role in the work was as an individual—not part of the group or team. In this scenario, he positioned himself as a top-down leader who will act as a consultant and decision-maker.

At the end of the meeting, the parting discussion with Chris highlights his status hierarchically in relation to the potential proposal project, with Belinda tentatively asking him if he is interested (and with *repetition* that indicates that her question is unexpected). Belinda's *hedge*, 'I know you're so over-extended', reflected her *interpretation* that Chris is not interested, based on his actions moments before when he began putting away his pen and notebook:

> Belinda: Chris, are you interested in something like this? Is this a project that would be of interest to you? I know you're so over-extended.
> Chris: Hum, well, I would like to but you know if it's mostly content based we have to see where the resources are going to come from. Who is going to do--
> Belinda: Right
> Chris: --the work and that's my concern because--
> Nate: Yeah
> Chris: --I have other, I have many other-- tasks to do for this big proposal.

Chris's question of 'who is going to do the work' implies that he will not be doing the work, and thus positions his Work Orientation as an individual separate from the team (Stage 1) and his Leadership model as top-down (Stage 1: they will acquire resources and pay someone else to do the work). Also, Chris *repeated* the statement 'I have other, I have many other tasks to do' to emphasize that his input would be limited. Again, Chris presented his role as a discipline-specific expert consultant—putting his Discipline Orientation and Knowledge Engagement at Stage 1 of Amey & Brown's model. Chris's agreement to participate in the project would thus be determined by the efficiency of the project plan—an approach again characteristic of Amey & Brown's Stage 1 in which individuals contribute their expertise in a linear fashion.

Stage 2 interactions—Jan. Jan's initial interactions with the team were very different from those of Chris. Jan used *interpretations, generalizations, repetitions, hedges, conditional modals* and *false starts* to build her ideas from the team and gently disagree when necessary. The team members also engaged in

false starts and *conditional modals* in similar ways. The common ground of expectations at Amey & Brown's Stages 2 and 3 built further consensus and resulted in a positive invitation to join the team as a collaborator.

At the outset of the meeting, Brad briefly introduced Jan, who then explained her background to the team. She concisely explained her area of technical expertise, *interpreting* her experience in relation to the interdisciplinary team, and then immediately *generalizing* toward integrating her work with the team's work: 'Brad was talking to me about what you're hoping to do with this technology, it's very exciting, and I have some ideas that I could share with you guys.' Jan's use of the subjunctive *modal* 'could' indicates a tentativeness contingent on whether or not the team is interested in hearing her ideas. She started out by presenting her ideas as potentially fitting in with the work the team is already doing. Brad then used a *false start* to push the conversation forward: 'Because Jan was especially talking about how … how particulates might not be the low hanging fruit…'. In this way, Brad and Jan were already engaging with the thought process of the team—that is, trying to figure out a good place to start applying their technology to a new content area. So, in terms of Amey & Brown's (2005) model of interdisciplinary collaboration, Jan's Discipline Orientation and Knowledge Engagement was a "parallel…coordinated approach" (p. 25, Stage 2) in which she took into account the team's ongoing work and offers to 'share' her own ideas in that context.

As the meeting progressed, Jan used *repetitions* to state disagreements and reinforce her point. For example, Jan explicitly *repeated* her disagreement with the team on a particular type of monitoring device:

> Jan: See, this is, the reason I keep, um, balking at this whole idea, is that we already know that particulates are a problem, so we don't need to collect any more data to monitor that and we can, we already have controls--
>
> Brad: yeah
>
> Jan: --for that. Where it's breaking down is that they're saying that they don't want to buy the controls, so if they're not even wanting to buy the controls, they wouldn't buy the monitoring.

Although Brad has also mentioned this difference at the beginning of the meeting, the team kept going back to the idea of monitoring. Jan explained her position several times, *repeating* in more direct terms until the team acknowledged her point:

> Jan: you know, it would, I can't, they- I can't see them voluntarily buying an additional technology that would then reveal that they're exposing their

employees to something

Brad: but, the, if they're asked for information they have to provide it. Or they don't get the insurance.

