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Combining interaction and context design to support collaborative argumentation in education

by Simon McAlister, Andrew Ravenscroft and
Eileen Scanlon,



Centre for Information Technology in Education
Institute of Educational Technology
The Open University, Milton Keynes MK7 6AA

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Institute of Educational Technology
The Open University
Walton Hall
Milton Keynes MK7 6AA

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McAlister, S., Ravenscroft[#], A. & Scanlon, E.

Institute of Educational Technology (IET), Open University, UK

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Abstract

Empirical studies and theory suggest that educational dialogue can be used to support the development of reasoning, critical thinking, and argumentation in learners of the sort used in academic practice. However this often presents a challenge, especially in Open and Distance Learning (ODL) situations, where learners often lack the opportunity to converse, argue and debate face-to-face in order to develop such skills. So this research has developed an educational design for synchronous online peer discussion that includes a mediating interface to guide and scaffold students towards more academic dialogue and facilitate extended argument. This is linked to a broader set of online educational activities – a designed local context, which aims to motivate students to argue through creating suitable conditions to support the structuring of interactions. This educational design for peer argumentation is based on collaborative working and a dialogue game approach to discussion, using sentence openers and flexible rules (which show preferred next moves) to structure the dialogue. The design and system has been successfully used with students at the UK Open University. This paper will describe the educational design and features of the AcademicTalk system, demonstrate its use with small groups of distance education students, compare AcademicTalk dialogues with those arising from Chat and discuss some preliminary findings from an ongoing evaluation.

1. ***Why support collaborative argumentation in education?***

Computer supported collaborative learning is an endeavour which has gained in profile in recent years to the extent that some claim it as “the dominant use of technology in education” (Dillenbourg, 2003pIX.) There are a number of research communities engaged in studies of the variety of ways in which computers can be used in collaborative learning, ranging from joint problem solving, remote experimentation, distributed design to supporting conversations between learners. Even when we focus within this larger endeavour on specific applications of computer supported collaborative learning such as conversations between learners, there are a series of developments in both the design and evaluation of such uses. For example, the literature on computer mediated communication (and especially conferencing in distance higher education) has proceeded from useful insights into both the benefits for learners offered by such technologies and the identification of difficulties in designing good quality experiences for learners (see e.g. Mason and Bacsich, 1998; Salmon, 2000) to the importance of evaluating such efforts (see e.g. Jones et al, 2000). In this paper we approach one particular type of collaborative activity, educational dialogue between peers online and look at ways that particular designs drawn from past work including support for argumentation, can illuminate our understanding of this type of activity and promote effective educational interaction.

Previous work has clearly demonstrated that we often need to ‘drill deeper’ than the concept of ‘collaborative dialogue’ to identify, characterise and design lower level features - such as roles, rules, strategies and moves to support particular types of dialogue in achieving particular educational goals. Ravenscroft (2000) and Ravenscroft & Matheson (2002), demonstrated how a dialogue-game for ‘collaborative argumentation’ – specified in terms of such features – lead to conceptual development in science. Similarly, Wegerif (1996) has shown how the approach of ‘exploratory talk’ – based on ground-rules for dialogical reasoning, can lead to improvements in generic reasoning skills in school-children, and Pilkington & Parker-Jones (1996) have demonstrated how an ‘inquiry’ dialogue-game leads to improved reasoning and reflection in medical students. In brief, this and other work (see Ravenscroft & Pilkington, 2002 for a review) presents a strong support for the notion that structuring and guiding learners dialogue can lead to clear and significant educational benefits, and further, that collaborative educational argumentation is often essential to support the sort of ‘deeper dialogue’ that in turn leads to conceptual development and improved reasoning in learners. These empirical studies accord well with Vygotskian (1978) approaches to learning, that emphasise the development of higher level mental processes – such as critical reasoning and reflection, through internalising linguistic processes – such as argumentation, that occur ‘in the social’.

