Discourse Analysis: The problematic analysis of unstructured/unfacilitated group discussions

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Abstract

An increasing number of researchers are studying discourse in order to understand classroom instruction. Based on social linguistics and activity theory, researchers have derived frameworks for breaking down discussion and identifying its structure and composition. These frameworks can be fairly easily utilized to analyze class instruction, because it is typically highly facilitated and/or well structured.

In a recent qualitative study, we encountered significant challenges in applying these frameworks to discourse in a professional development setting with little facilitation. In this presentation, we explore the challenges faced when conducting discourse analysis in unstructured discussions by: first, discussing our analytical approach; second, describing the challenges we encountered and how we dealt with them; and third, describing the Framework for Contextualized Function (FCF), which we developed to make meaning out of the discussion. We also describe one way of visualizing the structures of these discussions. We hope that this will encourage and empower researchers to study similarly complex discussions, as may exist among faculty and in cooperative learning environments.

Background and Theoretical Perspective

Discourse is a social process, central to all aspects of life. Through it, individuals interact with one another; they share ideas, cooperate, and build their knowledge and understanding of the world. As people engage in conversation, they both respond to others and anticipate further responses (Nassaji & Wells, 2000). As people participate in discourse, they produce a commodity (the sum total of the discussion) and address or accomplish tasks. Thus as Truxaw and DeFranco (in press) describe, discourse can serve either of two main purposes: a) to clearly transmit an accurate message (univocal discourse), or b) to serve as a process for thinking, creating a new message via discussion (dialogic discourse).

Fairclough (2003) stated that discourse "is an irreducible part of social life, dialectically interconnected with other elements of social life (p.2)." This means that we can learn about social life, in part, by studying discourse. As one example, we can learn about the professional development of preservice teachers, inservice teachers, college faculty, or graduate teaching assistants by studying the discourse that they engage in during professional development activities. Furthermore, we can learn about them as teachers by studying the different forms of discourse in which they participate and how they participate in these conversations. Classrooms provide another example. By studying classroom discourse, we can come to understand participants' roles, the nature of instruction, and forms of instruction. We can also identify and recognize power and other social elements in the classroom setting.

Recent mathematics education research has addressed these issues. By way of example, Truxaw and DeFranco (in press) recently conducted a study of classroom discourse within mathematics classrooms in order to determine how teaching practices impacted the nature of discourse in the classroom. They found that different models of teaching could promote different types of discourse, on a continuum ranging from univocal to dialogic by nature.

Other studies of classroom discourse, both within the context of mathematics and outside of it, have proven valuable in understanding the *triadic dialog* (Nassaji & Wells, 2000). Nassaji and Wells (2000) and Truxaw and DeFranco (in press) describe the triadic dialog in detail; they point out that this structure, also known as Initiate-Respond-Followup (IRF) or Initiate-Respond-Evaluate (IRE) is the most prevalent form of discourse in classrooms, whether the instruction style is oriented toward transmission or student inquiry. In this structure, the teacher *initiates* a piece of dialog, directed at a student; a student then *responds*; and then, the teacher will either *evaluate* the response or otherwise *follow-up* with additional comments. Understanding the triadic dialog has helped us better understand teachers' roles in classroom discussion (Truxaw & DeFranco, in press).

Traditional classroom instruction is a common, but unique scenario. In the classroom, the teacher is the primary source of knowledge and is responsible for making sure that discussion proceeds in an orderly and meaningful way. Teachers must assure that all students benefit from the knowledge constructed/transmitted during the discourse, and must make sure such conversation meets the strict pedagogical purpose of the class. Nassaji and Wells (2000) state all of these as contributing reasons for the prevalence of the use of triadic dialog in the classroom.

In many important discussions, even in educational contexts, these conditions do not exist. Thus it is plausible that many conversations do not follow the strict IRF/IRE structure and may more closely resemble casual conversation. One such example would be cooperative learning experiences, such as pair/group work or discovery/investigative activities, which have grown in popularity. When teachers allow students to work in groups, many of the conditions mentioned in describing traditional instruction may disappear. In each group, there may not be an individual who feels the same responsibilities as the teacher does in the classroom setting; also, there may not be a clear facilitator. The same conditions may not exist within discussions among colleagues as they converse regarding teaching; such

conversations may also lack a clear discussion leader or a strict pedagogical purpose. Under these conditions, conversations may be complex in structure and are likely to deviate from the typical classroom form.