Jan: so, it would have to be the insurance company

Belinda: Well, it would be an implicit force […] It's, it's it's a monetary

Brad: exactly, it's kind of like workman's comp is an indirect incentive

Jan: because, see they are already not responding to that incentive

All: [laughter]

This exchange occurred in a consistently conditional modality—all speakers used the modals 'if' and 'would' in order to avoid shutting down each other's perspectives and emergent ideas. Note that Jan's *hedge, conditional modal* and *false starts* 'you know, it would, I can't, they-' indicate that she was uncomfortable with dismissing the entire idea that the team was pushing. Furthermore, Belinda's *false start* and *conditional modal* shows that she was attempting to understand and verbalize the concept that Jan is trying to explain, and Jan is putting forth a marketing argument (that insurance companies would be more likely to buy monitoring technologies than industry companies). Brad's conditional 'if' also helped maintain the open-ended tone. In this way, different perspectives are considered in parallel, through a dialog versus a debate format. This dialog style of verbal exchange reveals a frame of expectations that aligns with Amey & Brown's Stage 2. That is, the Disciplinary Orientation was parallel—engaging perspectives of business, engineering, and architecture/building construction. The Knowledge Engagement was coordinated, with participants both contributing and listening, though not yet collaborating. A clear leader is not identifiable; rather, the Leadership was distributed and inclusive.

As the meeting concluded, Nate directly asked Jan to join the proposal project. She agreed but also *hedged* by mentioning that she is an assistant professor, implying that she is a junior faculty member and needs to be involved in proposals. Both Nate and Ted responded by emphasizing her importance to the team:

Nate: So the, um, you know again, if I'm pushing this thing but, you know, we're this, we're this […] but I'm assuming that, um, from your dis-, from our discussion here that, that if we were to submit a proposal, you'd be willing to

be on it?

Jan: Oh, yeah [laughter]

Nate: OK

Jan: Granted, I'm an assistant professor

Nate: I wanted, I guess I wanted to hear a yes because frankly, I don't think we're going anywhere without you...on this.

Jan: Cool

Ted: Yeah, yeah, yeah, so, I view this group, I view this group as we're kind of a core that can reach out in a bunch of different directions

Jan: That's great.

Ted: And we're going to have to grab

Nate: Yeah--

Ted: I mean, in order to be successful we're going to have to grab other people

Nate: --Right, and this one--

Ted: and bring them in.

Nate: --is set up perfect.

Jan: Collaboration is fun, you know what I mean?

The seamless switches between the 'I' and 'we' pronouns demonstrated Nate's and Ted's integrative team philosophy—a Work Orientation at the team (Stage 3) level with a Leadership model that was at least facilitative and inclusive (Stage 2). Also, they noted that the team needs different perspectives in order to be successful, and that Jan would be part of a team that values 'reaching out in different directions'—indicating the integrative Stage 3 of Discipline Orientation. If Jan decided to participate in the proposal project, it was clear that she was joining a collaborative enterprise of knowledge engagement in which all disciplines are valued and leadership is distributed. Jan's last line, 'Collaboration

is fun, you know what I mean?' highlights her collaborative Stage 2/3 Knowledge Engagement and continues her *hedgelike* approach in which she continually sought cohesion with the other members at a team (Stage 3) level of Work Orientation.

Contrasting interactions—Sean and Robin. Sean and Robin were introduced to the team in the same meeting, which provides an opportunity for direct contrast of their Amey & Brown stage expectations and how their use of linguistic features evidenced these expectations. Like Chris, Robin portrayed himself as an expert on engineering design who could act as a consultant to the team, reflecting Stage 1 of Amey & Brown's model. In promoting the idea of outcomes assessment, he used an engineering example:

> Robin: Right, OK. So now I have a concept sketch of it. How the heck would I know whether it worked? So, do you want a plan that would say, OK, here's what our design looks like. When we build it we're going to run these tests to make sure it's in compliance here. I'm going to push the button and turn it on and it's going to go up and then I'm going to push the button and turn it off and it's going to go down and that will constitute success.
> Ted: Is it acceptable to the user is what you're saying. Like…
> Robin: Yeah
> Ted: How do we know that's acceptable?
> Robin: How do you know? It's some kind of performance test. So--
> Nate: Well, no, I'm not hearing "is it acceptable to the user" I'm hearing "does it work."
> Robin: Well, but acceptable to the user, I mean you can define … a performance test anyway, when you do the design, at the beginning.