There is an ongoing problem of supporting and developing argumentation skills in ODL (Open and Distance Learning) students, as they are often both ‘new’ to academic practice and lack the opportunity to converse, argue and debate face-to-face in order to develop such skills. So, building on the previous work above, this research developed a mediating interface linked to a set of activities – or

designed local context, to guide and structure educational argumentation in ODL situations. In other words it is aimed to ‘scaffold’ the use and development of argumentation skills in these learners.

2. ***Structured dialogue and designing context***

Previous work with dialogue-games (e.g. Ravenscroft & Matheson, 2002), although successful, has pointed out the necessity to consider the local context in which successful argumentation takes place, as we don’t ‘argue with anyone about anything at anytime’. A point recently emphasised by Ravenscroft (2003a, 2003b) who suggested that we need to at least consider, or if possible, design the local context for interaction, to suitably ground students prior knowledge and cultivate the social, motivational and empathic features that support meaningful and effective interaction. This necessity to create, cultivate or construct a context for interaction is particularly important in ODL situations, where social relationships, shared understandings, clear identities, and general intersubjectivity is often limited or lacking. So this research developed an educational design that included a mediating interface –AcademicTalk, derived from collaborative dialogue-game approaches, linked to a broader set of phased dialogic activities designed to foster the conditions for suitable educational argumentation. These are described in the following sections.

2.1 ***Structuring educational argumentation with AcademicTalk***

The AcademicTalk client, that is shown in Figure 1, builds on the (near) synchronous messaging capability of IRC (Chat) protocols, adding a new packet layer which provides new capabilities. It also presents a novel interface to the learner using a threaded structure of messages in which each message is a reply to a previous message. The key features of managed synchronous dialogue, sentence openers and guidance on opener selection which support and scaffold the dialogue are described below.

2.1.1. **Managed synchronous dialogue**

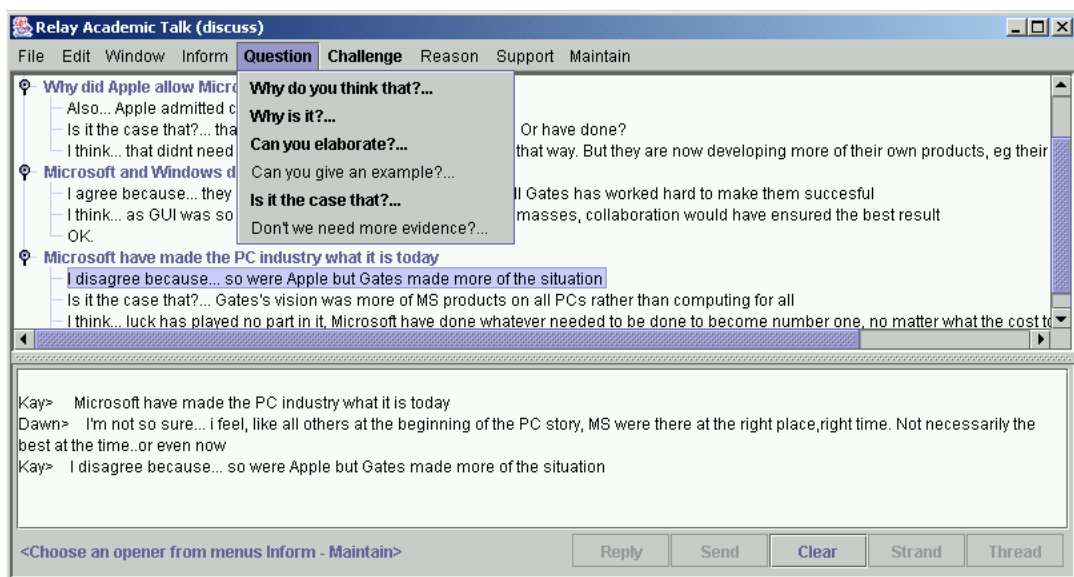
Synchronous discussion has the advantage of immediacy of live feedback when compared with asynchronous discussion, such as Listserv or conferencing. Although textual, the forms of communication are closer to spoken conversation than asynchronous discussion (Garcia & Jacobs, 1998). As in face-to-face discussions, synchronous discussion can be lively and animated (and enjoyable participants report), in contrast to the more considered and indirect forms of interaction in asynchronous CMC.

