Using exchange structure analysis to explore argument in text-based computer conferences

Journal Item

Using exchange structure analysis to explore argument in text-based computer conferences

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Abstract

Computer conferencing provides a new site for students to develop and rehearse argumentation skills, but much remains to be learnt about how to encourage and support students in this environment. Asynchronous text-based discussion differs in significant ways from face to face discussion, creating a need for specially designed schemes for analysis. This paper discusses some of the problems of analysing asynchronous argumentation, and puts forward an analytical framework based on exchange structure analysis, which brings a linguistic perspective to bear on the interaction. Key features of the framework are attention to both interactive and ideational aspects of the discussion, and the ability to track the dynamic construction of argument content. The paper outlines the framework itself, and discusses some of the findings afforded by this type of analysis, and its limitations.

Keywords: computer conferencing, argumentation, exchange structure analysis

1.1. Introduction

Recent years have seen an increase in the use of asynchronous text-based computer conferences as a context for student discussion. Participating in argumentative discussion is seen as fostering a critical attitude towards knowledge and helping to develop the skills involved in presenting well-supported and reasoned arguments (Baker *et al.* 2003; Terenzini *et al.* 1995). It calls for the ability to put forward a proposition supported by evidence and to engage with different viewpoints by challenging or

defending claims, a process which many students find difficult both in multi-party debate and in individually authored essays (Andrews 1995). Although these skills may be developed in face-to-face discussions, asynchronous computer-mediated forums can offer particular advantages since text-based and time-delayed communication makes it easier for students to keep track of complex issues under discussion (Tolmie and Boyle 2000). In these environments, the interaction takes the form of a 'slow discussion' (Andriessen 2006, p. 19), offering students considerably more time than in face-to-face interaction to reflect on the viewpoints of others and to compose their own responses. Lea (2001) also argues that students can exploit the arguments and counterarguments which have been rehearsed online as rhetorical resources in their written work. The very fact that online discussion differs from face-to-face discussion may however make it difficult for teachers to know how best to set up, monitor, and follow up computer conferencing so as to benefit from these advantages (Andriessen 2006; Kirkpatrick 2005; Williams 2002).

Much of the research into online discussion is concerned with pedagogical implications, and seeks to develop understanding of the way that particular aspects of the interaction may contribute to educational goals. One influential research tradition is that of computer-supported collaborative learning (CSCL), which sees social interaction as an important element of knowledge construction. CSCL focuses on understanding the ways that the affordances of online environments can help to scaffold students in learning together, using quantitative content analysis as a means of investigating the processes of online interaction. Research has moved from investigation of observable and quantifiable behaviours such as rate of participation or message length, to inferential studies which categorise elements of the discussion with the aim of elucidating

processes of knowledge construction, collaborative learning or critical thinking (De Laat and Lally 2004; Gunawardena *et al.* 1997 1997; Hara *et al.* 2000 2000; Weinberger and Fischer 2006). Recently, however, a growing body of literature has addressed the problems of validity and reliability associated with this inferential use of quantitative content analysis (De Wever *et al.* 2006; Rourke and Anderson 2004; Schrire 2006). While CSCL focuses on collaborative learning, other research has also looked at argumentation in online environments, using approaches which vary depending on the purpose of the research. Clark *et al.* (2007) review a number of such studies and classify them according to whether the focus is on formal argumentation structure (e.g. Erduran *et al.* 2004; Toulmin 1958); conceptual quality (e.g. Clark and Sampson 2008; Kuhn and Udell 2003); epistemic nature of reasoning (e.g. Duschl 2007); the nature and function of contributions within the dialogue (e.g. Andriessen *et al.* 2007; Janssen *et al.* 2006); or argumentation sequences and interaction patterns (e.g. Baker 2003; Leitão 2000).

Andrews (2005) suggests that approaches to analysing argument range along a spectrum from logic at one end to rhetoric at the other. The Toulmin model (Toulmin 1958; Toulmin *et al.* 1984) lies towards the logical end, focussing on the generic properties of rational argument, while at the rhetorical end the focus is on the way views are exchanged, in what Andrews calls 'the choreography of argument' (2005, p. 110). A similar contrast is implied by Sandvik's (1997) discussion of the interactive and argumentative aspects of spoken political argumentation. She comments that the argumentation would be represented as a hierarchical reconstruction in a 'logical' pragma-dialectic approach (as for example in van Eemeren 2001), but in the process of reconstruction the linear unfolding of the discourse would be lost, obscuring interactive

Comment [cjc1]: A couple of repetitions here also Hara.

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aspects of the argumentation. Leitão, too, comments on the need for a dialogical perspective on argumentation that can reveal 'both the proponent's and opponent's active and interrelated roles in the course of a dialectical weighing up of supporting and opposing elements in social contexts' (Leitão 2000, p. 339).

The focus of this paper is the development of an analytical framework designed to capture this dialogical perspective on argumentation, drawing on linguistic approaches to analysing exchange structure (Eggins and Slade 1997; Sinclair and Coulthard 1975). Our interest is in the way students interact online to propose, defend and challenge arguments, and we examine both the types of contributions they make, and the way these build up into an ongoing argumentative discussion. Unlike the studies reported above, we analyse the discussion from a linguistic perspective, highlighting the patterns of interaction that occur, and the way that various different moves are realised linguistically. The analytical framework is designed to account comprehensively for the linguistic data, thus providing insights into the role of non-argumentative as well as argumentative contributions to the discussion. An innovatory feature of the analysis is the system of tracking the way that arguments are dynamically constructed and by which participants. Better understanding of all these aspects of argumentation may help in illuminating how educators can best make use of computer conferencing to help develop students' argumentation skills.

1.2. The research context

The analytical framework was developed for two research projects[1], each looking at argumentation within an asynchronous text-based environment, one at university and one at secondary school level. The university course, 'Perspectives on Complementary and Alternative Medicine' (CAM), is part of an undergraduate programme in Health and Social Care at the Open University, U.K. Data was collected over two years from nine tutors and their students, but our analysis has focussed on two conferences based on argumentative tasks, one about the factors leading to an increase in the choices available when making decisions about health, the other posing the question: 'how realistic are the assumed benefits of statutory regulation?' The secondary school research project involved an electronic conference between two U.K. schools over a three week period, in which Year 9 pupils (aged 13-14) discussed and evaluated the factors contributing to the Nazis' rise to power in 1933. In both projects, we also collected and analysed students' written assignments and carried out interviews with teachers and students.