Robin's *interpretation* of success was based on an engineering model of functionality, and he *generalized* this definition to an interdisciplinary project. In terms of Amey & Brown's model of interdisciplinary collaboration, Robin communicated Knowledge Engagement as an expert who could advise the team about something outside of their expertise (Stage 1); and by using engineering as a translation metaphor, he positioned engineering as dominant with respect to the other disciplines represented in the meeting, thus taking a Stage 1 Discipline Orientation. Nate used a negative statement to disrupt the narrative and *backtracked* to Robin's initial statement about whether something 'worked', indicating that his expectation of what is 'acceptable to the user'—a user-centered industrial design or marketing model—was not being met. Likewise, Robin's use of 'anyway' indicates that his expectation was also not met, but he tried to push forward without resolving the point. At this point, Sean, taking a different approach, attempted to bring together the differing perspectives by *backtracking* to Nate's earlier objection about what is "acceptable" (thus

indicating an integrative (Stage 3) Discipline Orientation by bringing in another disciplinary perspective) and she *hedged* with the words 'I think' and 'because' which could indicate she is less confident in asserting her expertise over others:

> Sean: I think there's a distinction here, because I've sat in with design people before, and 'acceptable to the user' is not just that it will work. Like—

At this point, Robin interrupted to *repeat* his engineering example and, when pressed by other members to consider other criteria for success, used an *interpretive* comment to characterize Nate's discipline's contribution: 'Right, does it look good, is it aesthetically… does it fit the room décor…' This prompted Ted to immediately label Robin's characterization as 'pigeonholing.' It is probable that Ted had interpreted Robin's comment as dismissive, again contributing to an impression that in terms of Discipline Orientation his expectation of the project is that the engineering discipline is dominant (Stage 1). It is worth noting that Ted is an engineer, but as a member of a Stage 3 team, he was comfortable defending his architecture colleague's perspective.

Robin and Sean also used *repetition* to make their points, but in different ways. While Robin repeated the engineering example described above, Sean repeated the idea of outcomes assessment but instead based it on the team's course, beginning with the *hedge* 'you know' and the *connective* 'so':

> Sean: You know, so, do you want them to learn how to communicate better in interdisciplinary teams, yes or no?
> Nate: Absolutely
> Matt: Yeah
> Sean: OK, that's an outcome
> Nate: Got ya
> Sean: And, and we'll do--
> Nate: I get your drift
> Sean: --some product, like a report or a, or a proposal or something like that--
> Nate: And that will
> Sean: --will demonstrate
> Nate: prove
> Sean: --the outcome
> Nate: the outcome. Demonstrate the outcome
> Sean: Prove the outcome

Sean again used a type of *hedge* 'some product, like a report or a, or a proposal or something like that' to indicate that this is not her territory but rather that the details would be determined through a team effort. Her and Nate's language meshed in a dialog characteristic of Amey & Brown's Stage 2, a frame of

expectations in which Knowledge Engagement is coordinated and speakers work as a team contributing from their disciplines in a parallel versus a dominant mode.

The result of the meeting with Robin and Sean was the most ambiguous, perhaps due to their very different modes of interaction with the team. After Sean discussed a specific course activity that she and Matt both had experience with, Matt recalled:

> Matt: They had, um, a person who was responsible for arbitration and, ah, maybe it's time to, pull out some of those, some of those documents again…and spread them out on the table, when we talk about our syllabus, see if there's anything useful.

By using the pronoun 'we', Matt indicates that he might like to follow up on Sean's idea, perhaps even in collaboration (Stage 3 of Knowledge Engagement). Sean nods at this suggestion, but yields to Robin in the adjournment of the meeting. On the other hand, Robin pushed for "next steps" and started to assume a leadership role based on his own source of funding:

> Robin: that, the first thing I'd like to, to sort of try to figure out and accomplish, is what we need to do for the summer and what the schedule's going to look like. And I think that the thing that, that I have summer money for and sort of what happens there is to help plan and organize the class and talk about specific interventions that we're going to do. And I know you have a couple and I think there's a couple more that are going to emerge.

