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Article

Sociocultural discourse analysis:

analysing classroom talk as a social mode of thinking

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Abstract

This paper describes a methodology for the analysis of classroom talk, called sociocultural discourse analysis, which focuses on the use of language as a social mode of thinking – a tool for teaching-and-learning, constructing knowledge, creating joint understanding and tackling problems collaboratively. It has been used in a series of school-based research projects in the UK and elsewhere and its use is illustrated with data from those projects. The methodology is expressly based on sociocultural theory and, in particular, on the Vygotskian conception of language as both a cultural and a psychological tool. Its application involves a combination of qualitative and quantitative methods and enables the study of both educational processes and learning outcomes.

KEYWORDS: CLASSROOMS, TALK, SOCIOCULTURAL, DISCOURSE ANALYSIS, METHODS

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1 Introduction

In this article I will describe and discuss a methodology for analysing talk which colleagues and I have developed in recent years. As I will explain, I am using the term 'methodology' to refer to an integrated set of methods and procedures. It has been designed to serve a particular research interest, which basically is to understand how spoken language is used as a tool for thinking collectively. We have mainly used it to study how people pursue joint educational activities. I call this methodology 'sociocultural discourse analysis' to distinguish it from other approaches and because it is based on a sociocultural perspective on the nature and functions of language, thinking and social interaction. From this perspective, language is regarded as a cultural and psychological tool for getting things done. The methodology has been used to analyse teacher-student and student-student interactions and I will draw on data from both for illustrative examples. Several colleagues have been influential in the development and used of the methodology and I will refer to our joint publications wherever appropriate.

A wide range of methods for analysing talk are now available (as discussed, for example, in Edwards & Westgate, 1992; Mercer, Littleton & Wegerif, 2004). Such methods cannot be judged as intrinsically better or worse for analysing talk, at least in abstract terms: any method can only be judged by how well it serves the investigative interests of a researcher, how adequately it embodies the researcher's theoretical conception or model of language in use and their beliefs about what constitutes valid empirical evidence. A methodology represents the interface between theory and particular research questions and the use of particular methods and procedures in an investigation represents a methodology in action. It determines not only how data is analysed, but what kind of data is gathered. I will begin by explaining in more detail the theoretical foundations of the type of discourse analysis my colleagues and I employ.

1.1 A sociocultural perspective

Research into the processes of teaching, learning and cognitive development has been transformed in the last 20 years by the emergence of a theoretical perspective which is usually called 'sociocultural', but is also sometimes described as 'socio-historical' and (more recently) 'cultural-historical'. (See for example Wertsch, 1985; Daniels, 2001; Wells & Claxton, 2002.) Its origins are mainly in the work of the Russian psychologist Vygotsky (e.g. 1978). Sociocultural research is not a unified field, but those within it treat communication, thinking and learning as related processes which are shaped by culture. The nature of human activity is that knowledge is shared and people jointly construct

understandings of shared experience. Communicative events are shaped by cultural and historical factors and thinking, learning and development cannot be understood without taking account of the intrinsically social and communicative nature of human life. From a sociocultural perspective, then, humans are seen as creatures who have a unique capacity for communication and whose lives are normally led within groups, communities and societies based on shared 'ways with words', ways of thinking, social practices and tools for getting things done. Education is seen as a dialogic process, with students and teachers working within settings which reflect the values and social practices of schools as cultural institutions. A sociocultural perspective highlights the possibility that educational success and failure may be explained by the quality of educational dialogue, rather than simply in terms of the capability of individual students or the skill of their teachers. It encourages the investigation of the relationship between language and thinking and also of the relationship between what Vygotsky (1978) called the 'intermental' and the 'intramental' – the social and the psychological – in the processes of learning, development and intellectual endeavour.

1.2 Language as a tool for collective thinking

Many human activities involve not just the sharing of information and the coordination of social interaction, but also a joint, dynamic engagement with ideas amongst partners. When working together, we do not only interact, we 'interthink' (Mercer, 2000). Some sociocultural researchers have investigated how, in particular encounters or through a series of related encounters, two or more people use language to combine their intellectual resources in the pursuit of a common task. Good examples would include Middleton and Edwards' (1990) study of collective remembering, Elbers' (1994) research on children's play and that of O'Connor and Michaels (1996) on the orchestration of classroom group discussions. Discourse analysts of other theoretical persuasions, such as conversation analysts, have also studied the processes of joint intellectual activity. However, few researchers have tried to relate the content, quality and temporal nature of dialogue during joint activities to outcomes such as the success or failure of problem solving, or to specific learning gains for participants (a notable exception being the work of Kumpulainen & Wray, 2002). Yet the relationship of dialogue processes to outcomes is of crucial interest, with possible practical implications not only in educational settings.
Studying the joint construction of knowledge can also tell us more about the nature of spoken language, because such joint knowledge-building is an essential requirement of conversational interaction. Conversations are founded on the establishment of a base of common knowledge and necessarily involve the

creation of more shared understanding. Conversational partners use language to travel together from the past into the future, mutually transforming the current state of their understanding of the topic(s) of their conversation. To do so, they need to build a contextual foundation for the progress of their talk; talk is also the prime means for building that contextual foundation. Gee and Green (1998) refer to this aspect of language use as 'reflexivity'. If one is interested in how talk is used to enable joint intellectual activity, one must be concerned with the ways that shared knowledge is both invoked and created in dialogue. This concern was central in the development of the methodology I describe here, especially in the earliest stages when Edwards and I were working on the research reported in *Common Knowledge* (Edwards & Mercer, 1987).

1.3 The dynamic and contextualised nature of talk as collective thinking

Talk which mediates joint intellectual activity poses a considerable methodological challenge for a discourse analyst because of its reflexivity. Any specific interaction in which two people are engaged in solving a problem together has a *historical aspect* and a *dynamic aspect*. Historically, the interaction is located within a particular institutional and cultural context. Speakers' relationships also have histories. Things that are said may invoke knowledge from the joint past experience of those interacting (e.g. their recall of previous activities they have pursued together), or from the rather different kind of 'common knowledge' which is available to people who have had similar, though separate, past experiences. This knowledge may be more or less culturally specific. For example, two people conversing who had at different times studied linguistics at Lancaster University could safely assume much shared understanding of both the subject and the locations in which it was studied, even if this had been gained quite separately. The *dynamic* aspect of collective thinking refers to the fact that the basis of common knowledge upon which shared understanding depends is constantly being developed. The contextual base is in a constant state of flux, as immediate shared experiences and corresponding conversational content provide the resources for building future conversational context.
A key problem for researchers concerned with understanding how talk is used for the joint construction of knowledge (or, indeed, with understanding how conversational communication functions at all) is gaining an understanding of how speakers construct the contextual foundations of their talk. We can only do this in a partial, limited fashion, by sampling their discourse over time and by drawing in our analysis on any common resources of knowledge we share with the speakers. But however difficult it may be to find a solution, the problem cannot be avoided.