1.3. Linguistic approaches to argumentation

Linguistic approaches to analysing argumentation include both exchange structure analysis and genre analysis. Exchange structure analysis draws on a model originally designed to examine classroom discourse (Sinclair and Coulthard 1975; Wells 1999). This model involves a hierarchy of five levels – lesson, transaction, exchange, move,

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and act – in which a typical exchange consists of initiating, responding and follow-up (IRF) moves, and each move is realised by acts such as eliciting, informing, prompting, and acknowledging. The focus is thus on the pragmatic function of utterances. This model has been developed by Pilkington (1999; 2001) to analyse the interaction occurring in computer-mediated dialogue. The extract below, for example, (Pilkington 1999, p. 46) represents an IRF exchange during an M.Ed online seminar:

LNC So is Case's theory a learning theory or a developmental one?

BU I read it as developmental

LNC So did I

Pilkington's DISCOUNT scheme involves several layers of analysis, and in addition to identifying dialogue roles through exchange structure, it also considers rhetorical predicates - relationships such as cause, purpose and condition that hold between propositions (Mann and Thompson 1988). These make it possible to track how ideational content is structured within a single dialogue turn or across turns. The scheme has been used to investigate the way in which different types of role are distributed between tutor and students, and has had educational implications for raising student awareness of roles (Pilkington 2003; Pilkington and Walker 2003) and designing teacher intervention strategies (Kneser *et al.* 2001; Walker and Pilkington 2001).

An alternative linguistic approach to argumentation draws on genre theory as pioneered by Martin (1992). From this perspective, genres are seen as 'staged, goal-oriented social processes' (Eggins and Martin 1997, p. 243) and a text can thus be analysed in terms of the generic stages it passes through in order to achieve its purpose within a given social context. A school history essay, for example, may set out to challenge a commonly held viewpoint, and in so doing moves through the stages of outlining the position to be challenged, presenting rebuttal arguments, and putting forward an alternative

interpretation (Coffin 1997; 2006). Generic stages can often be identified in the messages which students post in computer conferences, as in the following example from the undergraduate course in Complementary and Alternative Medicine. The student, Amy, posts a lengthy message which involves two arguments, each consisting of a claim and accompanying support:[2]

Claim I also believe, however, that choice is only really available if you have money to spend and I think this has always been the case even in the pre modernity period.

Support If you take the example of Louise in the course book, she has lots of choice in theory but little money and this actually equates to no choice. more money usually equals more choice.

Claim I also believe that choice is only available if you know it's out there.

Support When I was in a lot of pain with my back I simply took painkillers and awaited my physio appointment. it never even occurred to me to I had a choice and could try a CAM therapy because I didn't know what was out there.

Where students post extended conference messages of this sort, it is possible to identify the generic stages they go through in developing an argument, and to analyse the ideational meanings that are being made and the linguistic resources used to convey those meanings (Coffin *et al.* 2005a; b).

Some texts, however, are more amenable to generic analysis than others. Eggins and Slade (1997, p. 270) point out that casual conversation may include both 'chunks' of text, such as anecdotes, which have relatively clear generic stages, and stretches of 'chat' where a more finely-grained analysis of discourse structure is needed to track the

[2] Pseudonyms are used throughout, and all data is reproduced with the original spelling and punctuation and use of the use of text abbreviations or 'textese', where it occurred.

dynamic nature of the interaction. Computer mediated communication is widely recognised as displaying features of both written and spoken modes (Collot and Belmore 1996; Ferrara *et al.* 1991), and while in some contexts it may be analysed as 'chunks' with a distinct generic structure, in other contexts it may be better regarded as a form of written 'chat'. As Harrison (1998) points out, if CMC does indeed resemble conversation, then we would expect interactional aspects to be prominent, although the interaction may be very different from that usually found in face-to-face conversation in small groups.

One striking difference is that asynchronous discussion disrupts the linear sequence of face-to-face conversation, since a turn need not relate to the immediately preceding turn, but may refer back to something mentioned much earlier. The example below is taken from one of the secondary school discussions, with the messages logged in the order they were sent. Bashaar's message responds not to the immediately preceding one from Emily, but to an earlier post on the topic of the Wall Street Crash, as his use of the subject header makes clear. However, subject headers were used inconsistently by the students, and cannot therefore be relied on to indicate how messages relate to each other. Daniel, for example, uses the same header as Emily but as becomes clear later, he was actually responding to Bashaar.

Emily *Hitler And Communists*

I think hitler made people change there minds so they would change there minds and vote for him, he also would always say what his people wanted to here.

Bashaar *The Wall Street Crash*

i think your right about the effect of the wall street crash but the prices of food and other things have increased and that made the government weak and that made hitler gane more vote.

Emily *Nazis Propagander*

Hitler would always use propergander, by saying what they wanted to here he would also use this to gain more votes.

Daniel *Nazis Propagander*

no way !!!!!!!!!!!!!!!!!!!!!!

This poses problems for any system of analysis in which moves are identified in relation to what immediately precedes or follows them. Eggins and Slade (1997), for example, distinguish opening from sustaining moves on the basis of elliptical dependence, but this distinction does not transfer well to asynchronous discussion, where elliptical responses are often avoided because of their potential ambiguity. (It may however apply satisfactorily to computer conferencing that takes place in real time or is mediated by a learning environment that itself structures interactions.)

A further methodological problem is determining the unit of analysis. Discourse analysts typically identify functional moves as units of discourse structure; Eggins and Slade, for example, identify moves based on the grammatical independence of the clause and intonation features, but note that in casual conversation 'most clauses are moves, and most moves are clauses' (Eggins and Slade 1997, p. 186). This however, is not true in computer-mediated discussion, where moves are frequently longer, and intonation is not available to help identify move boundaries. These differences make it difficult to represent the choreography of a computer conference using an analytical system designed for use in face-to-face contexts. The following section will outline the ways in which we developed an analytical framework to accommodate the particular features of asynchronous argumentative discussion.