These conversations pose a challenge for researchers, who wish to study and understand them. In unfacilitated discussions, individuals may not have clear roles or their roles may shift. Thus, in understanding such conversations, we face the challenge and question of how to determine the structure of unfacilitated discussions and describe the function of individuals' contributions within such a context.

During a research study, we faced this very challenge. In this paper, we address this question by describing some of the challenges we encountered, how we overcame them, and the framework that we developed—one way of finding meaning in unfacilitated discussions.

Context

The work that this paper addresses grew out of a recent research study (Belnap & Withers, 2008), which aimed at understanding discussion among graduate mathematics teaching assistants (GMTAs) within the context of a professional development program. In this study, we focused on understanding what GMTAs brought with them that empowered them to participate in peer-to-peer teaching discussions. This professional development program, Video Observations with Peer-feedback Sessions (VOPS) (Belnap & Withers, 2008), aimed at providing GMTAs with a flexible form of professional development, giving them a chance to improve as teachers with few rules or consequences.

The VOPS Program

The VOPS program is a form of professional development aimed at bringing GMTAs together in a setting where they can receive instructional feedback and discuss teaching. VOPS consisted of weekly 50 minute sessions. In each session, GMTAs watched 15-20

minutes of classroom instruction from one participant volunteer's class; this served as a catalyst for about 30 minutes of subsequent peer-to-peer teaching discussion/feedback.

The structure of VOPS discussion centered around GMTA participants and their needs. Group discussion during the sessions was monitored, not facilitated. Thus, there was generally no clear discussion leader; GMTAs were allowed to control the discussion themselves. Furthermore, there was no specific or explicit curriculum or direction for each session. Thus, discussion topics arose and developed at the discretion of the participants.

This structure was purposive and helped meet the goals of the sessions, which were to: a) encourage the development of a community of teaching among participating GMTAs, b) provide participants with opportunities to receive feedback on their teaching, and c) encourage peer-to-peer teaching discussions. The structure did this by encouraging group interactions, individual involvement, and group ownership of discussion. Thus discussion followed the needs, interests, and desires of the group, representing a collective product and collaborative effort.

The VOPS Study

Grounded in the VOPS program, the ongoing VOPS Research Study is dedicated to understanding and encouraging productive peer-to-peer teaching discussion among GMTAs. The initial focus of the study revolved around two central questions: What elements (*things*) do GMTAs draw upon in order to contribute to peer-to-peer teaching discussions? and, How do they utilize these elements as they contribute to the discussion?

To address these questions, we conducted a longitudinal, qualitative research study of the VOPS program. Data consisted of video and transcripts of the sessions (details in Belnap & Withers, 2008).

Data analysis was complex and multilayered, due to the second research question, "How do [GMTAs] utilize these elements as they contribute to the discussions?" To ad-

dress this question, we needed to accomplish three tasks for each GMTAs' contributions: first, identify what elements were being drawn upon (the first research question); second, determine its function within the context of the discussion; and third, identify the connections between them. The greatest challenge arose in the second (identifying the contextualized function of each contribution).

To identify the function of individual contributions relative to the discussion, we needed two things: first, a way of discerning the structure of the discussion, in other words, a way of identifying the tasks or topics being addressed by the discussion; and second, a fremework that described the functions of individual contributions.

Literature and Analytic Approach

We determined the contextualized function of individuals' contributions using a three-fold approach. First, we determined the basic structure of the discussion, breaking it into sequences (segments in which individual tasks are discussed). Second, we identified the dominant task of each sequence in order to determine the context of each contribution. Third, we identified the function of each contribution relative to the dominant task of the sequence and surrounding contributions. The sections that follow describe the process, challenges, and frameworks that we utilized, adapted, and developed to accomplish these tasks. Segments taken from one VOPS transcript, shown in tables 1, 2, and 3, will be used as an illustration; for space considerations, the GMTAs referred to as Ann, Maud, Lyndsey, Liz and Sarah may be indicated by initials (A, M, L, Lz, and S respectively).