However, there is a problem with the standard Chat interface, that is often used for this purpose (for example in products such as FirstClass and WebCT), which posts messages in a viewing pane as they are received. Given response and typing time, reply messages are often displaced from their antecedent messages by intervening messages on other subjects (Garcia & Jacobs, 1999). With dyadic conversation this is not usually a problem, even if two or more strands of conversation exist. However with four or more participants, the effect is somewhat like a noisy party in which replies get lost in the hubbub of conversations. This *sequential incoherence* poses a substantial cognitive load for the learner in matching new messages against their possible antecedents

(Herring, 1999). This makes the simple Chat interface inappropriate for a lot of educational discussion because the strand of argument is not easily visible for inspection.

Figure 1 demonstrates how AcademicTalk addresses this problem. It has two viewing panes to remedy sequential incoherence, one to browse the latest messages, and another to view the selected message and its antecedents, linked by the reply relationship. This relation implies a message structure of an inverted tree shape, with branching where two or more replies are received to a message. The tree structure is two dimensional and so requires two viewing panes. A message and its antecedents comprise an argument strand providing a coherent sequence of dialogue¹.

Figure 1 - AcademicTalk interface



So unlike Chat, where there is pressure to be 'first poster' to keep the reply near to the antecedent message it replies to (Herring, 1999), in AcademicTalk there is less pressure since every reply is placed next to its antecedent message when viewed as an argument strand. It is also possible to browse early messages in the discussion and reply to them, offering some of the reflective advantages of asynchronous discussion.

2.1.2. Sentence openers to support academic dialogue

AcademicTalk requires that a sentence opener be chosen for each new message. Once an opener has been chosen the learner completes the message in their own words. The set of openers has been developed for higher education students, based on earlier work on collaborative working and effective peer dialogue (Soller & Lesgold, 1999; McManus & Aiken, 1995; and Johnson & Johnson, 1991). Unlike studies using openers as shortcuts to existing forms of interaction (Lazonder, 2003), the aim here is to facilitate a refined form of interaction, leading to the development of argumentation and reasoning skills. A major

¹ The upper pane lists the tail (latest) message of each argument strand and when selected the strand is listed in the lower pane.

extension of the opener set has been to build in this emphasis towards argumentation, for example, evidence giving and requesting. The wording of openers was chosen to be clear and direct, and they are presented on six *Intention* menus to aid location (see Table 1 for a partial listing, and Appendix I for a full listing).

Table 1 - AcademicTalk selected sentence openers, by intention

<i>Inform</i>	<i>Question</i>	<i>Challenge</i>
I think...	Why do you think that?...	I disagree because...
Let me explain...	Why is it?...	How is that relevant?...
Let me elaborate...	Can you elaborate?...	A counter-argument is...
Because...	Can you give an example?...	An alternative view is...
An example...	Is it the case that?...	Is there evidence?...
My evidence...	Don't we need more evidence?...	How reliable is that evidence?...
Reason, Support & Maintain shown in Appendix I		

2.1.3 Guidance on opener selection

Figure 1 shows how certain openers are highlighted to the learner when making a choice, as suggestions to be considered in making a reply (see Fig. 1). This 'preferred reply' set of openers is derived from dialogue game rules and corresponds to notions of well-formed dialogue (for example, 'Can you elaborate?...' suggests a reply 'Let me elaborate...'). However, learners may choose to use openers not in this preferred set, depending upon the context and content of the message. So a flexible, non-directive and yet constructive form of guidance is provided.

2.2. *Cultivating the local context for interaction*

Such issues as student motivation to argue, their preparedness in terms of content and whether they feel safe to contribute will be important to the success of discussion. These features are addressed through a phased activity design that is described below. This amounts to structuring discussion at the macro as well as micro, or message, level.