2 Sociocultural discourse analysis

As I mentioned earlier, I use the term 'sociocultural discourse analysis' to refer not just to one particular method, such as the qualitative, interpretative procedure which my colleagues and I employ in our analysis of specific events, but to the methodology as whole (which involves several methods, both qualitative and quantitative, as I shall explain). It seemed necessary to name it in this way because the term 'discourse analysis' is used to refer to several different approaches to analysing language (both spoken and written) and to quite different methods. Within linguistics, its use usually indicates an interest in the organisation and functions of continuous text. It can signify research on monologic texts as well as on dialogue. Within sociology, psychology, anthropology and educational research, it usually refers to the analysis of episodes of talk in social context. In sociology 'discourse' can also be used to refer to the general social climate of ideas associated with a topic rather than specific conversations and so some discourse analysis may amount to a branch of cultural studies.

The sociocultural discourse analysis I describe here has been influenced by the work of language researchers in several disciplines, but has its own special characteristics. It differs from 'linguistic' discourse analysis in being less focused on language itself and more on its functions for the pursuit of joint intellectual activity. As in linguistic ethnography and conversation analysis, reports of the analysis are usually illustrated by selected extracts of transcribed talk, to which the analyst provides a commentary. And like some linguistic analyses – but unlike much ethnographic research – it incorporates a concern with the lexical content and the cohesive structure of talk, especially across the contributions of individual speakers, because word choices and cohesive patterning can represent ways that knowledge is being jointly constructed. It differs from conversation analysis (as exemplified for example by the work in Drew & Heritage, 1992: see also Schegloff, 1997) because cognition and the social and cultural context of talk are considered legitimate concerns. Indeed, as I mentioned earlier, dialogue is treated as a form of intellectual activity – as a social mode of thinking. Unlike discursive psychology – at least the version with which I am most familiar – the sociocultural analysis I describe here is concerned not only with the processes of joint cognitive engagement, but also with their developmental and learning outcomes (cf. for example, Edwards & Potter, 1992: 19). Other educational researchers have also devised useful approaches to the analysis of talk based on a sociocultural perspective and have used them in the pursuit of their own research questions. Examples can be found in Lyle (1993; 1996), Hicks (1996), Gee and Green (1998), Wells (1999), Alexander (2001) and Kumpulainen and Wray (2002). While their methods share some features with those I describe here, I do not of course claim to represent their methodologies or underlying rationale.

2.1 The complementary use of qualitative and quantitative methods

Within the social sciences, a common distinction which is made between research studies and, indeed, between researchers, is whether they use qualitative or quantitative methods. The choice between these types of methods oft en seems to be ideological as much as methodological, with quantitative researchers claiming to uphold the more 'scientific', 'rigorous' approach and qualitative researchers claiming the more 'human', intrepretative stance. My own view is that the ideological associations of methods are oft en an obstacle to sensible research design, limiting the range of options available. Different kinds of methods enable different kinds of research questions to be addressed and different kinds of evidence to be obtained. Each has strengths and weaknesses. Focusing on the analysis of talk, the relative strengths and weaknesses of the various qualitative and quantitative methods for analysing talk can be summarised as follows.

2.1.1 Quantitative analysis

This type of method most obviously includes the coding scheme approach known as 'systematic observation' in which utterances are allocated to predefined categories, but also would include any other methods which involve measuring the relative frequencies of occurrence of particular words or patterns of language use. These methods provide an efficient way of handling a lot of data; for example a researcher can 'survey' a lot of classroom language relatively quickly. Numerical comparisons can be made, which may then be subjected to a statistical analysis. However, the actual talk data may be lost early in the analytic process. In systematic observation studies, all you work with are your coded categories and the ways these have been pre-determined can limit the analyst's sensitivity to what actually happens. Categories are usually treated as mutually exclusive, even though utterances commonly have more than one possible functional meaning. Moreover, a static coding of types of utterance cannot handle the dynamic nature of talk and so cannot deal with the ways that meaning is constructed amongst speakers, over time, through interaction.

2.1.2 Qualitative analysis

Here I would include ethnography, sociolinguistic studies and conversation analysis. These methods rely on the close, detailed consideration of carefully transcribed episodes of talk. Categories used are often generated through the analysis: they are outcomes, not prior assumptions brought in to sort the data. The examples of talk provided to any audience for the research are real: they are not asked to take on trust the validity of an abstracted categorisation scheme.

A positive feature of this kind of approach for analysing talk as collective thinking is that the actual talk remains the data throughout the analysis and so the processes of the joint construction of knowledge can be examined in detail. The development of joint understanding, or the persistence of apparent misunderstandings or different points of view, can be pursued through the continuous data of recorded/transcribed talk. However, qualitative methods are difficult to use with large sets of data, because the analysis is so time-consuming. (It is commonly estimated that transcribing and analysing one hour of talk using such methods will take between 5 and 12 hours of research time.) As a result, datasets are often small and so it is difficult to use such analyses to make convincing generalisations. Researchers are open to charges of selecting particular examples to make a case.

Having assessed their various strengths and weaknesses, my colleague Wegerif and I decided to explore the complementary use of qualitative and quantitative methods of analysing talk (as first discussed in Wegerif & Mercer, 1997). One of our motivations was to combine the detailed analysis of talk in specific events with a comparative analysis of dialogue across a representative sample of cases. For this latter kind of analysis, we needed to deal fairly easily and quickly with quite a large language corpus (such as one consisting of over 20 hours of transcribed conversation). To do so, we combined interpretative methods with the use of computer-based text analysis. Concordance software enables any text file to be scanned easily for all instances of particular target words. Commonly used examples are *Monoconc, Wordsmith* and *Conc 1.71*. Recent versions of qualitative data analysis packages such as *NVivo* also offer some similar facilities. A concordancer allows a researcher to move almost instantly between occurrences of particular words and the whole transcription. This enables particular words of special interest to be 'hunted' in the data and their relative incidence and form of use in particular contexts to be compared. Not only can the repetition and frequency of occurrence of items be measured, but the analysis can also indicate which words tend to occur together (collocations) and so help reveal the way words gather meanings by the company that they keep. The results of such searches can be easily presented in tabular form. Collocations and repetitions can reveal some of the more subtle, local meanings that words have gathered in use, meanings which are not captured by literal definitions.