1.4. Developing the analytical framework

A major issue in analysing computer-mediated discussion is identifying the unit of analysis; different researchers use a range of different types of unit, but often without discussing the criteria involved. In view of the problems of reliable segmentation, Strijbos *et al.* (2006; see also Weinberger and Fischer 2006) argue that it should be carried out separately from coding, and moved in their own research to a unit that could be identified reliably without problems of overlapping boundaries (a sentence or part of a compound sentence). In our system of analysis, we also decided to use a grammatically defined unit that allowed us to segment the text reliably before beginning coding: the t-unit, which consists of an independent clause together with clauses dependent on it. This segmentation is illustrated in the following message from one of the secondary conferences. The first t-unit involves both an independent and a dependent clause ('cos money was worthless 4 them'), while the others each consist of a single independent clause.

1. the wall street crash wos bad 4 germans cos money was worthless 4 them.
2. lol unlucky.
3. the stockmarket is huuuuuuuuge
4. so it wld of made a big impact on german life....

Elliptical utterances may need to be filled out in order to reach a decision, as in t-unit 2), which has been reconstructed as 'lol <that was> unlucky'. Once the text is segmented in this way, each t-unit is coded according to the move that it realises; where a move comprises more than one t-unit, coding is simply continued over all the relevant units. This approach allows us to compare the frequency of different moves, and to provide a rough indication of the proportion of the conference occupied by each type of move (which may vary considerably in length).

Comment [cjc2]: Sarah I think it would be good to explain this and OMG (used in tables)

A number of researchers categorise the type of talk which is going on in computer-mediated discussion, distinguishing for example between task-related and non-task-related material (Schellens and Valcke 2004), between transactive statements, transactive questions, and non-transactive statements (Felton and Kuhn 2001), or between explanation, argumentation, problem resolution, and management (de Vries *et al.* 2002). Since our main focus was argumentation, we began by classifying argumentative talk as distinct from social, procedural, and other instructional talk. This distinction, however, proved difficult to maintain. Our original criterion for identifying a move as argumentative was that it formed part of the negotiation of claims, either by proposing, supporting or challenging a position. Yet in real life discussions, as Erduran *et al.* (2004) point out, claims are not always easily identified. They may occur at different levels, so that what is put forward in one move as a claim may in later moves be used as justification for another claim. Erduran *et al.* resolve the ambiguities in their data through consideration of explicit indicators of logical relationship such as 'so' and 'because'. They were dealing, however, with classroom situations, in which the teacher was consciously encouraging children to make their reasoning explicit. In our data, such relationships were often left implicit, making it difficult to be certain whether or not a piece of information was intended as evidence relating to a particular claim. Consider for example the following message in one of the undergraduate discussions (italics added):

1. I believe, to the lay person, qualifications, Diplomas etc. mean little and say little about the training.
2. Professional bodies seeking to regulate their practices are *after all*, often in dispute amongst themselves.

3. *Equally* in Allopathic medicine, the drugs industry is the biggest in the world
4. and often acts unethically.
5. For instance supplying third world countries with banned, or untried drugs.
6. Side effects *too* , differ between individuals.

The discourse marker ‘after all’ in t-unit 2) seems a reliable indicator that this statement is intended as support for the preceding claim. It is difficult to decide, however, whether the markers ‘equally’ (in 3) and ‘too’ (in 6) are meant to indicate further support for this claim, to introduce new claims, or perhaps to challenge or defend claims made earlier in the discussion. Van Eemeren and Grootendorst (1984, pp 113-14) caution against relying on discourse markers to resolve such ambiguity, since discourse markers are not always used in an argumentative sense, nor does reasoning necessarily involve such explicit markers. A further complication is that speakers and writers may not plan their arguments with analytical rigour; they may themselves have a somewhat fuzzy view of the relationship between the argumentative moves that they make, or may use discourse markers without the sort of precision that an analyst (or teacher) might hope for. If in analysing argumentation we aim to understand what are and are not effective strategies, the analytical system must itself be able to cope with such imperfect interaction.

In the analytical system developed by de Vries *et al.* (2002), moves were identified as argumentative only if they appeared in an 'argumentative sequence', that is, a sequence which involved clear disagreement between participants. Their students' interactions were however structured to focus on areas of disagreement, and also took place in real time. In our data, where discussion was asynchronous and more open-ended, a move

that did not at first appear to be argumentative, might be picked up later by another participant and woven into the argumentation.

Consequently, rather than trying to maintain a clear distinction between argumentative and non-argumentative moves, it seemed better to regard this type of material as contributing to a gradually expanding pool of data which participants could draw on in building arguments, whether with explicit or implicit reasoning. Instead of argumentative moves, we identified a more loosely defined category of 'discussion' moves, as part of a four way classification:

- Discussion: Moves relating to the topic under discussion in the conference, which form part of (or potentially contribute to) the on-topic argument.
- Social: Moves which relate primarily to constructing or negotiating solidarity/community.
- Procedural: Moves relating not to the discussion of the topic, but to establishing and maintaining the conditions which allow the discussion to take place. This includes both technical and organisational issues.
- Other field-related: Moves that can be roughly classified as 'classroom talk', and cannot be classified under any of the other three categories as defined above. This includes factual queries and responses not related to the intended topic of discussion, and teaching moves such as evaluating student contributions.

Since our focus was the way that students argued in the conference discussion, we aimed to analyse moves in the 'discussion' category exhaustively. Within the other three categories we indicated only particularly salient types of move.

Central to our analysis of the discussion is the claim, or contestable proposition. Within this category we recognise four subtypes: *claim*, *thesis*, *recommendation* and *counterclaim*. The label *thesis* is used when it is necessary to indicate a claim at a higher level in a hierarchy of claims; this tended to occur more often in the ~~essays~~ students'

written assignments than the conferences. A *recommendation* makes a claim about how things should be, rather than how they are, while a *counterclaim* challenges a previous claim by taking an alternative position. Each of these types of move is coded with a unique identifying number, and moves relating to that claim within the same or subsequent messages are given the same reference number. This feature enables us to track the way that a claim, once put forward, is either endorsed, elaborated, challenged or ignored by other participants.