Determining the Basic Discussion Structure

Our first step in determining the contextualized function of individuals' contributions was to identify the structure of the discussions. To do this, we used a framework described in detail by Nassaji and Wells (2000); Wells (1996). This involves breaking the discussion

down into pieces of varying complexity: moves, exchanges, and sequences.

As individuals participate in discourse, they take *turns* speaking (giving utterances), often both responding to what has preceded and anticipating a further response. These turns to speak (or sometimes portions thereof) may be more oriented to what preceded than what follows. Such a turn (or piece thereof), which is given as a response or as a catalyst for a response, can be thought of as the smallest functional unit of discourse, called a *move*. Moves can thus consist of questions or statements that elicit a response or that respond to another's move.

As two or more individuals make moves in the discussion that respond to one another, they participate verbally in an exchange of thoughts and ideas. An *exchange* then can be identified as a collection of moves, one of which initiates the flow of information and others that respond to the initiating move or the responding moves. Since an exchange represents the smallest unit in which information is traded, it represents the fundamental unit of discourse.

It is common for conversations to require more than a single exchange to convery the desired information or to accomplish a task. Because of this, not all exchanges stand alone; some build upon others in order to continue the task at hand. Thus exchanges fall into two main types, *nuclear* and *bound*. Nuclear exchanges can stand alone, while bound exchanges cannot; they are either embedded within prior exchanges or depend upon them (Truxaw & DeFranco, in press). Bound exchanges may be further differentiated. Nassaji and Wells (2000) explain:

> "Bound exchanges of three kinds regularly occur. 'Preparatory' exchanges are used to establish communication or to select a designated speaker; 'embedded' exchanges are used to confirm uptake or to repair various types of breakdown (e.g. 'clarification'); while 'dependent' exchanges are used, for example, to give

> or seek additional information ('comment') or justification for the information already supplied ('justification') (p.378)."

Although information is shared at the exchange level, it is common for a task to require multiple exchanges. Thus we look at a larger unit of discussion, the *sequence*. A sequence is defined as a nuclear exchange and all exchanges bound to it. At this level, many tasks and topic are initiated, developed, and carried to completion; hence some see this as the basic unit of conversation (Nassaji & Wells, 2000). For this reason, we chose the sequence level to represent the context of each individual's contributions.

The Problematic Nature of Unfacilitated Conversation

Using the above framework for determining the structure of conversation can be straightforward, if the discussion that is taking place is well-structured. For example, in most classrooms, the teacher controls the topics, the flow, and even who contributes to/participates in the discussion. Consequently, teachers often serve as the initiator of both exchanges and sequences (Nassaji & Wells, 2000), leading to triadic dialog. As discussed, this convenient structure can disappear or become obscure when one looks at unfacilitated or monitored discussions, in which there is no clear discussion leader. This was exactly the case in the VOPS discussions.

In these circumstances, discussion structure can be far more complex. The VOPS discussion structures usually resembled casual conversation, in which Nassaji and Wells (2000) note that "either participant can initiate a bound exchange at any point and, as a result, sequences can extend over many exchanges (p.378)." We noted this very challenge when analyzing VOPS discussions. In fact, we found that complications, caused by the complexity of discussion, extended far beyond lengthy sequences. Many of these complications could be classified into two major categories: first, the nonlinear, overlapping, or incomplete nature of exchanges and sequences; and second, the size and structural composition of individual

exchanges.

The first set of complications were generated by two major aspects of the context: first, the lack of an explicit pedagogical purpose for each session; and second, the lack of structuring facilitation. Because of the lack of facilitation, *anyone* could initiate an exchange of *any type* at *any time*. Because no specific and explicit pedagogical purpose guided discussion, purpose was derived from the group during the discussion process. Our experience was that not only *could* anyone initiate nuclear exchanges at any time, but they *did*. Limited facilitation created an absence of preparatory exchanges as well, contributing to the complexity. This resulted in three analytically challenging cases. First, sequences (and more frequently) exchanges could overlap chronologically. Second, while some sequences were lengthened by the freedom of creating bounded exchanges, more often, the negotiation of purpose generated large numbers of short sequences and sequences that were cut-off before they reached a conclusion. Finally, sequences could re-emerge at later times in the discussion.