An important and valuable aspect of this analysis is that the basic data remains throughout the whole process. By integrating this method with other methods, the analysis can be both qualitative (focusing on the relationship between particular interactions which occur at different times in the data) and quantitative (assessing the relative incidence of 'key words' or collocations of words in the data as a whole, or comparing their incidence in data subsets). Initial

exploratory work on particular interactions can be used to generate hypotheses which can then be tested systematically on a large text or series of related texts. For example, a researcher may want to see if a technical term introduced by a teacher is taken up by students later in their group-based activity. And by locating all instances and collocations of a term in the transcription file, the way it is used by teachers and students in relation to their joint activity can then be considered (see for example Monaghan, 1999; Wegerif & Mercer, 1997; Mercer, 2000: Chapter 3). I will illustrate this feature later in the paper.

3 Linking processes to outcomes

Most analyses of talk in educational settings have been exclusively concerned with the processes of education, not with educational outcomes or effects. This again seems oft en to reflect researchers' commitment to certain types of research paradigms, with little overlap between those who use quantitative, experimental type methods to assess effects/outcomes and those who use qualitative methods to focus on processes. My colleagues and I have tried to transcend this methodological divide, because we have as much interest in educational outcomes (of classroom dialogue) as in educational processes. For example, we have investigated the relationship between the ways that teachers talk with students and the learning that students can subsequently demonstrate (as described for example in Rojas-Drummond, Mercer & Dabrowski, 2001; see also Mercer, 2000: Chapter 6). We have also related variations in styles of talk amongst groups of children to their different rates of success in problem solving and to the educational attainment of the individuals involved (e.g. Mercer, Dawes, Wegerif & Sams, 2004). In this way, we have not only taken advantage of the affordances of different methods and paradigms, but have also provided a variety of empirical support for the conclusions of our research which has been accepted as valid by a wider range of audiences. I will return to these matters also later in the paper.

4 Analysing collective thinking in the classroom

As mentioned earlier, our methodology has been used to analyse both teachers' talk with students and students' talk amongst themselves in paired or group activities. The analyses of teacher-student dialogue came first and they generated an account of the different discursive techniques teachers typically and frequently used as the 'tools of their trade' (Mercer, 1995). All teachers ask their students a lot of questions, creating the Initiation-Response-Follow up/Feedback (IRF) exchanges first described so graphically by Sinclair and Coulthard (1975). They also regularly offer their classes *recaps* – summaries of what they consider to be the salient features of a past event – which can help

students to relate current activity to past experience. These may be *literal* or *reconstructive*, the latter being where the teacher 'rewrites history', presenting a version of events which perhaps fits in better with his/her teaching plans. Teachers also often *elaborate* and *reformulate* the contributions made to classroom dialogue by students (for example in response to a teacher's questions) as a way of clarifying what has been said for the benefit of others and also to make connections between the content of children's utterances and the technical terminology of the curriculum. They often mark experiences as significant in the experience of the class by using 'we' (as in 'When we did the experiment last week'). A list of techniques I have identified is presented in Table 1.

to elicit knowledge from learners
Direct elicitations
Cued elicitations
to respond to what learners say
Confirmations
Repetitions
Elaborations
Reformulations
to describe significant aspects of shared experiences
'We' statements
Literal recaps
Reconstructive recaps

Table 1: Some techniques that teachers use (from Mercer, 1995: 34)

These techniques seem to be in common use throughout the world, even though teaching styles and ways of organising classrooms vary within and across cultures (see Edwards & Westgate, 1994; Mercer, 1995; Alexander, 2000). Of course, as with the tools of any trade, teachers can use these common discursive techniques relatively well or badly. To evaluate the use of techniques, we need to consider what their intended educational purpose might be. For a teacher to teach and a learner to learn, both partners need to use talk and joint activity to create a shared framework of understanding from the resources of their common knowledge and common interests or goals. Talk is the principal tool for creating this framework and by questioning, recapping, reformulating, elaborating and so on teachers are usually seeking to draw pupils into a shared understanding of the activities in which they are engaged. As mentioned above, the purpose of identifying these techniques has been to pursue an interest in the ways teachers guide the joint construction of knowledge. Other kinds of

research interests (in, say, classroom control and discipline) would of course generate different typologies.

Our early observational studies of children's talk in groups (Fisher, 1992; Dawes, Fisher & Mercer, 1992; Mercer, 1994; 1995) also created a typology, by which my colleagues and I described children's talk as being more or less like three archetypical forms: Disputational, Cumulative and Exploratory:

- *Disputational talk*, which is characterised by disagreement and individualised decision making. There are few attempts to pool resources, to offer constructive criticism or make suggestions. Disputational talk also has some characteristic discourse features – short exchanges consisting of assertions and challenges or counter assertions ('Yes, it is.' 'No it's not!').

- *Cumulative talk,* in which speakers build positively but uncritically on what the others have said. Partners use talk to construct a 'common knowledge' by accumulation. Cumulative discourse is characterised by repetitions, confirmations and elaborations.

- *Exploratory talk*, in which partners engage critically but constructively with each other's ideas. Statements and suggestions are offered for joint consideration. These may be challenged and counter-challenged, but challenges are justified and alternative hypotheses are offered. Partners all actively participate and opinions are sought and considered before decisions are jointly made. Compared with the other two types, in Exploratory talk knowledge is made more publicly accountable and reasoning is more visible in the talk.