As mentioned above, participants often put forward material which might, potentially at least, be regarded as support for a claim. In analysing this type of material, there is a danger of overinterpretation; the analyst, by reading 'co-operatively', may infer relationships that were not in fact intended by the participant, creating an idealised interpretation that represents not what participants actually did, but what they perhaps should or could have done. Leitão, for example, considers an idea to be supporting 'if (1) it reads naturally after a typical support indicator (e.g. because) has been inserted between that idea and the speaker's position and (2) it gives an answer to a query that would typically elicit a justification' (Leitão 2000, p. 344). Our view, on the other hand, would be that such ideas may be regarded only as potentially supporting, and that we cannot be sure of the participant's intentions. In our analysis, we code all such material according to its pragmatic function (e.g. reporting, describing, explaining), regardless of whether it is or is not explicitly related to a particular claim. The numbering system, however, allows us to distinguish those moves which are clearly related to a claim, from those where the relationship is no more than a weak inference; we term these 'integrated' and 'unintegrated' moves. We began with a set of 'discussion' moves derived from earlier work, but have gradually expanded and modified the list to account

for those actually occurring in our data. The complete list is given in Appendix 1, together with examples from both the university and secondary school data.

1.5. Tracking the dialogue

The labelling of functional moves within an argumentative discussion bears a similarity to other analyses of the nature and function of contributions within the dialogue, as reviewed by Clark *et al.* (2007); in particular, it shares with the DISCOUNT scheme (Pilkington 1999) a concern to identify both exchange structure and ideational content structure. The innovatory feature of our analytical framework, however, is the way it enables us not only to identify different types of move, but also to capture the dialogic nature of argumentation by tracking the way that claims are made and responded to within the asynchronous environment. Figure 1 illustrates the coding system that facilitates this tracking, applied to an extract from the undergraduate discussion on statutory regulation of complementary and alternative medicine. Each unit is coded under one of the four headings (discussion, social, procedural or other). Whenever a new claim is first made, as in t-unit 84, it is given a number and a brief label to help the analyst keep track of it. The column headed 'Supports/Challenges' allows us to record links between a claim and any other move that relates to it. For example, the concession in t-units 85/86 relates to an earlier claim 04, while the counterclaim in t-units 87/88 is coded twice, once as a new claim 09, but also as a challenge to the earlier claim 07. The full display also shows other features such as the participants' pseudonyms, the subject header for each message, and the date and time it was logged. The analysis is carried out in Excel spreadsheets, making it possible to filter the data according to specific criteria, for example, all the moves relating to a particular claim, or performed by a particular participant.

Figure 1: Extract from a coding sheet

Number	T-units	Discussion	Social	Procedural	Other	Auto entries	Supports / challenges	New claims
83	Some people turn to CAM because they are disillusioned with orthodox medicine.	sreas					08	
84	Therefore, if CAM is seen to start compromising its beliefs and principles for the sake of regulation, could it lose popularity?	claim					08	08 Regulation might compromise CAM
85	But we do live in a society that always looks for proof and evidence. Proof of qualifications, proof a therapy works, proof it is safe.	concede					04	
86	For the most part, I think this will be possible for most therapies, without too much compromise.	concede						
87	I don't think the therapy needs to become biomedical,	counter					07	09 CAM could be validated by science
88	but it could carry out 'clinical tests' to prove it is safe and effective	counter						
89	Do you agree?	aprom						

Figure 2 Extract from a summary chart

Comment [cjc3]: Sarah, do you think these abbreviations are sufficiently transparent. E.g. I wondered about c-fact?

Participant	Claims								
	01	02	03	04	05	06	07	08	09
Je	descr								
Je	CLAIM+								
Ra	↓	CLAIM							
Ra	agree	↓							
Je		agree							
Ra		agree							
Ra		eg							
Ro			CLAIM						
Ro			descr						
Ro		↓	descr						
Ro		claim							
W		agree							
Ju		agree							
Ju		↓		descr					
Ju		claim		CLAIM					
W				counter	COUNTER				
W					descr				
Ju				↓	conc				
Ju				claim					
Ju				explan	↓				
W					explan				
W					c-fact				
Ju		↓			conc				
W		explan							
W		explan							
W		claim				CLAIM			
Ju		agree				↓			
S			↓			agree			
L			agree						
W	↓						CLAIM		
Ju	claim								
W	explan								
S								CLAIM	
S			↓					explan	
Ra			claim						
Ra	↓								CLAIM
Ro	claim								
Ro	explan								

Statistical information can be read directly from the spreadsheets, but to enhance this quantitative data, information was also transferred to summary charts providing a diagrammatic display of the argumentation across time. (Social, procedural and other field-related moves are not included in these summary charts.) The extract in Figure 2 shows the summary chart for part of a secondary school conference, and has been generated from the corresponding coding sheet. [3] Each claim made in the discussion is listed and numbered along the top, and the moves relating to that claim are shown in the column below, in the order that they occurred in the discussion. New claims (including thesis statements, counterclaims and recommendations) are indicated using capitals, while subsequent moves appear in lower case. The participants are indicated by initials in the left-hand column, with T representing the tutor. We can see, for example, that student W(illiam) first agrees with claim 02, which was introduced by Ra(chel) and restated by Ro(bert). Later he challenges Ju(stin)'s claim 04, by putting forward his own counterclaim 06, supporting it with three types of supporting move and eliciting a concession (twice!) from Ju(stin). The summary charts can be inspected in this way to identify particular patterns of interaction, but they also provide a useful overview of the structure of the discussion as a whole, and suggest aspects that merit further qualitative analysis.