The lack of controlled discussion also led to subtle sequence shifts, making it difficult to separate the text into sequences. For this reason, we could not simply divide the discussion into sequences, without first identifying moves and exchanges. We had to build the structure from the ground up in order to identify individual sequences. This is where the second set of complications came into play.

The second set of complications came from the lack of facilitation in conjunction with the group (or collaborative) nature of the context. In this setting, when one individual made a move that was directed toward the group (rather than a specific individual), any other participant(s) could (and often did) respond to that move. Furthermore, any other individual(s) could follow-up on that response (and often did). Thus, unlike in one-on-one or facilitated discussions, exchanges could involve not only two people, but multiple individuals. This caused lengthy exchanges and made it extremely difficult to identify how

individual moves linked into exchanges.

To help in the identification of exchanges, we incorporated various viewpoints and strategies. Initially, we looked for obvious connections among near-by contributions, such as questions and answers. We then looked for chronologically interrupted contributions that were resumed by the contributor. At times, we further resorted to visual cues, such as body posture and hand gestures that would indicate to whom individuals were directing their comments. We also utilized peer coding and negotiation to rectify problematic passages. Of course, we did these things only to the extent that they helped us identify the sequence structure, since that was our ultimate goal from this analysis.

Another important tool that we relied upon during this structural analysis was *prospectiveness*. Prospectiveness, as described by Nassaji and Wells (2000), Truxaw and DeFranco (in press), and Wells (1996), is defined as the degree to which a statement, question, or other utterance expects or requires a response. Wells (1996) explains that it is a general principle of discourse analysis that prospectiveness decreases throughout an exchange until the exchange terminates, unless intentionally altered by a participant. Wells (1996) describes three basic levels of prospectiveness: *Demand, Give*, and *Acknowledge*. Acknowledge moves are the least prospective, which respond to a more prospective move, but do not themselves expect any further response. Give moves are more prospective than Acknowledge statements, expecting but not requiring a response. Demand moves are the most prospective, requiring a Give move in response. Based on this, the prospectiveness of these types of moves can be ordered D>G>A.

The single bound exchange, shown in table 1, provides an example of both prospectiveness and the complexity possible in a single exchange. Maud initiates the exchange with statements about herself, as a learner; it is reasonable for her contribution to receive a response, but it does not require further response or information; thus L108 is a Give (G). Ann chooses to respond with a simple, "Yeah," which would not even expect a response; hence

L108	G	Maud:	Yeah, like that's what happens to me, where I, I'm working on something and then I can't think about it anymore, so I take a break. But while I'm doing something else, I think about it still and I go back and make notes.
L109	A	Ann:	Yeah.
L110	G_c	Maud:	Like your brain still works on it. If you're not–
L111	G_r	Lyndsey:	It's just hard to be forced to–
L112	G_c	Maud:	–if you're not forced to–
L113	G_{rc}	Lyndsey:	–keep producing.
L114	A	Ann/Maud:	Yeah.
L115	G_r	Ann:	Yeah, and it's a two-hour class, which is a long time to think about it.

Table 1: Complex exchange with prospectiveness coded.

L109 is an Acknowledge (A). Maud's next contribution provides information to which one may respond, but is not formulated to require a response; watching the video, it was clear that Ann's statement interjected into a momentary pause in L108, thus L110 is actually a continuation of the give in L108. We marked the prospectiveness of such responses with a subscript c; so L110 is a continued-give (G_c). In L111, Lyndsey interjects into Maud's statement with a Give that responds directly to Maud. We marked the prospectiveness of such responses with a subscript r; thus L111 is a give-in-response (G_r). This pattern continues: Maud continues her Give (G_c) in L112; Lyndsey continues her give-in-response in L113 (G_{rc}); Maud and Ann acknowledge (A) Lyndsey in L114; and then Ann gives-in-response (G_r) in L115. Demand moves rarely occurred in VOPS; for examples of demands, see Nassaji and Wells (2000).