As with the description of teachers' talk strategies, the three types of talk were not devised to be used as the basis for a coding scheme (of the kind used in systematic observation research). We have had no wish to reduce the data of conversation to a categorical tally, because such a move into abstracted data could not maintain the crucial involvement with the contextualised, dynamic nature of talk which is at the heart of our sociocultural discourse analysis. Rather, the typology offers a useful frame of reference for making sense of the variety of talk in relation to our research questions. While recognising its relative crudeness, we have found that the typology is a very useful heuristic device. In an initial consideration of the data, it particularly helps an analyst perceive the extent to which participants in a joint activity are at any stage (a) behaving cooperatively or competitively and (b) engaging in the critical reflection or in the mutual acceptance of ideas. It is also very useful for explaining the principles and outcomes of discourse analysis to 'users' of research, such as teachers. Our original intention was to refine the typology into a more subtle and extensive scheme for differentiating talk in terms of its variety and adequacy for carrying

out different types of joint intellectual activity, but my own view now is that this would not be a particularly worthwhile development. It is hard to see what value a much more complex differentiation would offer and the elegant simplicity of a three-part list would be lost.

The reader might like to test the application of the typology by considering each of the following short examples of discussions, Transcripts 1–3 below (to which I will also provide my own commentary).

4.1 A note on transcription

For all kinds of discourse analysis, it is important that the transcription of speech is a faithful representation of what is actually said, to the extent that speakers' utterances are not misrepresented and as much information relevant to the analysis is included as is practically possible. But as with methods of analysis, no one particular convention for transcribing speech is intrinsically better than another. Transcription choices should be determined by the research questions being addressed and the claims which will be made on the basis of the analysis. For example, in our research we have not usually recorded details of the length of pauses made by speakers (as is often done, for example, in the transcripts of conversation analysts). We decided that information about the lengths of pauses was not relevant to the questions we were addressing. The format we have usually adopted in recent times is that shown in the examples below, in which standard punctuation is used to represent the grammatical organisation of the speech as interpreted by the researcher. As shown in the later examples (Transcripts 4–7) any comments about other features of the talk and non-verbal aspects of the encounter judged as relevant to the analysis are recorded in a third column. Non-word utterances such as 'mm'/'ooh' are included when they are judged to have a communicative function (e.g. to show surprise, agreement, or to extend a speaker's turn in the face of possible interruptions). Words spoken emphatically are in italics. Simultaneous speech is shown by the use of brackets ([ ) preceding each utterance. Where the accurate transcription of a word is in doubt, it is followed by a question mark in parentheses (?). Utterances which cannot be understood are marked [unintelligible].

In all three of the transcripts below, the participants are primary school children working at the computer. They are all engaged in the joint task of making up a conversation between two cartoon characters portrayed on a computer screen and also have to decide what the characters are thinking as they speak. They then type the words into the relevant 'speech' and 'thought' bubbles. (Whenever it seemed to the researchers that the children were speaking the voices of the characters, the words have been placed in inverted commas.)

Transcript 1: Jo and Carol

Carol	Just write in the next letter. “Did you have a nice English lesson”
Jo	You’ve got to get it on there. Yes that’s you. Let’s just have a look at that. “Hi, Alan did you have a nice English lesson. Yes thank you, Yeah. Yes thank you it was fine.”
Carol	You’ve got to let me get some in sometimes.
Jo	You’re typing.
Carol	Well you can do some, go on.
Jo	“Yes thank you”
Carol	[unintelligible]
Jo	You’re typing. “Yes thank you” “I did, yeah, yes, thank you I did.”
Carol	You can spell that.
Jo	Why don’t *you* do it?
Carol	No, because *you* should.

Transcript 2: Sally and Emma

Sally	Yeah. What if she says erm erm “All right, yeah.” No, just put ‘Yeah all right.” No, no.
Emma	No. “Well I suppose I could.”
Sally	“spare l5p.” Yeah?
Emma	Yeah.
Sally	“I suppose.”
Emma	“I suppose I could spare 50p.”
Sally	“50?”
Emma	Yeah. “Spare 50 pence.”
Sally	“50 pence.”
Emma	“50 pence. “And Angela says “That isn’t enough I want to buy something else.”
Sally	Yeah, no no. “I want a drink as well you know I want some coke as well”.
Emma	“That isn’t enough for bubble gum and some coke.”
Sally	Yeah, yeah.

Transcript 3: Tina, George and Sophie

George	We’ve got to decide.
Tina	We’ve got to decide together.
George	Shall we right, right, just go round like [take
Tina	[No, go round. You say what you think, and she says.
George	I think she should be saying ‘Did you steal my money from me?’
Tina	Your go.
Sophie	I think we should put ‘I thought that my money’s gone missing and I thought it was you’.
George	‘I think it was you’.
Sophie	Which one?
Tina	Now what was it I was going to say, Um, um.

George No because she's *thinking,* so we need to do a thought. So we could write her saying
Sophie 'My money's gone [missing so'
Tina [I was going to say if we're doing the one where she's saying, this is *saying* not thinking.
Sophie 'My money's gone do you know where it is?'
Tina No, [on the saying one she could say
George [You should be saying
Tina Like she could be thinking to say to Robert, she could be saying 'Do you know where's my money?' 'Do you know anything about my money going missing?'
George Yeh, what, yeh that's good. When she's thinking I think she should be thinking 'Oh my money's gone missing and its defi nitely Robert.'
Tina Yeh.
Sophie No 'cos she's *saying* it to him isn't she?
Tina [No she's *thinking* at the moment.
George [No she's *thinking.*
Tina *That's* the speech bubble.

4.2 Commentary: Transcripts 1, 2 and 3

The talk in Transcript 1 has characteristics of Disputational talk. Both participants take an active part, but there is little evidence of joint, cooperative engagement with the task. Much of the interactional talk consists of commands and assertions. The episode ends with a direct question and answer, but even this exchange has an unproductive, disputational quality.

Transcript 2 has features of Cumulative talk. There is no dispute and both participants contribute ideas which are accepted. We can see repetitions, confirmation and elaborations. The interaction is cooperative, but there is no critical consideration of ideas.

Transcript 3 has characteristics of Exploratory talk. It begins with Tina and George making explicit reference to their task as requiring joint decision making and they attempt to organise the interaction so that everyone's ideas are heard. They then pursue a discussion of what is appropriate content for the character's 'thought' and 'speech' bubbles in which differing opinions are offered and visibly supported by some reasoning (For example 'No, because she's *thinking,* so we need to do a thought.' '…if we're doing the one where she's saying, this is *saying* not thinking.'). However, their reasoning is focused only on this procedural issue: they do not discuss explicitly or critically the proposed content of the character's thoughts and words. Later parts of the discussion also have a disputational quality, as the participants simply seem to assert and counter-assert that a character is either thinking or speaking. Were the space available to include longer examples, I could show that their later discussion also has some cumulative features.