1.6. Results and discussion

The analytical framework was applied to computer conferences from two different settings, and though both involved asynchronous text-based discussion, they differed in terms of the participants themselves, the disciplinary area and the topics of discussion,

[3] This is achieved in Excel by populating the cells to the right of the analysis with a formula that transfers data from the columns used for coding.

the affordances of the particular technology, the organisation of the student groups, and the way the activity fitted within the overall curriculum. The framework proved sufficiently flexible to cater for these differences. Each research project led to a different set of findings, but one feature revealed in both cases was that the discussion was marked by a complexity of argument strands (i.e. chains of moves relating to a particular claim) simultaneously unfolding in relation to different sub-topics. The tendency for argument strands to disperse rather than build towards an overall position may be a distinctive feature of the medium. With little pressure to establish a stable or overarching point of view, students can explore a range of different viewpoints which may in turn trigger new lines of thinking.

~~Yet~~ W~~w~~hilst our analysis pointed to students' success in collaboratively strengthening claims, it also revealed that many claims received no response at all, and suggested that unresponded claims tended to inhibit student participation (Hewings *et al.* forthcoming). Agreeing moves may ~~therefore~~ help to contribute to a collaborative ethos. The importance of the interpersonal dimension is also highlighted in the university data, where it was found that the group with the lowest level of social interaction had the least focussed debate, as measured by the proportion of non-integrated discussion moves (Coffin *et al.* forthcoming). Challenging is seen as a key feature of effective argumentation (Clark and Sampson 2008; Erduran *et al.* 2004), yet although in interviews students reported that they enjoyed challenging and being challenged, such moves were in fact relatively uncommon in our data. The analysis suggests a relationship between the frequency of challenges and specific linguistic features of the claims that students put forward, with claims that were expressed more tentatively being more likely to be challenged (Coffin *et al.* forthcoming). Findings of this sort indicate

Comment [cjc4]: Sarah, I couldn't see the logic in the contrasting 'yet'

Comment [cjc5]: Again, I couldn't see the logical link?

the value of a linguistic perspective on argumentation, and of analysing both interaction and ideational content.

The analytical framework developed for these research projects is a promising approach to investigating dialogic aspects of argumentation in asynchronous environments. In particular, it makes it possible to track different patterns of argumentation moves, how moves are distributed between participants, and what types of supporting moves are made in relation to claims. There are, however, several issues that need to be acknowledged. As with many other schemes for analysing argumentation, the framework does not address the quality of argument content (Clark *et al.* 2007). The coding system relates supporting moves to a claim according to the speaker or writer's intentions (as far as these can be determined from the textual evidence), even though these moves may be based on faulty content or reasoning. Consider, for example, the following exchange:

> Naomi What do you think to Julie Stone's suggestion that 'Statutory regulation is inappropriate for most therapies, not because it would confer unmerited legitimacy, but because it could fundamentally alter the nature of those therapies.'?
>
> Emily As a nurse I have to say I disagree & feel that there should be statutory regulations for therapist, as otherwise any cowboys can undertake therapies & do more harm than good, at least if there is a regulatory body people are monitored.

Emily's response is coded as a challenge supported by logical reasoning, since this is how she has presented it. It is clear though, that the reasoning she employs does not in fact address the issue raised by Naomi. Effective argumentation structure does not itself guarantee that the arguments employed are academically valid, and assessing

conceptual and epistemological quality is particularly difficult as it involves field-dependent criteria (Sampson 2008).

Since functional analysis depends on attempting to reconstruct speaker/writer intentions, there are inevitably problems with reliability. In the initial stages of developing the framework, data was analysed by the project team, and the coding categories were gradually agreed on through discussion of the data. From then on, text data was coded by a single researcher in order to maximise consistency. Nonetheless, we recognise the need to improve reliability. One direction is to make the move descriptors more robust, by refining the criteria and seeking to specify more closely particular linguistic realisations that characterise particular functions.

However, it is necessary to recognise that functional analysis is part of a qualitative, not a quantitative methodology. The function of an utterance is frequently ambiguous, even taking into account contextual information. In interpreting other people's utterances, we rely on a process of inferencing to make sense of what we hear; there is no privileged access to 'what the speaker really means'. And speakers themselves do not necessarily mean one thing: an utterance may simultaneously be performing several functions, or may be ambivalent between two mutually exclusive interpretations. An ostensibly humorous remark, for example, might also be a thinly veiled criticism; a piece of evidence apparently offered in support of another participant’s claim could be intended to undermine it. Such uncertainties are part of our face-to-face interactions, and they need to be accounted for in online environments as well.

Attempting to be too precise can lead to overinterpretation, tidying up the interaction in ways that may mask the phenomenon we are trying to investigate. Participants in discussion do not operate with clearcut notions of neatly packaged claims for which evidence can be marshalled to one side or other as corroborating or countering. This is what the analyst is concerned with, not the participants. Categories of functional analysis are necessarily a simplification of what is a much more fluid exchange of ideas that may be only half-formed, in a context where participants are concerned about interpersonal roles and relationships as well as ideational content.

Our analytical scheme has been made as flexible as possible to account for features of this sort. The distinction we draw between integrated moves (which can be clearly related to a claim) and unintegrated moves (where the relationship is less clear) allow us to recognise variations in the relevance of participants' contributions to a discussion. Another important aspect is the coding of social moves, and there is certainly more to be investigated in the relationship of this sort of interaction to the academic business of the discussions. In both research projects, social moves were common and rather than derailing the discussion, as reported in some studies (e.g. Kirkpatrick 2005; Williams 2002), tended to support the view that the social dimension is important in facilitating discussion.

Despite the limitations of the analytical framework presented here, it does offer a way to examine 'the choreography of argument', to attend to the nature of the contributions made by both tutors and students and the way that the discussion unfolds over time through interaction between the participants. These features contribute to the ultimate aim of the analysis: to understand better the ways in which students may be supported in

developing argumentation skills that can be deployed in multiparty debate, whether online or face-to-face.

References

Andrews, R. 1995. *Teaching and learning argument*. London: Cassell.

---. 2005. Models of argumentation in educational discourse. *Text* 25: 107-27.

Andriessen, J. 2006. Collaboration in computer conferencing. In *Collaborative learning, reasoning and technology*, 197-231. New Jersey: Lawrence Erlbaum Associates.

Andriessen, J., M. Baker, K. Lund, M. Quignard and M. Van Amelsvoort. 2007. Rainbow: A framework for analyzing computer-mediated pedagogical debates. *International Journal of Computer Supported Collaborative Learning* 2.