This coding process helped in identifying exchanges. Sudden increases in prospectiveness were critical points, where a new exchange *could* occur. Marking responses and continuations helped us track complex, multi-participant exchanges, such as the one discussed. Once exchanges were identified, sequences were more easily identified by classifying exchanges as nuclear or bound. So, using prospectiveness with other strategies, we were able

to split turns into moves, group moves into exchanges, and group exchanges into sequences. These sequences represented the contextual unit for each individual move.

Framework for Contextualized Function (FCF)

Once we had identified the sequences, we were poised to examine the contextualized function of individual contributions. This involved identifying not only how each move functioned relative to nearby moves, but also relative to the sequence's dominant task.

In facilitated discussion, the facilitator usually initiates sequences and bound exchanges. In such cases, it is often safe to assume that the nuclear exchange defines the dominant task of the sequence. In unstructured conversations, however, we cannot assume this. Because the topics of conversation are negotiated *during* the discussion, it is possible for bound exchanges to focus in on a task not initially set forth in the nuclear exchange.

This was something we noted about the VOPS discussion; often sequences began with a series of exchanges that shifted focus, until the group would hone-in on a particular task. Thus, the first thing we did to identify function was to read the sequence and identify the dominant task (or topic/purpose) of the sequence, if it existed. We then interpreted each move's function relative to this task.

For example, sequence 8, shown in table 2, has no dominant task. Referring to the video, Maud tries to get them to talk about how Ann could have elicited more student thought and explanation, but then (in L77) she shifts the focus to students' lack of conceptual understanding; neither topic dominates the sequence. In the next sequence, shown in table 3 (there was no sequence 9), there is a task that permeates the sequence: deciding how to keep students engaged and productive during class, particularly when classroom discussion becomes unproductive.

Given the dominant task, we discerned each move's function(s) in two ways: first, how it related to other moves; second, how it related to the dominant task. We used grounded

theory (Strauss & Corbin, 1998) and constant comparison for analysis. Starting with an individual sequence, we clustered its moves by common themes, regarding what role they played in the discussion and how they related to other moves. Next, we conceptualized these groups and formed categories, examining properties and identifying the attributes of each category. Then we took the resulting framework and applied it to other sequences, adjusting the categories and their definitions, until we reached a saturation point. At that point, we recoded independently using our definitions and negotiated differences until reaching a consensus; throughout, we continued refining by cutting extraneous categories, redefining them for clarity, or merging categories where distinctions were not essential to our research questions.

The resulting framework, the Framework for Contextualized Function (FCF), consists of 16 functional categories. These are *suggestion, proposition, information, extension (extend), modification (modify), clarification (clarify), justification (justify), invalidation (invalidate), confirmation (confirm), qualification (qualify), evaluation (evaluate), continuation (continue), incompletion (incomplete), request, restatement (restate),* and *simple response*. As we describe these categories, we will draw upon sequences 8 and 10, in tables 2 and 3 for examples.

The first categories (i.e. suggestion, proposition, and information) describe statements, comments, and/or examples that add substantive content to the discussion. They are the building blocks of the sequence, often being acted upon by other contributions. *Suggestions* directly relate to and contribute to the sequence's dominant task. *Propositions* contribute to the development of the discussion like suggestions, but do not directly relate to the dominant task. *Information* consists of statements that neither directly address the dominant task, nor add to the discussion's structure; they only provide contextual or background information (at most).