2.2.1. Creating conflict to support motivation

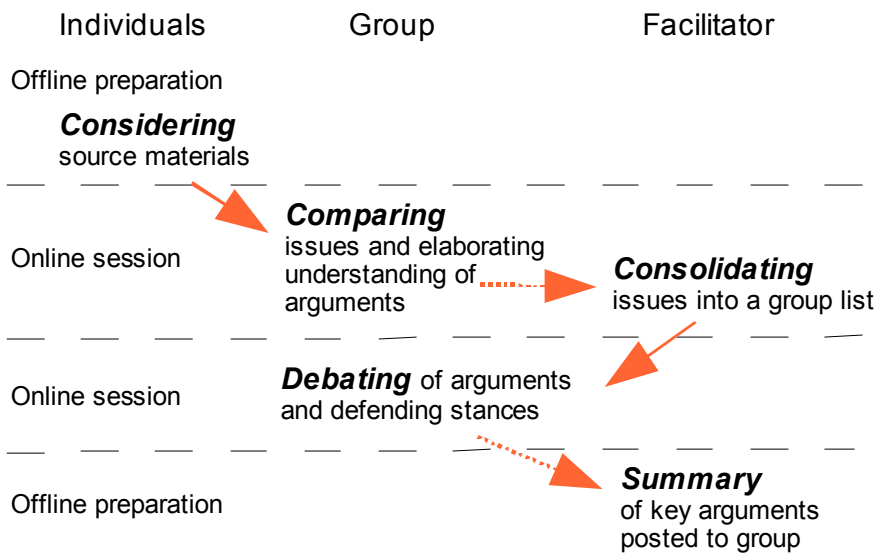
Academic controversy can be a motivation to argue; creating conflict has always been dramatic and demanded an emotional involvement (Johnson & Johnson, 1993), so one way to achieve this is by wording the discussion topics to create a normative framework within which to argue². The creation of conflict requires learners to adopt opposing perspectives (Veerman, 2000; Baker, de Vries & Lund, 1999), and is seeded by providing preparatory reading to all students in the form of alternative and opposing perspectives on the discussion topics, alongside a more balanced overview.

² For instance a discussion topic used in this study was 'Microsoft and Windows deserve their success', designed to raise questions about Microsoft business practices and the merits of Windows as an operating system.

2.2.2. Design of a phased activity

The context design includes a four phase collaborative learning activity (shown in Fig. 2 and described in detail elsewhere³), based on phased activity models (Johnson & Johnson, 1993; Quignard & Baker, 1999; Newman, 1996). The phased activity shown here was formulated for ODL students, but adapted from a more general model. It is chosen to provide maximum opportunity for preparation, exploring issues, and knowledge building.

Figure 2 – The collaborative learning activity



The first group discussion session (Comparing) uses AcademicTalk to explore and elaborate issues, gain familiarity and instil confidence in the learners who are usually still constructing their knowledge. The second session (Debating) with AcademicTalk is more conflictual as the students take sides in a debate about one or more subtopics. An interval of a day between the two online sessions allows students time to check their understanding with the source materials (i.e. returning to *Considering*), given that their knowledge is often tentative at this stage (but with knowledgeable and confident students it might be possible to conflate these sessions). In terms of learning about a discussion topic, the *Considering*, *Comparing*, and *Debating* phases correspond well with the three stage model of knowledge *acquisition*, knowledge *building*, and knowledge *refinement* (Quignard & Baker 1999, Bereiter 1994, Scardamalia et al., 1994).

2.2.3. Role of the facilitator

A facilitator from the discussion group plays a management role keeping the group focussed, whilst also playing an active part in the argumentation and discussions. In the initial group session (*Comparing*), the main task is to ensure the chosen topic is broadly covered and that the group does not get mired in one issue. The facilitator can move discussion on by gradually introducing key questions identified in the preparatory readings.

³ S R McAlister (2001), *Argumentation and Design for Learning*. Dialogue and Design for New Media Group, Technical Report 01/2. The Open University, UK.