Baker, M.J. 2003. Arguing to learn: Computer-mediated argumentative interactions for the co-elaboration of scientific knowledge. In *Confronting cognitions in computer-supported collaborative learning environments*. Dordrecht The Netherlands: Kluwer Academic Publishers.

Baker, M.J., M. Quignard, K. Lund and A. Séjourné. 2003. Computer-supported collaborative learning in the space of debate. In *Designing for change in networked learning environments: Proceedings of the international conference on computer support for collaborative learning 2003*. Dordrecht: Kluwer Academic Publishers.

Clark, D.B. and V. Sampson. 2008. Assessing dialogic argumentation in online environments to relate structure, grounds, and conceptual quality. *Journal of Research in Science Teaching* 45: 293-321.

Clark, D.B., V. Sampson, A. Weinberger and G. Erkens. 2007. Analytic frameworks for assessing dialogic argumentation in online learning environments. *Educational Psychology Review* 19: 343-74.

Coffin, C. 1997. Constructing and giving value to the past: An investigation into secondary school history. In *Genre and institutions: Social processes in the workplace and school*. London: Cassell.

---. 2006. *Historical discourse: The language of time, cause and evaluation*. London: Continuum.

Coffin, C., S. North and D. Martin. forthcoming. Exchanging and countering points of view: A linguistic perspective on school students' use of electronic conferencing. *Journal of Computer Assisted Learning*.

Coffin, C., C. Painter and A. Hewings. 2005a. Argumentation in a multi-party asynchronous computer mediated conference: A generic analysis. *Australian Review of Applied Linguistics*: 41-63.

---. 2005b. Patterns of debate in tertiary level asynchronous electronic conferencing. *International Journal of Educational Research* 43: 464-80.

Collot, M. and N. Belmore. 1996. Electronic language: A new variety of english. In *Computer-mediated communication: Linguistic, social and cross-cultural perspectives*, 13-28. Amsterdam: Benjamins.

De Laat, M. and V. Lally. 2004. It's not so easy: Researching the complexity of emergent participant roles and awareness in asynchronous networked learning discussions. *Journal of Computer Assisted Learning* 20: 165-71.

De Vries, E., K. Lund and M. Baker. 2002. Computer-mediated epistemic dialogue: Explanation and argumentation as vehicles for understanding scientific notions. *Journal of the Learning Sciences* 11: 63-103.

De Wever, B., T. Schellens, M. Valcke and H. Van Keer. 2006. Content analysis schemes to analyze transcripts of online asynchronous discussion groups: A review. *Computers and Education* 46: 6-28.

Duschl, R.A. 2007. Quality argumentation and epistemic criteria. In *Argumentation in science education: Recent developments and future directions.* Berlin: Springer.

Eggins, S. and J.R. Martin. 1997. Genres and registers of discourse. In *Discourse as structure and process,* 230-56. London: Sage.

Eggins, S. and D. Slade. 1997. *Analysing casual conversation*. London: Cassell.

Erduran, S., S. Simon and J. Osborne. 2004. Tapping into argumentation: Developments in the application of toulmin's argument pattern for studying science discourse. *Science Education* 88: 915-33.

Felton, D. and D. Kuhn. 2001. The development of argumentative discourse skill. *Discourse Processes* 32: 135-53.

Ferrara, K., H. Brunner and G. Whittemore. 1991. Interactive written discourse as an emergent register. *Written Communication* 8: 8-34.

Gunawardena, C.N., C.A. Lowe and T. Anderson. 1997. Analysis of a global online debate and the development of an interaction analysis model for examining social construction of knowledge in computer conferencing. *Journal of Educational Computing Research* 17: 397-431.

Hara, N., C. Bonk and A. Charoula. 2000. Content analysis of on-line discussion in an applied educational psychology course. *Instructional Science* 28: 115-52.

Harrison, S. 1998. E-mail discussions as conversation: Moves and acts in a sample from a listserv discussion. *Linguistik online* 1.

Hewings, A., C. Coffin and S. North. forthcoming. E-conferencing: Corpus and discourse insights. In *Academic writing: At the interface of corpus and discourse*, 000-00. London: Continuum.

Janssen, J., G. Erkens, J. Jaspers and G. Kanselaar. 2006. Visualizing participation to facilitate argumentation. In *7th International Conference of the Learning Sciences*, . Bloomington, IN.

Kirkpatrick, G. 2005. Online 'chat' facilities as pedagogic tools: A case study. *Active Learning in Higher Education* 6: 145-59.

Kneser, C., R.M. Pilkington and T. Treasure-Jones. 2001. The tutor's role: An investigation of the power of exchange structure analysis to identify roles in cmc seminars. *International Journal of Artificial Intelligence in Education* 12: 63-84.

Kuhn, D. and W. Udell. 2003. The development of argument skills. *Child Development* 74: 1245-60.

Lea, M.R. 2001. Computer conferencing and assessment: New ways of writing in higher education. *Studies in Higher Education* 26: 163 -81.

Leitão, S. 2000. The potential of argument in knowledge building. *Human Development* 43: 332-60.

Mann, W.C. and S.A. Thompson. 1988. Rhetorical structure theory: Toward a functional theory of text organization. *Text* 8: 243-81.

Martin, J.R. 1992. *English text: Systems and structure*. Amsterdam: Benjamins.

Pilkington, R.M. 1999. *Analysing educational discourse: The discount scheme. Cblu technical report no. 99/02*. Leeds: Computer Based Learning Unit, University of Leeds.

---. 2001. Analysing educational dialogue interaction: Towards models that support learning. *International Journal of Artificial Intelligence in Education* 12: 1-7.

---. 2003. Reflecting on roles: Using synchronous cmc to develop a knowledge-building community amongst postgraduates. *International Journal of Continuing Engineering Education and Life-Long Learning* 13.

Pilkington, R.M. and S.A. Walker. 2003. Facilitating debate in networked learning: Reflecting on online synchronous discussion in higher education. *Instructional Science* 31: 41-63.