Our example sequences show all three of these. In L70 and L77 of sequence 8, Maud

	Sequence 8:	*No dominant task.*	
L70	Proposition	M:	(pause) maybe when–and I don't know if this related to what you were just talking about, 'cuz I kinda think–anyway, when they say, "Okay, it's 28; we have eight here, carry the two, and then add," and then (pause) when you say, "Why do you add the two," maybe give them a little bit more information on what you want. Like, okay, so you get twenty-eight; what does twenty-eight mean? Why, why would you carry your two?
L71	Inval.-Prop.	A:	We had talked about carrying a two because it was in the tens place when we added.
L72	Simp.Rsp.	M:	Ohh.
L73	Cont.-Inval. Qual.-Inval.	A:	So that I think the whole class was ok with, as far as adding goes. Well, at least they were when we added. But they might not have been–
L74	Extd.-Qual.	M:	Well, when they multiplied.
L75	Cont.-Qual.	A:	–they might not have carried that over to multiplication.
L76	Incomplete	M:	Because multiplication and–I don't know.
L77	Proposition	M:	Sometimes I think people are so tied to the algorithm that they know, that they can't make any sense of it; and they just do the algorithm with the blocks.
L78	Clar.-Prop.	A:	That's what they did.
L79	Simp.Rsp.	M:	Yeah.
L80	Cont.-Clar.	A:	I was amazed. I was like, "That's what you did."
L81	Clar.-Cont.	M:	You're like, "Did they help you at all?" And she was like, "yes." (pause) "Really?" (pause) "No." (All laugh)

Table 2: FCF Coding for sequence 8

makes contributions off of which the discussion builds; because there is no dominant task, these are propositions. In L82 of sequence 10, Sarah makes a contribution off of which discussion builds; this contribution directly addresses the dominant task, making it a suggestion. in L95, Sarah makes a statement, but it provides nothing to the discussion nor addresses the dominant task, making it simply information. All other contributions link to build off of these contributions.

The next three functions (i.e. extension, modification, and clarification) are statements and/or examples that connect to other contributions by altering their content in some way. *Extensions* serve the same function as a prior contribution, but add new dimen-

	Sequence 10:	*Task—Keeping students engaged and productive during class (i.e. what to do when class discussion becomes non-productive)*	
L82	Suggestion Justif.-Sug.	S:	I think maybe you could have just, when you're getting to those points when you're feeling like it's not going anywhere, turning it back to the groups. you know, "Discuss in your group; everyone back to your group. Come up with a reason right now. Talk about it." 'Cuz I know, I, me as a student, I'm not gonna say anything in class; I'm not gonna contribute to a class discussion, if I'm not–when we're talking about mathematics and I don't know what's going on. If I'm not sure about the mathematics, I'm not gonna say anything. Bu in a group of five, I might be willing to contribute something and actually come up with some ideas–
L83	Incomplete	A:	You know, I think that's really–
L84	Cont.-Justf.	S:	–and you could break it up.
L85	Clar.-Justif.	A:	–I think that's something that I haven't done actually, something I thought of this morning. I remembered how in Tia's class when we observed them, when they did group discussions about the reading, I had the same problem when we tried to discuss reading. I had like three people that made comments. Period. You know, and they make great comments, but nobody else comments–and I remembered how she would break and have them discuss it in a group and just about everyone said something in their group.
L86	Clar.-Justif.	M:	That's like what David had us do in 661, last time.
L87	Simp.Rsp.	L:	Yeah.
L88	Cont.-Clar.	M:	I thought that was brilliant, to break us up into little groups, because class is so immense.
L89	Extd.-Clar.	A:	And none of us are like scared of talking in there, I don't think. But in there, some of them are scared–
L90	Simp.Rsp.	S:	Oh, they're scared. Oh yeah.
L91	Eval.-Sug.	A:	And so it's even more so. That's a really good idea. I should do that.
L92	Rstate-Sug.	S:	So whenever things are getting like ehhh, I always just say, "Now talk about it in your groups."
(*talking simultaneously)			
L93*	Inc.(Rstate)	L:	Yeah, if you're not quite sure what's happening.
L94*	Inc.(Justif)	Lz:	Cause if you just keep asking how to do this.
L95*	Information	S:	I was like so, "We don't know, we don't know how to do this."
L96	Simp.Rsp.	A:	Yeah.
L97	Justif.-Sug.	S:	And that way I have a chance to regather my thoughts while they also get a chance to.

Table 3: FCF coding for sequence 10

sions, ideas, or content. *Modifications* also serve the same function as a prior contribution, but change its content in some significant way; these do not include restating, rewording, or paraphrasing. *Clarifications* may provide detail, illustrate, clarify, or simply provide an instance of a prior contribution.