In the offline phase between the discussion sessions (*Consolidating*), the facilitator itemises the issues discussed and constructs debating questions for the next phase. A good debating question requires some thought, both to balance the ability to argue from both sides, and to include as many relevant issues that arose from the first discussion as possible. The group choose their preferred question at the start of the *Debating* phase, and take sides. After the online debate the facilitator summarizes the whole discussion (*Summary*) in terms of the arguments used and posts this to a shared (asynchronous) conference.

3. *Using AcademicTalk*

Table 2 shows a dialogue demonstrating how AcademicTalk supports features of educational argumentation, specifically, how ideas put forward are collaboratively examined and refined via the introduction of an alternative view and the use of evidence. In this *Comparing* session, Andrew (the facilitator) posts a new thread title and Sandra stakes a claim for one of the contenders to be considered using the opener 'I think...'. Eric uses the opener 'I agree because...', which prompts him to explain a complementary position. This is one of the preferred reply openers when responding to 'I think...'. Note that the ordering of the Intention menus suggests a cycle of informing, questioning, challenging, and support or reasoning.

Table 2 – *AcademicTalk: argumentation demonstrating the collaborative resolution of positions*

Topic: 'Who do you think made the most significant contribution to the Internet project pre-1990?'		
1	Andrew	Visionary Fathers - Who are they and why?
2	Sandra	I think... people like Lick who predicted the future
3	Eric	I agree because... Lick would have to be the visionary father. Bush only had ideas on organising documents. Not sharing them.
4	Dawn	An alternative view... is that Lick built upon Bush's ideas and used them as a starting place for his own
5	Eric	Is there evidence?... That Lick built on Bush's ideas?
6	Dawn	My evidence... is on the www.ibiblio.org/pioneers/licklider.html page, in the section Libraries of The Future, it mentions he sought to use Bush's ideas as a platform for his own
7	Andrew	Also... Lick was a psychologist and brought a different perspective to Bush's ideas
8	Eric	I agree because... I didn't read as closely as you Dawn ;-)
9	Dawn	I think... that each 'layer' of ideas were built upon to creat the whole
10	Eric	Good point.

Notes: The discussion concerns Internet visionaries JCR Licklider (Lick) and Vannevar Bush.

Dawn advances a more sophisticated alternative view (4), but Eric challenges the veracity of the claim (5), with the opener 'Is there evidence?...'. This opener is key to prompting students to move from opinion-based claims towards justifying their claims in an academic manner. Authoritative evidence is produced by Dawn to back the alternative view (6) using the preferred reply move 'My evidence...'. Andrew (7) adds more insight in how ideas from one

context may be taken further in new contexts. After Eric accepts the evidence (8), Dawn, by induction, proposes a synthesis (9), that the group can agree with (10).

4. *Demonstrating AcademicTalk and comparison with Chat*

This section further demonstrates features of argumentation supported by AcademicTalk, and compares these with argumentation achieved with Chat on a similar topic, to illustrate how improved argumentation can be supported. A Chat episode is shown first and some of the typical problems noted. Two episodes follow from AcademicTalk which show deeper, more varied and yet more coherent argumentation as well as a much more direct style of interaction. All these episodes were chosen by a course tutor as good examples of argumentation. Note that the same phased activity design was employed, so only the interface differed across the shown cases.

Table 3 – Chat: argumentation that informs but fails to engage

Topic: "The Windows PC owes its success to features, like the GUI, that were first developed for the Apple Mac"		
78	Ken:	On a slightly different tack. How else could a 'successful' GUI look and should Apple be allowed to monopolise that?
79	Daisy:	Does windows or Mac have the greater share of the market?
81	Chrissy:	GUI make it[the] computer user friendly so no company should have a monopolie
84	Ken:	I think so too, (Chrissy). For the same reasons that MS, or any company, shouldn't hold a monopoly
86	Vikki:	I agree there shouldn't be a monopoly
88	Daisy:	Why then, isn't there more software for the Mac?
89	Ken:	Less than 10% of the market
90	Karl:	mac suffers for software (Daisy) because it is not an open standard
91	Chrissy:	because of market factors, pc sell more units and therefore more protencal user for the software house
92	Ken:	Yes, but neither is MS (Karl).
93	Karl:	why write programs for one computer which only has a small share of the market when u can write one that can be used on virtually all other machines that get most of the use
94	Vikki:	good point
97	Ken:	I agree, (Karl)