However, Nate replied with the *hedge* 'just', saying that he wants 'just one more time talking before we talk about doing this.' Note again the pronoun usage in Robin's language, which is heavily based on 'I'. Even though his statement begins with a *hedge* 'sort of', his frame of expectations was based on a hierarchical structure undergirded by his financial input, which aligns most closely with Amey & Brown's top-down leadership orientation of Stage 1. That is, his Knowledge Engagement would be as an expert consultant (Knowledge Engagement at Stage 1), with the Disciplinary Orientation dominantly being educational assessment. Although his Work Orientation was somewhat group-based (Stage 2: 'specific interventions that *we're* going to do'), and his view of Leadership facilitative (Stage 2: he was willing to self-fund), there is a definite sense that he was attempting to establish his individual work role and schedule.

Summary. These four potential collaborators verbally indicated their expectations of working with the team, and these expectations aligned with different stages in Amey & Brown's model. Reflecting Stage 2 and 3 in Work and Discipline Orientation and Knowledge Engagement, Jan and Sean attempted

to integrate their experience with the team's goals, and they presented their expertise in a way that implied coordination with all disciplines represented. Since the team was already operating at Stage 3, the common ground of expectations facilitated ongoing collaborations for Jan and Sean with the team. On the other hand, Chris and Robin exemplified Stage 1 by presenting themselves as expert consultants with a singular disciplinary stance. In Robin's case, this provoked an immediate negative response from multiple team members. In both cases, the mismatch on expectations with respect to Amey & Brown's interdisciplinary team stages was too strong and neither Chris nor Robin continued to work with the team.

Discussion

This Stage 3 interdisciplinary faculty team emphasized integration of disciplines while eschewing traditional leadership structures—this was the enduring frame, or structure of expectations, necessary for working with them. As the team met with potential collaborators to pursue a safety-related project, they were explicitly looking for someone who could "leave their discipline at the door." The two potential members who collaborated long-term with the team engaged in discourse in ways that demonstrated willingness to work toward common understanding as well as respect and integration of everyone's contribution. These approaches to teaming are consistent with Stages 2 and 3 of Amey & Brown's model.

We analyzed the discourse using seven linguistic features that could help researchers gain insight into an individual's expectations of interdisciplinary collaboration. Although quantity of usage was not taken as an indicator in this qualitative study, we did note a few patterns. Individuals who became collaborators used linguistic features of expectations such as *dialogic repetition*, *backtrack*, and *hedgelike words and phrases* more often than those who did not collaborate with the team. Their language use signaled willingness to adapt and shift expectations in a shared discourse, as well as alignment with the Stages 2 and 3 of Amey & Brown's model, characterized by increased integration, collaboration, teamwork, and distributed leadership. Furthermore, in these instances, both team members and the potential collaborators were working towards the creation of common ground both in terms of content and in terms of collaborative behaviors.

On the other hand, when potential members came to the meeting expecting to contribute primarily as domain experts, perhaps for a shorter period of time, they did not work as successfully to create common ground. Their expectations were evidenced by the extensive use of *debative repetition*, *false starts*, and *interpretations*. This evidence of expectations signaled an approach dominated by contributing disciplinary expertise through repetition of one perspective,

interruption of narrative, and interpretation through discipline-centric lenses. These speakers' attempts to describe other disciplinary perspectives were viewed as stereotypes ('pigeon-holing') by the team members. In addition to this dominant Discipline Orientation, in terms of Amey & Brown's model, these speakers emphasized other Stage 1 characteristics through their Knowledge Engagement as experts, individual contribution to Work, and a top-down Leadership model. We argue that, since the core team was operating at Stage 3, these discourse behaviors contributed to the outcome of not establishing common ground nor ongoing collaboration.