Returning to our two sequences, we can see some examples of these. In L85, L86, and L88, we see clarifications. Immediately after offering her suggestion in L82, Sarah provides detailed reasoning, supporting her suggestion; she talks about how in a group setting, she would be willing to contribute. Ann follows (in L85) with an illustration (or instance) of that very thing, making L85 a clarification of the reasoning in L82. Maud provides another instance in L86 and continues it in L88, making them clarifications of L82 also. Following L88, Ann makes a contribution with the same role as L88 (providing an instance); her contribution is not novel, but instead adds details to Maud's, without changing any of the details of Maud's contribution; thus L89 extends L88 (i.e. it is an extension of L88). If Ann's contribution had changed some of the details of Maud's contribution, then L89 would have been a modification, instead.

The next five functions (i.e. justification, invalidation, confirmation, qualification, and evaluation) are statements and/or examples connecting to other contributions by directly addressing their validity or truth (whether perceived or actual) in various ways. *Justifications* provide logic, reasoning, and/or support for *why* the contribution is valid/true. *Invalidations* explicitly and directly discredit, negate, cast doubt on, or weaken a prior contribution. *Confirmations* are simple responses that affirm or deny a prior contribution's validity/truth without explanation, synthesis, or example. Without invalidating, *qualifications* restrict a prior contribution, limiting/placing bounds on its applicability, meaning, and/or generalizability. *Evaluations* express judgment regarding a prior contribution's meaning.

The next four functions (i.e. continuation, incompletion, request, and restatement)

are statements that vary in function, depending on the contribution to which they connect. *Continuations* continue/extend a prior contribution from the same contributor, without a change in function. *Incompletions* are statements that are incomplete, because they are either too short to determine function or have distinguishable function, but do not complete their thought. *Requests* are solicitations for the type of contribution specified; requests are coded by what type of response would appropriately answer the question (anticipated response), not by the actual response received. *Restatements* are revoicings of a prior contribution without significant addition or modification; restatements include restating, rewording, and paraphrasing.

The last category of function is *simple response*. Statements of this type simply express agreement, acceptance, or acknowledgment, but otherwise do not contribute to the discussion as the other categories describe. As noted, statements of this form that expressly affirm validity/truth are marked as confirmations instead.

It should be evident that (except for suggestions, propositions, information, and simple responses) all functions actively link to other contributions; in doing so, they either affect the other contribution in some way or derive their own function from it. Because of this, each of their category names has a verb form and a noun form; we use the verb form to identify the function and the noun form to identify its object.

The FCF provides a means of identifying both the function of each contribution and to what it links (or acts upon). These relationships describe the structure of the sequence by showing relationships among individual contributions. This is why L87 is not coded as an evaluation, because it does not evaluate another contribution. The FCF also contextualizes function, because the dominant task is used when interpreting the role of each contribution. For instance, the dominant task of sequence 1 (not shown) was providing background information on the clip to be shown; with this task, suggestions would be statements/examples that provide contextual information on the class. With a different

L70:	Proposition				
L71:	Invalidation				
L73:		Qualification			
L74:			Extension		
L75:			Continuation		
L77:				Proposition	
L78:				Clarification	
L81:					Clarification

Table 4: CFSM for Sequence 8

task, however, such a contribution would likely be classified as information. Thus the FCF orients functions to the sequence's dominant task.

Contextualized Function Sequence Maps (CFSMs)

Contextualized Function Sequence Maps (CFSMs) were another construct that we used to understand the structure of the sequences. CPSMs provided a global view of a sequence's structure, by showing how individual contributions fit together to form the sequence, while maintaining chronological information.

In CPSMs, we show all substantive contributions or portions which have significant functions in the development of the discussion. Thus we exclude simple responses and incomplete responses, unless they have a discernible function.