The example of Chat dialogue shown in Table 3, from the *Comparing* activity phase, contains interesting points which are discussed, but not in detail. The dialogue is still rooted in the rather shallow ‘trading’ of opinions without questioning or justification. This is probably due to the sequential incoherence of the replies separated from their antecedent message, and which requires a distracting cognitive effort (Herring, 1999) to match them up (note from the non-consecutive numbering that intervening messages on other themes have already been removed). Students often assist the matching process by incorporating the name of the person they are replying to, but inevitably messages are missed (79) and major points may go unnoticed (92). This latter point is illustrated by the error in the statement by Karl (90) (he refers to Apple’s lack of ‘open architecture’ – hardware not software), picked up later by

Ken (92). It is probable that Ken's correction went unnoticed by Karl, who was involved in typing a long and successful contribution (93) and made no response to the earlier correction before the topic moved on.

Table 4 shows a equivalent episode from a *Comparing* session, using AcademicTalk. Here, the students engage in a more coherent and detailed dialogue in which qualifications are made and justifications requested. The students are new to HE and their ideas are not sophisticated, yet the dialogue displays a variety of argumentation features compared with the (mainly) informing dialogue of the Chat example. Jane uses qualification with the opener 'That is valid if...' (18), to address Neil's initial point which is opinion-based, and counters him later with contrary evidence using 'An alternative view...' (48). Daphne questions Patrick's post hoc rationalisation of events (61) with 'Why do think that?...'.

Table 4 – *AcademicTalk: argumentation that is coherent, detailed and varied*

Topic: "The Windows PC owes its success to features, like the GUI, that were first developed for the Apple Mac".		
8	Jane	Who has the better operating system Mac or Windows
12	Neil	I think... Microsoft has the better O/S than apple in 90% of the programs
15	Patrick	That's right.
18	Jane	That is valid if... they had the same number of programs for each. Apple is way ahead of grafics use
38	Neil	Is it the case that?... Apple use [that] part as an attractor for their PC If so, maybe thats the reason that they are not as popular as MS IMHO
+++48	Jane	An alternative view... I[s] that Macs were aimed at the printers and publishers- they came up with the industry standard of Pagemaker -still in use in printshops now
>>>54	Neil	That is valid if... the question was aimed in a business users but in IMHO the question is aimed at the whole industry
>>>55	Jane	Good point.
45	Patrick	Let me explain...Apple simply tried to have it's cake and eat it...There should have been an open standard
+++59	Neil	That's right.
61	Daphne	Why do you think that?... They wernt to know it was to become an open product. May be they were hoping there standard woudl become defact[o]
Notes: MS is Microsoft, O/S is operating system, open standard refers to open architecture of the standard pc compared with Apple's pc.		
Note on presentation: The presentation of the episode has been adapted for paper by combining several linked argument strands and only indenting multiple replies. Each message is a reply to the first preceding message where the message numbers are aligned, except '+++' which introduces an indented reply. So 45 & 48 are replies to 38, and 59 & 61 are replies to 45. The non-consecutive numbers attached to messages are not significant as the discussion is multi-threaded.		

Table 5 shows an episode from a *Debating* session with AcademicTalk, in which the students use constructive conflict. This episode shows good, detailed argumentation about the relevance of ideas to the Internet project. It can be seen that the participants engage with, and challenge arguments proposed using the opener 'I disagree because...'. These direct challenges, which are infrequent in

equivalent Chat dialogues, may result from a sense of ‘permission’ given by using openers in a ‘dialogue game’ which overcomes politeness rules.

In this episode Eric is championing JCR Licklider as *the* Internet visionary against Andrew’s claims for V Bush some twenty years earlier. Dawn is able to see the merits of both claims. Eric proposes and maintains the essential element of networking in the Internet vision (94, 110, 126, 145), against Andrew’s (and Dawn’s) arguments. By a series of rebuttals, using openers ‘I disagree because...’ and ‘That is valid if...’, he manages to get Andrew’s agreement for this point of view.