Rourke, L. and T. Anderson. 2004. Validity in quantitative content analysis. *Educational Technology Research & Development* 52: 5-18.

Sampson, V. and D.B. Clark. 2008. Assessment of the ways students generate arguments in science education: Current perspectives and recommendations for future directions. *Science Education* 92: 447-72.

Sandvik, M. 1997. Reconstructing interactive argumentative discourse. *Argumentation* 11: 419-34(16).

Schellens, T. and M. Valcke. 2004. Fostering knowledge construction in university students through asynchronous discussion groups. *Computers and Education* 46: 349-70.

Schrire, S. 2006. Knowledge building in asynchronous discussion groups: Going beyond quantitative analysis. *Computers and Education* 46: 49-70.

Sinclair, J.M. and R.M. Coulthard. 1975. *Towards an analysis of discourse: The english used by teachers and pupils*. London: Oxford University Press.

Strijbos, J.-W., R.L. Martens, F.J. Prins and W.M.G. Jochems. 2006. Content analysis: What are they talking about? *Computers and Education* 46: 29-48.

Terenzini, P.T., L. Spinger, E.T. Pascarella and A. Nora. 1995. Influences affecting the development of students' critical thinking skills. *Research in Higher Education* 36: 23-39.

Tolmie, A. and J. Boyle. 2000. Factors influencing the success of computer mediated communication (cmc) environments in university teaching: A review and case study. *Computers and Education* 34: 119-40.

Toulmin, S. 1958. *The uses of argument*. Cambridge: Cambridge University Press.

Toulmin, S., R. Rieke and A. Janik. 1984. *An introduction to reasoning*. New York: Macmillan Publishing Co.

Van Eemeren, F.H. 2001. *Crucial concepts in argument theory*. Amsterdam: Amsterdam University Press.

Van Eemeren, F.H. and R. Grootendorst. 1984. *Speech acts in argumentative discussions*. Dordrecht: Foris Publications.

Walker, S.A. and R.M. Pilkington. 2001. Facilitating computer-mediated discussion classes: A study of teacher intervention strategies. In *Proceedings of IEEE International Conference on Advanced Learning Technologies (ICALT 2001)*, 253-57. Madison, USA.

Weinberger, A. and F. Fischer. 2006. A framework to analyze argumentative knowledge construction in computer-supported collaborative learning. *Computers and Education* 46: 71-95.

Wells, G. 1999. *Dialogic inquiry: Towards a sociocultural practice and theory of education*. Cambridge: Cambridge University Press.

Williams, P. 2002. The learning web: The development, implementation and evaluation of internet-based undergraduate materials for the teaching of key skills. *Active Learning in Higher Education* 3: 40-53.

Appendix 1 Analytical framework

DISCUSSION	Examples from university data	Examples from secondary school data
Contestable propositions		
Assertions that may be challenged/supported		
Claim		
A contestable proposition relating to how things are (analytic)	I think the whole structure of the NHS has got too big, unwieldy and inflexible	I think the nazis got into power becouse they had a bit of luck with the wall street crash.
Recommendation		
A contestable proposition relating to how things should be (hortatory)	A good rule of thumb would be to check whether the CAM specialist is registered as such and/or ask how long a specialist has been practicing.	All of the MPs should go to the north and stay up there for life. (essay data)
Counterclaim		
A claim which takes an alternative position to a previous claim	I don't think the therapy needs to become biomedical, but it could carry out 'clinical tests' to prove it is safe and effective	I disagree that luck was that important because Hitler deliberately used his skills to persuade people.
Thesis		
An overall position on an issue (at a higher level of generality than a claim) is put forward (i.e. a thesis statement)	The pursuit of statutory regulation may be based on a number of assumptions about the perceived benefits that statutory regulation would offer complementary therapies:	As much as there are good things about Hitler's leadership, there were also a lot of events that were beyond Hitler's control.

Comment [cjc6]: Can we second column?

Comment [cjc7]: This se similar to refute in that there disagreement with a reason g

Claim / Support

A claim which includes supporting evidence or reasoning in the same move	There appears to be a paternalistic stance from the RP in that she withheld information regarding the effects of the reiki, as there was no explanation on the first visit on what Mrs. Bannister might expect, symptom wise, from the treatment.	Hitler was a very good speaker, as he was able to manipulate the german people into thinking that jews and communists were to blame for the downfall of the German Empire.

Comment [cjc8]: Or T un

Informing moves

Information or reasoning which is put forward as part of the on-topic discussion; these moves may be either integrated (used to support a claim) or unintegrated (not linked to any particular claim, but available as potential support for a claim).

Recount

A recount of a series of actions or events	Although chiropractic grew rapidly in Europe it was not until the late 1970s that the Anglo-European College of Chiropractic (AECC) was established in the UK. (essay data)	In 1914 he joined da army an faught in WW1 nd got a medal 4 bravery. In 1918 he felt dat germany was betrayed bi da government.

Procedure

Information about how a procedure is being/has been/will be carried out	In order to find out about CAM usage in a more formal setting, I shall look at websites of local NHS health centres and NHS and private hospitals. (essay data)	We will also put shells down, so when we go over the top, the barbed wire will be cut down so we can just run straight through. (essay data)

Description

Information about the nature or condition of a person, place, object or concept	In the former USSR there are two schools of homeopathy , a very advanced classical school centred on Kiev, and a more French style one centred on Moscow (essay data)	Hitler was a loud speaker and always tried his hardest to get his points across

Counterfactual explanation Reasoning that speculates on what might have happened	Furthermore, had Mrs Bannister known that her symptoms might increase on treatment, she may have refused to have it.	Without this deal Hitler would not be able to become the vice president of Germany.
Explanation Other logical reasoning, involving explicit causal relationships	We are so used to trained medics that people often assume other therapists are similarly qualified, I think.	I think that the wallstreet was very useful to hitler because the great deprsession led him to look like a saviour. but if things like the wall st crash had not happend i don't think hitler or the nazis would have got into power
Personal assertion A comment related to the on-topic discussion which describes the writer's affective response and is therefore not open to challenge	I do not want ot be associated with this practise!	wow its quite amazing how tactical hitler was, from a penniless man to the chancellor,
Professional experience Reference is made to professional experience provided by the writer	When I sat for a short time on our college regulation panel I was impressed by the help we got from the academic advisor on the panel.	