The FCF describes sequence 8 as follows (see tables 2 and 4). Maud gives a proposition (L70); this is shown by the upper left "proposition" box. Next, Ann's L71 invalidates proposition L70; thus a box for invalidate is placed directly below the proposition box—below because it chronologically follows L70, in the same column because proposition L70 is the object of the action. Maud's simple response (L72) is omitted. Then, Ann's L73 has two functions: first, a continuation of invalidation L71, in the first sentence of L73; second a qualification of that invalidations (not discrediting, but limiting it). The continuation needs not be shown, since it immediately follows, but the invalidation is shown as a box directly

L82:	Suggestion			
L82:	Justification			
L85:		Clarification		
L86:		Clarification		
L89:			Extension	
L91:	Evaluation			
L92:	Restatement			
L93:	Inc.(Restate.)			
L94:	Inc.(Justif.)			
L95:				Information
L97:	Justification			

Table 5: CFSM for Sequence 10

below the invalidation. To show that it connects to the invalidation, it must be in a column where the invalidation is the top most entry; to do this, we extend the invalidation to cover two columns. Thus any entry connects only to the top most entry of that column. Next, Ann's L75 goes in the same column because it continues the qualification L73. Maud's incomplete is omitted.

Then we get a new thread of discussion (connected structure) in the sequence. This starts because Maud's L77 is independent of the prior thread, which we note by placing a small blank column between it and the prior thread, making them visually disjoint.

Continuing in this fashion, we get a nice visual image of the global structure of sequence 8. At a glance, we can see that there was a disconnect in the conversation, with two separate threads being discussed. We also see that contributions built recursively on each other, rather than connecting to the originating propositions.

The map of sequence 10 (table 5) gives us an overview of that sequence We immediately see highly connected, unified discussion, predominantly centered around (and directly addressing) one suggestion. The lack of invalidations and qualification shows a level of unity and agreement. We also see that and *information* contribution took place, related to the thread (no column gap), but not contribute to the structure.

In the end, CFSMs provides a visual representation of the functional structure of the sequence. We see such information as: the sequence's chronological progression, connections among individual contributions, each contribution's function, and the sequence's structure relative to the sequence's dominant task.

Discussion

Looking back, the FCF helped us address our original research questions. The FCF identified individual contributions' functions within their sequences' context. With it, we see the function of each statement; and we see links among individuals' contributions. By looking for connections between functions within the FCF and other codes, such as our code for the elements on which individuals draw as they participate, we can address more complex questions.

The VOPS study aimed at understanding what elements (*things*) GMTAs drew upon to contribute to teaching discussions. By identifying elements in a contribution and then using the FCF to identify the function of that contribution, we were able to see how the contributing GMTA utilized that element in the discussion. For instance, in the end of L81 of sequence 10 (table 3), Sarah draws upon her student perspective (see Belnap & Withers, 2008), seeing things from the point of view of a student. The FCF tells us that this move was to justify a suggestion. Thus, in L82, Sarah drew upon a student perspective to justify a suggestion. Thus in the VOPS study, the FCF allowed us to identify how GMTAs used various elements to contribute to the discussion.

The FCF and the CFSMs will also allow us to address other questions, by comparing other information with function. One thing we plan to do is compare the contributors with the functions, ascertaining the roles they play in the discussions. Another process will be to reverse our element-function comparison, identifying all elements that served a specific function; for example, looking at all elements that compete for the role of justification.

Another possible direction is using the FCF to identify GMTAs' teaching roles (in their classrooms). With this, we could measure one form of change in teaching practices, gauging the impact of professional development programs.

Beyond FCF comparisons, CFSMs show potential. We plan to use them to compare and classify occurring sequences. Through this, we may understand how to define and recognize productive/unproductive conversation, even identifying the conversation's nature. We may also identify/investigate when and why some threads are abandoned.

Ultimately, the FCF was developed for one purpose, to provide a tool for describing the contextualized function of individual contributions in a sequence. While developed within the VOPS study, its potential goes beyond; it is already opening many other research opportunities, both in unfacilitated *and* facilitated discussions.

The challenges we faced in looking at unfacilitated discussion created labor-intensive analysis. In the end, however, the approaches we have discussed and framework developed have allowed us to make meaning out of these complex discussions. We hope that our efforts will encourage and empower other researchers to look at similarly complex discussions, because reality is that many important classroom, professional development, or other educational conversations are similarly complex.

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