Table 5 – AcademicTalk: argumentation that challenges

Topic 'Who do you think made the most significant contribution to the Internet project pre-1990?		
91	Andrew	Influential and Inspirational Internet Visionary - Vannevar Bush or JCR Licklider?
94	Eric	I think... It has to be Lick. He saw the benefit of networking computers. Bush only saw the benefit of organizing information.
96	Dawn	I agree because... Bush's initial idea did not take the idea of the information 'memex' into the realm of networking
100	Andrew	I disagree because... It was Bush who defined a whole new way of thinking about technology and how it should be developed and funded
106	Dawn	Good point.
107	Dawn	I agree because... Bush also had the idea of linking this information (hypertext linking?), just maybe not the networking idea
110	Eric	I disagree because... Although Bush's ideas have been used in the internet. His ideas had nothing to do with computers and networking them. He only visualised a single machine working by itself.
119	Andrew	I disagree because... he has been described as a prophet of cyberspace!
121	Andrew	Because... you have to remember at what time he was talking about this machine and its ability to leave associative trails that could be passed on to future generations
126	Eric	That is valid if... if we consider the internet as only interlinked documents. But what about other applications such as e-mail or file sharing?
133	Andrew	I disagree because... still require human interface with the computer, which is what he predicted would be the most exciting area of computing
145	Eric	A counter-argument is... is that the most exciting area is communicating with other computers and users of computers. Not just your own with all the information locked inside it, like the Memex machine.
146	Andrew	Good point.

To summarise, both episodes from AcademicTalk demonstrate a deeper engagement between students than the Chat episode. The students engage more directly with each others’ ideas, producing deeper and more extended argumentation.

5. *Preliminary findings from evaluations*

The preliminary results presented here relate to four discussions, taken from a larger study, that were selected as a balanced cross-section of the main data. These included 32 ODL students on a first level technology course about the development of the personal computer and the Internet. Five course-related topics were discussed in small groups of 4-6 students using the phased activity design. Half the groups used Chat (CHAT) and half used AcademicTalk (TALK) for discussion. The context and the preparatory readings were the same for both conditions. Four group discussions, two from each condition with the same two topics, were analysed. We accept that this is a small-scale sample and the results at this stage are indicative rather than conclusive.

5.1. *Off-topic content*

Table 6 shows a comparison of on and off-topic messages between the two conditions. Initial reading of the transcripts found there was a considerable amount of off-topic messages in the CHAT data, but little or none in the TALK data. Off-topic messages, broken down into humorous, social, and other off-topic, accounted for 32% of the dialogue in CHAT, whereas in TALK there was little off-topic.

Table 6 - Count of on and off-topic messages by condition

	<i>TALK</i>	<i>CHAT</i>	<i>TALK%</i>	<i>CHAT%</i>
Total on-topic messages	202	258	99	67.7
Use of humour	2	32	1.0	8.4
Social chat	0	43	0	11.3
Other unrelated course topics	0	48	0	12.6
Total off-topic messages	2	123	1.0	32.3
Total messages	204	381	100	100

5.2. *Types of dialogue moves*

In order to analyse the dialogue that was solely concerned with on-topic argumentation in the CHAT data, course tutors were asked to choose selections of good argumentation from each discussion for further analysis. The episodes chosen by tutors, eight episodes from each condition, were analysed by type of dialogue move as described in the DISCOUNT dialogue mark-up scheme (Pilkington, 1999). The DISCOUNT mark-up scheme is a general framework for categorising speech acts in terms of 'dialogue moves', and is derived from a dialogue game approach to analysing conversation.

A major difference in the use of dialogue moves was that *Inform* moves comprise only 13% of the moves in TALK, while in CHAT they are 23%. Another major difference is that the TALK data showed 10% of the moves were direct disagreement (*Withdraw*), compared with only 2% in CHAT.