Comment [cjc9]: I think t example because it didn't act

Personal experience Reference is made to personal experience provided by the writer	Just after I had my daughter 6 years ago I was diagnosed with hypertention and was told by my doctor I would be on medication for the rest of my life.	
Exemplification One or more specific examples of a general point	The GMC has also been criticised for letting criminals like Harold Shipman "slip through the net".	i.e. whan he got put in jail he used the court to get across his point by making a huge speech and getting the judge on his side and the rest of the court.
Other information Any other material which is part of the specified on-topic discussion, but does not fall into one of the above categories	and the cry of "Let me through, I'm a qualified aromatherapist" would ensure at least some basic first aid until paramedics arrived!	In his time Hitler would kill a lot of Jewish people.
Agreement A previous claim is confirmed by a participant agreeing with it	I agree there is much more information about CAM available giving us greater choice.	i agree that hitler used propaganda in most of his speeches so he could get more votes to become chansellor

Refute A questioning or criticism of an argument or claim made in a previous turn, (or in a forum outside the conference such as a text book, academic article etc.) No new claim is made, unlike Counterclaim	Is it good enough to say that 'I am good at my jub but I cannot take exams' or I cannot afford to register.	he wouldnt of just been offered chacellor because he had forced them to give him the job
Concession Recognises the validity of an alternative viewpoint expressed in a previous turn. This move is subsidiary to a claim being put forward by the writer	I agree with Alexs comment about increased access to information [*but also believe that a little knowledge is far more dangerous than no knowledge]*	I can understand what you are saying boy [*but i still think that the people of germany would not have agreed to the holocaust if they were warned*.]
Argument Prompt A question designed to stimulate and prompt participants' views on an issue	are communities now also linked to time as we continually move, breaking old relations and creating new?	bt do u agree dat the nazis came 2 pwere coz dey had hitler??...

Information Prompt A question designed to stimulate participants to provide information as part of the on-topic discussion	*[i think some of the treatments particularly sonic, stones and reiki are a load of baloney]* - has anyone ever experienced any of those...?	I don't understand, how did making the German currency worthless make Hitler powerful?
Issue The overall issue to be debated is identified (without indication of the stance or approach to be taken by the writer)	THE SAFEGUARDS PROVIDED FOR USERS OF CHIROPRACTIC WITHIN THE U.K. (essay heading)	Hitler's leadership was the main reason Nazis came to power in 1933. Do you agree? (essay heading)
Preview The direction of the forthcoming discussion or section of discussion is explicitly introduced	Finally it's interesting here to digress briefly and consider the alternative versus complementary argument.	This essay is about whether it was Adolph Hitler's leadership that brought the Nazis to power or whether he was given an advantage as a result of things he could not control. (essay data)
Summary Preceding discussion points are explicitly summarised or completed	To summarise what I see as the 'story so far' drawn from preceding emails [...] I suggest the following: [...] 1. Increased information available to 'all' a) media – TV, radio etc.	in this essay i have discussed the good and the not so good points of the 'great' reform act and i have proven that it wasn't that great at all! (essay data)

Comment [cjc10]: This s factual statement. I can't find assignment booklet but I thin good to choose a more debate proposition.

SOCIAL	Examples from university data	Examples from secondary school data
Encouragement Participants motivate and encourage each other	Many thanks to those of you who have contributed so far.	I like those facts william lol
Teasing Participants denigrate each other or each others' contributions, playfully or otherwise (opposite of Encourage)	Enthusiasms one thing but some of you peeps are getting carried away!!!	omg mandy wat u chaffin on bout !!!!!!
Deferring Participant minimises own contribution and/or seeks reassurance from others	please correct me if anyone knows any different	I don't kno if they are 100% reliable so don't shout at me if they are wrong:
Salutation Participants open contributions with a greeting	Hi folks	hi meg it's lizzy
Signing off Participants close contributions	Best, Julie.	luv rebecca (9ama)
Other	Bethany did you have a good holiday?	oi john do u no a gal called jessica

PROCEDURAL	Examples from university data	Examples from secondary school data
Problem Describes and/or asks for assistance with a procedural problem (relating to technical issues or other conditions that affect the ability to carry out the task)	With respect,are these sessions supposed to be brief replies to Julie's question or complete essays which, along with study stuff for K221 we're expected to plough through?	Do you know how to view what you've already written? If so right back!
Help Provides information intended to help with procedural matters	Then go to this online tutorial, use 'write to conference' to open a new message box (or click 'reply' to another message to continue a thread) and use right click 'paste' to put your message into the box.	POST SOMETHING THEN CLICK ON YOUR NAME. CLICK ON EDIT USER INFO THEN U CAN CHANGE URE DISPLAY NAME.
Directive Moves in which a participant (normally the tutor) instructs participants how to carry out the task	Think about the choices you have made in relation to your own health or well-being and the interactions you have had with health practitioners. Then look at the case study presented for TMA01 in the assignment booklet	Please try to keep your posts to the subject.
Other		Dude, this is so cool! I can reply myself!

OTHER FIELD-RELATED	Examples from university data	Examples from secondary school data
Elicitation Any move intended to elicit factual information which is related to the wider educational field but not part of the specified on-topic discussion itself	Can anyone help with this? One of our local practitioners has many hats but one of her labels is homotoxicologist. (This brought many interesting pictures to my mind!) However in brackets the leaflet said "complex homeopathy" as by way of explanation, so what is complex homeopathy and what is homeopathy?	Oh... then when did the Holocaust happen sir?
Informing Any move providing factual information which is related to the wider educational field but not part of the specified on-topic discussion itself	Yes complex homeopathy is particular use of combined homeoapthic remedies. It could be described as ujsing homeopathic remedies allopathically.	Hitler had a half brother called Alois Hitler who had a bar in germany
Other (includes explicit teacher evaluation of student contributions, or student evaluations in same style)	At this point you have hopefully managed to work your way through the first few chapters of Book 1 of the course.	You are right Raeesah,