5 The methodology in action

I will describe the methodology in action by providing an account of the procedures for gathering data within a typical project and then use transcripts to illustrate how the data gathered is analysed. In recent projects, we have had the following main interests:

(i) the nature and functions of teacher-student dialogue as a means for guiding children's joint activity and learning;

(ii) the quality of children's talk during group-based activities as a medium for joint problem-solving and learning;

(iii) the relationship between teacher-student and student-student dialogues, focusing on such issues as if/how teacher-student dialogue can be seen to inform students' subsequent group activity and whether their group talk shows that have been inducted into specific forms of discourse;

(iv) the relationship between the quality of students' engagement in classroom dialogue and learning outcomes;

(v) designing ways for teachers to improve the quality of classroom dialogue as an educational process.

These interests have meant that we have usually recorded both teacher-student and student-student dialogue in the same classrooms. In the most recent projects we have compared classrooms in which teachers were asked to use a specially-designed programme of discourse strategies and activities with classrooms in which no interventions were made. Typically, we gather data in classrooms over a period of not less than 10 weeks. The talk data consists of video-recordings and associated field notes. One or two 'target' groups of (usually) three children in each of the project classes are recorded, with each group being recorded several times over the observational period. Recordings are also made of the whole-class, teacher-led sessions which precede and follow each group activity. The nature and timing of these recordings is designed not only to enable us to look at the way children talk and interact in groups (and how this may change over time), but also so that we gain information about the temporal development of shared understanding in the class as a whole. These recordings are transcribed, initially by a professional transcriber, whose electronic file is then corrected by a member of the research team in the light of a careful re-viewing of each recording. Some comments about non-verbal aspects and other potentially relevant information about the events (e.g. as supplied by a teacher) are added at this stage.

The next step is a detailed analysis of the talk of the groups of children. Typically, this begins with members of the team watching recordings together, each with a transcript (which may be revised again in this process). We might first watch a series of recordings of groups made before the intervention begins (the implementation of an experimental teaching programme) and then move on to post-intervention recordings. We also look at the recordings and transcripts of teacher-led sessions from the same classes. This viewing is of course directed by our research questions. After such communal viewing sessions, individual members of the team carry out their own analyses of particular lessons or series of lessons.

In much recent research, the initial guiding framework for our analysis of children's group talk has been the typology of Disputational, Cumulative and Exploratory talk referred to earlier. One of our main interests has been in the extent to which the children engage in talk which has 'Exploratory' features and the extent to which the nature of their interaction enables them to engage productively in the task. A second interest has been in how the quality of their interaction changes over time under the influence of a teacher as a 'discourse guide' (Mercer, 1995: Chapter 5). This has involved analysing a related series of whole class sessions, group talk by children and occasions when a teacher has intervened in a group's activities.

It is not possible in an article such as this to include a great deal of transcript data. This means some aspects of the analysis, especially those concerned with the temporal development of collective activity through and across recorded sessions, cannot be fully explained. Nevertheless, some exemplification and explanation is possible. Transcripts 4–7 below are taken from the data of a recent project based in British primary schools. Most of this data has already been through the collective team viewing stage and some papers including the analyses which emerged from those sessions and subsequent related analyses have been published. However, the particular extracts of data included here have not been included together in any earlier publication and the commentaries I will provide on them represent my own analysis, generated for this paper. Transcript 4 is part of a whole-class session that was recorded a few weeks into the observational period of a project based in primary (Year 5) classrooms in England. In it, the teacher is setting up a group activity in which the children will work together on a computer-based science investigation. This lesson was the sixth in a series in which the teacher had been expressly encouraging the children to become more aware of how they talked and worked together. In a previous lesson (which we had also recorded) she had established with the children a set of 'ground rules' for how they should talk and work together in their groups. These included:

1. Members of groups should seek agreement before making decisions.
2. Group members should ask each other for their ideas and opinions ('What do you think?').
3. Group members should give reasons for their views and be asked for them if appropriate ('Why do you think that?').

The teacher told us that she had two main goals for the session: to ensure the children knew what to do in the computer-based activity and to ensure that the ground rules were in the forefront of their minds as they worked together. In this extract, she is focusing on the ground rules.

Transcript 4: Teacher-led session 1. Rehearsing the ground rules

Teacher	Before you go on to the next step on the computer what do you need to make sure that the whole group has done? Oh! More hands up than that. Emma?	
Emma	Agreed.	
Teacher	Agreed. The whole group needs to agree.	*Teacher writes 'everybody agrees' on board.*
	OK one of my speech bubbles. I wonder what kind of things we might hear each other saying during to-day's lesson?	
		Teacher draws a speech bubble. Points to a child.
Boy	What do you think?	
Teacher	What do you think?	*Teacher writes 'What do you think?' in speech bubble*
	Anything else you might hear people saying as we have today's lesson? Kaye.	
Kaye	What is your idea?	*Teacher draws a speech bubble and writes 'What is your idea?' in it.*
Teacher	Brilliant! What's your idea? Ooh, Sydney.	
Sydney	Why do you think that?	
Teacher	Excellent. Well done.	*Teacher draws a speech bubble and writes 'Why do you think that?' in it.*

	Any other things we might hear people say? Ruby.	
Ruby	I'm not too sure on that idea. What do you think?	*Teacher draws a new speech bubble*.
Teacher	Brilliant. Well done. What do we need to remember in our groups? Kiera?	
Kiera	That everybody gets a turn to talk	
Teacher	Everybody gets a turn to talk.	*Teacher points to a child*.
Girl	Everybody needs to share their opinions	
Teacher	Yeah – and are we all the same?	
Class	No	
Teacher	Will there be someone in your group that perhaps wants to talk all the time?	
Class	Yes	
Teacher	Will there be someone in your group who doesn't want to talk at all?	
Class	Yes!	
Teacher	How are you going to get that person who doesn't want to talk at all to say something? Shane? What do you think? How are you going to get that person who sits there and doesn't say anything to say something in your group? Help him out Tyber.	
Tyber	Ask them.	
Teacher	Ask them – brilliant. What about that person who talks ALL the time?	*Emphasises with actions*
Boy	Tell him to shut up.	
Teacher	Ooh! Are you? I hope not because that's not positive language is it? What could you do to help them out? Kiera.	
Kiera	Ask them and then ask somebody else and then ask the other person.	*Teacher silences an interruption with a gesture*
Teacher	Brilliant. Making sure that you ask everybody in the group. Excellent. Kaye?	