5.2.1. Requesting and providing evidence

With regard to evidence giving, about 25% of the TALK messages either requested or referred to evidence⁴, compared to only 9% of the equivalent CHAT messages. Further, about 17% of the TALK messages evaluated argument or evidence, compared with only 9% of the CHAT messages.

5.3. Claims and rebuttals

Claims, rebuttals and levels of argumentation were measured using an extended argument (TAP) approach developed by Osborne, Simon & Erduran, (2002). Here, simple argument begins with claims and counter-claims unsupported by reasons (level 1), while extended argumentation involved claims, reasons and rebuttals (levels 4 & 5). Rebuttals are regarded as highly important in the sense they have the potential to change the ideas and thinking of students. Therefore, the main features of the argument framework "include: the extent to which students have made use of the data, claims, warrants, backings and qualifiers; and the extent to which they have engaged in claiming, elaborating, reinforcing or opposing the arguments of each other" (ibid. p7).

The TALK data scored more highly in the deeper levels of argumentation (levels 4 & 5) and there were no clear rebuttals in CHAT. Table 7 shows the number of interactions that were categorised at each TAP level, with TALK data predominantly in the levels 3 to 5 showing extended argumentation, and the CHAT data in the lower levels 2 & 3 showing a simpler argumentation.

Table 7 - Levels of extended argument, count by condition, argumentation episodes

<i>TAP Level</i>	<i>TALK</i>	<i>CHAT</i>
1: Simple claims, counter claims	1	1
2: Claims with reasons	1	6
3: Claims with reasons and weak rebuttal	5	4
4: Claims with reasons and clear rebuttal	3	0
5: Extended argumentation, multiple rebuttals	2	0
Total	12	11

6. Discussion and Further Work

A striking outcome is that all students assigned to the TALK condition used the new interface fluently, and quickly engaged in the argumentation it was designed to support. Although the comparison with Chat that is reported in this paper was a quite small-scale sample of a larger corpus of data, a number of tentative conclusions are worth noting, accepting that these are pointers to possible trends rather than conclusive results. Firstly, AcademicTalk successfully scaffolded students' argumentation skills, with this condition showing more on-topic dialogue, more justification for their positions, better use of evidence, the exploration of alternative points of view and less simple 'trading' of opinions compared with Chat. Secondly, AcademicTalk supported more rebuttal of positions, extended argument and multiple rebuttals. These are

⁴ The majority of this was evidence by using examples 17%

promising results, when we consider that the interface design (i.e. AcademicTalk or Chat) was the key variable, with all contextual factors held constant including the requirement for preparatory activities before the sessions. Further analysis of the results is currently ongoing, and further work will clearly identify observed trends and outline the implications for the educational design and the AcademicTalk system. Nevertheless, results thus far clearly demonstrate the potential of the approach to design that was adopted, using features of dialogue games (sentence openers and flexible structuring of preferred responses) to guide and scaffold learner argumentation dialogue, and suggesting that the design decisions have had a positive impact on the dialogue. Preliminary findings suggest that this approach leads to more coherent and improved argumentation than is possible with less structured approaches, such as the use of Chat. This is a valuable insight in most ODL (and probably many other) learning situations, and we would expect that engaging in these improved dialectic processes leads to beneficial cognitive change and development.

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Appendix I

Table A - AcademicTalk sentence openers, by intention

Inform

I think...
Let me explain...
Let me elaborate...
Because...
An example...
My evidence...

Challenge

I disagree because...
I'm not so sure...
How is that relevant?...
A counter-argument is...
An alternative view is...
Is there evidence?...
How reliable is that evidence?...

Support

I agree because...
I see your point of view...
Also...
That's right.
Good point.

Question

Why do you think that?...
Why is it?...
Can you elaborate?...
Can you give an example?...
Is it the case that?...
Don't we need more evidence?...

Reason

Therefore...
What I think you are saying...
That is valid if...
Is your assumption that?...
Both are right in that...
To summarise...
Let's consult...

Maintain

Yes.
No.
Ok.
Thank you.
Sorry...
Is this ok?...
Would you please...
Ok. Let's move on.
Can we?...
Goodbye...