The implications of these findings are less about specific discourse strategies (e.g., hedges, interruptions, etc.) than they are about aligning expectations for interdisciplinary collaboration. When the expectations of two parties align, both are more committed to compromise and collaboration. This occurs as individuals explicitly seek to clarify epistemological and ontological differences and work toward a creation of common ground—through communication. The significant barriers to interdisciplinary research have a greater chance of being overcome if they are addressed rather than ignored, especially if participants are aware that their own expectations may or may not match the expectation frames of others. This leads to two additional observations: first, as noted previously, expectations are more often implicit rather than explicit; and second, differences can be productive, especially if consciously managed. In fact, differing perspectives are actually one of the advantages of interdisciplinary collaboration. When people expect differences, they often take extra effort to explain themselves and their position (Öberg, 2009). On the other hand, when collaborators appear similar on the surface, implicit differences can serve as a weak foundation upon which to build interdisciplinary collaboration. Therefore, we recommend that interdisciplinary researchers reflect on their own frames of expectations (e.g., which stage of Amey & Brown's model they are most comfortable with) and make efforts to explicitly clarify expectations with their potential collaborators. Specific questions about collaborative processes (e.g., meetings, writing) and what constitutes quality work can help uncover others' expectations (Öberg, 2009).

Limitations

This case study is limited in scope in that the data is pulled primarily from only three meetings. However, the core team involved in each meeting was observed over a long-term period of over 15 months before and after the meetings, so we were able to observe the team as it evolved. Also, each meeting was audio-recorded and completely transcribed to ensure accuracy of language use.

We also undertook the challenging task of using three theoretical models that relate to human interaction: 1) Tannen's discourse analysis approach that focuses on frames of expectations; 2) Amey & Brown's stage model of development that focuses specifically on interdisciplinary collaboration; and 3) Öberg's conceptualization of "common ground" that proposes the solution of uncovering implicit assumptions in interdisciplinary collaborations. Finding ways to synthesize these theoretical views of interaction has been a complex task. However, we believe that the attempt is worthwhile because: 1) using discourse analysis methods rather than open coding is more effective in identifying implicit frames of expectations embedded in conversations; 2) a model of developmental stages provides a useful structure for mapping different levels of collaborative behaviors in interdisciplinary contexts; and 3) a conceptualization of how common ground is created provides an accessible way to think of how and why people should navigate implicit and explicit beliefs. In order to more clearly illustrate how these theoretical conceptualizations interlock, we have created a visual model that shows frames of expectations negotiated through discourse to establish common ground. This model depicts an ideal scenario that results in a common ground at Stage 3 of Amey & Brown's Interdisciplinary Collaboration Model.

Using this linked interpretive analysis, we have posited in this study that the potential collaborators who eventually joined the team had expectations that aligned with those of the team; however, it is beyond the scope of this data to speculate whether the two potential collaborators who joined the team adjusted their expectations to the team, or whether their previous experiences influenced their expectations and ways of interacting. In other words, the issue is more one of "fit" in terms of team and prospective members' expectations (e.g., Stage 1, 2, or 3 interaction) than privileging Stage 3, particularly since Amey & Brown hypothesize that all interdisciplinary teams pass through Stages 1 and 2 to achieve Stage 3. Perhaps the other two potential collaborators would have been more welcome if and when the existing team was operating at Stage 1.

Conclusion

We offer two findings that have resulted from this study. First, we have presented a model (Figure 1) that synthesizes three conceptualizations of how explicit and implicit expectations impact human interactions across differing perspectives. Our model depicts a process in which people may be able to negotiate common ground for successful teaming by communicating their implicit expectations of interdisciplinary collaboration. Our second result is a recommendation for practice: we argue that in order for interdisciplinary collaborations to succeed, participants must identify their own expectations,

negotiate those expectations with others, and remain open to different ways of conducting work and pursuing knowledge.

This research represents an important step forward in combining theoretical perspectives and methods from higher education, linguistics, and psychology toward enabling interdisciplinary collaboration. The implications of this research for interdisciplinary collaborators emphasize awareness and respect for different perspectives, as well as the communication skills to build common ground. This study reveals no simple approaches for successful collaboration, but presents some intriguing findings and hypotheses to be explored in future work. Similar in-depth analyses of specific interdisciplinary teams can elucidate the relationship between fit (alignment of expectations) and respect of multiple disciplinary perspectives in sustaining interdisciplinary collaboration, and eventually these concepts may be formalized in larger-scale survey studies of many interdisciplinary teams.

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