5.1 Commentary: Transcript 4

The characteristic IRF structure of classroom talk is apparent here (as is the common feature that the teacher does most of the talking). There are of course many features of this interaction that are worthy of comment, but I will focus on the temporal quality of the dialogue and in particular the teacher's orientations to past shared experience and to future activity. The teacher begins by orientating the children to the immediate future, to the computer-based activity they will begin shortly. In that same first remark (a *direct elicitation*) she also orientates them to the past – to the 'ground rules' which she had discussed with them in the previous lesson. The children respond by offering their ideas, which we can see are also drawn from the shared experience of the previous lesson. The teacher provides evaluative comments in the form of *confirmations* (e.g. 'Excellent. Well done.'), repetitions ('What do you think' and 'Everybody gets a turn to talk'). She *reformulates* one child's remark:

Kiera:	Ask them and then ask somebody else and then ask the other person.
Teacher:	Brilliant. Making sure that you ask everybody in the group. Excellent.

She also consolidates this common knowledge publicly in a different mode, by writing it in speech bubbles on the board. In sociocultural terms, the board is being used as a cultural tool for this purpose and its use highlights the multimodal quality of much educational dialogue. (See Bourne & Jewitt, 2003, for a discussion of this kind of multimodality.) So we can see that this is an exercise in collective remembering and the consolidation of learning, driven by the pedagogic goals of the teacher. It is also worth noting that the teacher also provides some models of the kind of talk she is encouraging: towards the end of the episode she asks Shane 'What do you think?'. We can see how the teacher and children are drawing on recent past experience to establish ways that the children will talk and think together in the forthcoming computer-based task. With regard to the future, note the teacher's reference to 'positive language' in the final stage of the extract, which I will refer to later.

The next transcript comes from a recording of a group of three children later on in the same lesson as Transcript 4, as they work together on a computer-based investigation into the relative effectiveness of different materials for providing sound insulation. The software allows them to carry out simulated tests and they have already investigated the soundproofing properties of some

materials – cork, wood and paper – earlier in the activity. A novel feature of the extract as a piece of classroom discourse is that the computer is also a speaker. In the role of a 'talking bug' whose words appear both in text on the screen and are spoken out loud, it sets out the problem for the children.

Transcript 5: Group work 1. Blocking out sound

Computer	Now can you help me with a problem? I live in a hole in the ground and every morning the birds wake me up with their high-pitched singing.	
Sylvia	He should build it [with	
Computer	[I want to block out the sound with things I have found lying on the ground – stones, leaves, thick tree bark, sticks. How do I design a fair test to find out which is best? Talk together. When you have agreed, then click on 'continue'.	
Beau	Well [inaudible] will block out this	
Sylvia	What it's like cork?	
Kiera	But it's not. We've got to find out differences(?).	
Sylvia	Wood. Lots of sticks are [inaudible] wood	
Beau	Sssh	
Computer	Every morning the birds wake me up with their high pitched singing. Click continue when you have finished. Click this button to print what you have written.	
		Teacher tells class they have 2 minutes to complete this stage of the activity
Beau	Click on this	*The 'return' key is pressed, which causes the computer to restate the problem*
Sylvia	I want	*Reads screen*
Computer	I want to block out the sound with things I have found lying on the ground –stones, leaves, thick tree bark, sticks. How do I design a fair test to decide which one is best? Talk together. When you have agreed, then click on 'continue'.	
Beau	Um every morning, block out the, block the hole up and use one type of material.	
Sylvia	Use thick tree bark and stones and sticks.	

Kiera	No, look. We have to find out a way – we have to find out a way – to make ['sure'?]. Well, we'd have to use	
Beau	We'd have to make a fair test, right?	
Kiera	Well a fair test was, we'd have to use, what did you say a fair test was?	
		Turns to Beau
Beau	All the materials and one day go away and choose [one	
Sylvia	[These are all the materials you've got	*Points to screen*
Kiera	Yeah but let Beau carry on with what he was saying. What were you saying?	
Beau	Use one material every day when you wake up or when she wakes up and see which one blocks out the sound most.	
Kiera	Or have you got your own opinion? Do you agree?	*Turns to Sylvia*
Sylvia	Yes	*Long hesitation before speech*
Kiera	I agree as well. I think that's all of us agree.	*Children nod*

5.2 Commentary: Transcript 5

In this extract all three children engage with the task. Kiera, in particular, shows a concern with establishing a joint understanding of exactly what they are expected to do ('We've got to find out different…'; 'No, look. We have find out a way…'; 'Well a fair test was, we'd have to use…'). She also is the group member who shows most explicit concern with the group's adherence to the 'ground rules' which were established in the earlier whole-class session ('Yeah but let Beau carry on with what he was saying. What were you saying?'; 'Or have you got your own opinion? Do you agree?'). In this way, her remarks embody the recent educational experience of the group – and as such will serve to evoke the memory of that experience for the other members. Her contributions are most responsible for any resemblance the group's discussion in this episode has to Exploratory talk. ('Partners all actively participate and opinions are sought and considered before decisions are jointly made.') Other aspects of recently-created common knowledge are also apparent in the group's talk – for example, the references by Sylvia to wood and cork early in the extract can be understood as attempts to relate this new simulation task to the knowledge gained from those which they have recently completed. In these various ways, we can see how the children's joint intellectual activity depends crucially on the historical foundations of earlier talk in the whole-class session and group

activity. The talk is used to make joint sense of the current task and to maintain the quality of interaction defined by the class's ground rules.

This kind of data and analysis of course offers opportunities for pursuing other topics besides the use of talk itself. For example, we have used this kind of data to examine the teaching and learning of science (Mercer, Dawes, Wegerif & Sams, 2004). In a more extended analysis (i.e. using more of the available data) one might look more critically at the extent to which the teacher has used dialogue to help the children establish an adequate understanding of the scientifi c principles and procedures which they are expected to draw on in the computer-based tasks.

Transcript 6: Teacher-led session 2

Transcript 6 is from the next recorded lesson of the same class (about a week later). There were, of course, other lessons between the recordings, in which the researchers were not present. In this whole-class session, at the beginning of the lesson, the teacher is setting up another group activity, this time involving the task of putting numbers into sets.

Teacher	Can you remember what we had to sort in our science lesson?	
Child	Food.	
Teacher	Food. Brilliant! We had to sort it into different categories didn't we? This time we're going to be sorting numbers. So that's our objective – 'Sorting Numbers'.	*Writes objective on board.*
	I'm going to work with Donal and Alan to-day and in my group I've decided I'm going to sort the numbers by multiples of three, and I don't care what they think. What's the matter Michaela?	*Teacher takes on role of child with grumpy expression*
Michaela	You should, um, decide as a group.	
Teacher	Oh super.There's one of our ground rules already 'Decide as a group'.	*Writes this on board*
	OK. How am I going to do that? Because I want to sort my numbers by multiples of three. How am I going to make sure that we decide that as a group?	
Kiera (?)	Ask them what they think. Also, when you ask what they think, don't turn your back on them because that's not positive body language.	*Teacher writes*

Teacher	You mentioned positive body language. What other type of language do we need to make sure is positive?Not just our body language– come on Sydney – join in please. What other sort of language do we need to make sure is positive?	
Child	The way we talk.	
Teacher	The way we talk! Am I going to say "I'm going to sort these in multiples of three!" ?	
Child	No.	
Teacher	Michael, what would you say if you were in my situation?	
Michael	Um, 'I want to sort them by multiples of three. What do you think about?'	
Teacher	That would be a good thing to say.	
Michael	Miss, it would be a lot easier if everyone sorted them by multiples of one, then you wouldn't sort them by anything.	
Teacher	That's very true. You are a very good mathematician, Michael.	
Child	Um, you could say, 'Please can we sort out [inaudible]'	
Teacher	Super, well done. My pen's going to run out, isn't it? Can anybody think of one more ground rule that we think is important? Nirmal?	*Writes on board*
.		
Nirmal	Ask for their opinion.	
Teacher	Ask for an opinion. Ask what they think. I can put 'Opinion' – that's a much better word than ask what they think. Well done. One more ground rule that's important. Go on then Sydney?	*Writes 'Opinion' on board.*
Sydney	Be prepared to change your idea.	
Teacher	Well done. Why is that so important? Why should we need to be prepared to change our idea?	
Child	Somebody else might think different to you.	
Teacher	Somebody else might?	
Child	Somebody else might have a different opinion	
Teacher	Is your opinion necessarily going to be the best?	
Children	No.	
Teacher No?	So we need to change. Be prepared.	

	Fantastic. OK, as I'm wandering around the classroom and looking and watching and listening to what you are doing, I wonder what sort of things I might hear you saying? Go on. Tell your partner one thing you might say. Bernice, can you tell Sydney? And …stop! Ready? Looking this way. Donal's group. Share one of the things I might hear you say.	*Writes 'Be prepared to change' on board Children talk to each other.*
Donal	What do you think?	
Teacher	"What do you think?" Brilliant – Emma? *Writes this on board.*	
Emma	Why do you think that?	
Teacher	"Why do you think that?" That's another good one, not just what but why do you think that? Brilliant. Anything else I might hear you saying as I wander round ? Joe?	*Writes on board.*
Joe	Yes and No.	
Teacher	Yes and No. OK. People agreeing and disagreeing. Would you expand on just saying 'yes' or would you expand on just saying 'no'? Pardon?	*Inaudible remark from child*
Girl	You'd say why.	
Teacher	'Yes' and then 'why.' Ooh, all my pens are running out. 'yes' and then 'why' and 'no' and then 'why'.	*Writes 'why' on board.*
Girl	I'm prepared to change my idea because you're so cool.	
Teacher	I'm prepared to change my idea because you're so cool! Can you think of a better explanation than just because you're so cool? Because it's better – because it sounds more plausible – it sounds more interesting – Michael?	
Michael	If you were by my group you'd probably hear "Ah, but" and 'if' a lot because if one has one idea and another has another idea, we say 'ah, but, this, this, this, this' or 'ah, but this'-	
Teacher	But, you're then still explaining 'why'. Well done.	
Kiera	You could have 'What's your opinion?' because you're asking [inaudible].	
Teacher	Excellent. 'What's your opinion?'. Goodness me, I'm going to run out of board space. Uh, uh. Ssh, ssh. Nirmal?	*Writes on board*
Nirmal	'Do you like that idea?'	
Teacher	'Do you like that idea?' *Writes on board.*	

Child	'Why do you like that idea?'	
Teacher	Brilliant. One more then. Sylvia? Pardon?	*Inaudible response.*
Sylvia	'Do we all agree?'	
Teacher	That's the crucial one isn't it 'Do we all agree?' That's what you were going to say was it? 'Do we all agree?'	*Writes 'Do we all agree?' on board*

5.3 Commentary: Transcript 6

The teacher begins this session with a common type of *elicitation* – an appeal to the children's memory of past activity. This is one way in which teachers try to help children see the continuity of educational experience and to encourage them to recall knowledge of past events which is relevant to current or future activity. She here tries to establish the similarity between two potentially disparate activities, by invoking the generic category of action of 'sorting'. As in the session represented in Transcript 4, she again here makes a switch of topic from the formal curriculum content (maths) to that of how the children will work and talk together in groups. Her role play of the uncooperative partner is an unusual form of *cued elicitation* for invoking children's collective memory of the 'ground rules', which should by now be a well-established part of the common knowledge and local culture of this class. (A search through the data for this teacher would enable us to see if this kind of role play was a common technique in her repertoire: if it was, this would help explain the readiness with which Michaela responds to the cue.) The teacher responds to Michaela's remark with a confirmation and an explicit reference to 'our ground rules', so marking them as the common property of the class. She then uses a series of IRF exchanges to draw out once again – in this public forum – the main rules from members of the class. Her own utterances oft en include *repetitions* ('Do you like that idea?') and *reformulations/elaborations* of children's remarks ('Ask for an opinion. Ask what they think.').

Early in the extract, a child responds with a reference to 'positive body language', which the teacher picks up and elaborates in her next turn. We saw that this notion of 'positive language' was used by the teacher in Transcript 4. We can interpret the child's use of this term as an example of the appropriation by a student of new expression from the teacher, albeit in a teacher-led encounter. Th e data has granted us a glimpse of the historical process of the teaching and learning of a type of technical term. However, a computer-based search for the word 'positive' in all the data for this class showed that this was the only recorded instance of a child using the term: the teacher used it five times, always collocated with 'language', in two of five recorded lessons. There was not therefore

much evidence of the children taking up this expression and making active use of it in discussing their own interactions. Other terms and phrases used by the children, though less distinctive, also may share a similar history: 'Decide as a group'; 'ask for their opinion'; 'what do you think?', 'why do you think that?', while quite common English phrases, will almost certainly have acquired a special resonance for members of the class through the discussion of the 'ground rules' early in this series of lessons. In all the recorded data for this class, the teacher uses the phrase 'what do you think' five times, while the children use it 18 times, of which 15 occurrences are found during group work. The rate of usage of this phrase increases in group activity as time progresses.

One part of this extract that particularly interests me is towards the end when the teacher is asking members of the class if they might say more than simply 'Yes' or 'No' to someone else's idea – the section that begins with the teacher saying 'Would you expand on just saying 'Yes'…?'. An unidentified girl comments that she might explain that someone's idea has changed her mind because the speaker is 'so cool.' The teacher picks up on this, seeming dissatisfied with a reason which is not based on rational evaluation – though she does not really make this very clear, perhaps so as to avoid seeming too critical of the girl's comments. Michael then offers a brief account of some words he thinks would be frequently heard in his group, explaining that (if I may reformulate his remarks) these reflect the fact that different opinions are debated. We can see from this that Michael has gained an insight into the ways that the use of certain words reflects a certain kind of talk and a certain kind of mutual engagement with ideas. The teacher does not appear to recognise the potential significance of this contribution for the class's study of talk. Although she says 'Well done' she continues to pursue her point about the need to explain 'why'. This is perhaps unfortunate, but perfectly understandable: the process of discourse analysis offers insights which a speaker can hardly be expected to gain in the heat of conversational exchange. Nevertheless, this is the kind of issue which the analysis could be used to raise with a group of teachers in a professional development session based on the research. More positively, though, in such a session I would also be likely to draw attention to the ways this teacher successfully engages the class in explicit consideration of how they talk and to her efforts (in this extract and in other recorded sessions) to consolidate children's developing knowledge and understanding about how talk can be used to think collectively.

The final example, Transcript 7, is taken from later in the same lesson as Transcript 6. In it, three children in the class are embarking on the number sorting activity.

Transcript 7: Group work 2

Alan	'Sort. Type in category'. Shall we do multiples of 1? No, they'd all be mult, of-	*Reads and points to screen* *Looks at Neelam*
Nirmal	Five?	
Alan	No, three. No, yeah, no? Multiples of three, alright. Is M,U,L, mul- multi	*Looks at the others to check* *They nod agreement* *Begins to type*
Nirmal	Mul, it's TY	
Alan	Multi-pl, multiples of four, yeah?	*Typing*
Nirmal	Four or three?	*Leans round to ask Neelam*
Alan	Four or three. What do you think?	*Asks Neelam*
Neelam	Four	
Alan	Four. Yeah. Yeah?	*Types*
Nirmal	Shall I start? Is 18 a multiple of four?	
Neelam	4,8,12	
Alan	Ss	
Nirmal	Yes it is. Four times four	
Alan and Neelam	No, no, no, no, no	
Nirmal	Sixteen	
Alan	No, no , no, no.	
Neelam	No, it's sixteen.	*Nirmal puts it in the 'no' box*
Nirmal	Is fifteen?	
Alan	No	
Neelam	No	*Nirmal puts it in the 'no' box*
Nirmal	Is nine?	
Alan	No.	
Neelam	No.	
Nirmal	Why do you think that?	
Alan	Um	
Alan and Neelam	Because	
Alan	Because it goes four, eight then twelve so it misses nine out.	
Neelam	'Cos if you do four times five it isn't-	

Nirmal	And, and only, and only the even numbers end in zero, two, four, six, eight.	
Alan	Yeah. And four is even.	*Nirmal drops it in the box.*

5.4 Commentary: Transcript 7

This transcript includes many indications of the temporal relationship of this episode of talk with those we have already considered – for example, the use of the phrases associated with the ground rules ('What do you think?' 'Why do you think that?'). But what does it reveal about how this group of children are thinking together? They are definitely on task and working in a very collaborative manner. They ask many questions of each other, using them to check responses to ideas, to elicit opinions and to resolve differences of opinion. This manner of conversing can be seen to contribute to their success in the task. A good illustration concerns the discussion about what is a multiple of four. It is clear that Nirmal has not begun this activity with a good grasp of the 4 times-table. But through the discussion with Alan and Neelam he not only establishes correct answers, he elicits reasons for their claims:

'Why do you think that?'

'Because it goes four, eight then twelve so it misses nine out.'

He then concludes the episode with what looks like a realisation of how these facts accord with his own knowledge about even numbers:

'And, and only, the even numbers end in zero, two, four, six, eight.'

The discussion in this group has many of the features of Exploratory talk. Although we cannot be confident in making claims about learning from this evidence alone, we can see that this illustrates how, in a supportive group environment, children who are the more able in a subject may enable the progress of less able partners.

6 Quantitative aspects of analysis

Some quantitative aspects of the methodology cannot be illustrated through transcript extracts, as they involve the data corpus as a whole. In some studies we have assessed the effects of an intervention (known as the *Thinking Together* programme) in which teachers expressly encouraged the use of 'ground rules' for encouraging Exploratory talk amongst the members of their classes. More specifically, we wanted to see if this intervention produced observable changes in the nature of the children's talk. We used a computer-based concordance

analysis to count the relative incidence of key words and phrases which the qualitative analysis had shown are associated with the use of Exploratory talk and so identified variations over time within groups and between groups who had or had not been involved in the *Thinking Together* programme. Examples of such key words are 'if ', 'because', 'I think' and 'agree' (which we have seen used in Transcripts 3 and 7 of groups presented above). We searched for these in the combined transcript data of recordings for six groups of three children. Three of these groups were in target classes (those who had been involved in *Thinking Together*) and three were in matched control classes in other schools (who had pursued a normal curriculum). We had recorded all the groups *before* and *after* the intervention period, as they tackled a standardised set of problems (*Raven's Progressive Matrices*). The results of this analysis are shown in Tables 2a and 2b below. An analysis of variance revealed that the difference between the target and control conditions was statistically significant (F= 5.547: one-tailed p= 0.039). In accord with the outcomes of the qualitative analysis, this supported the view that the intervention had changed the children's talk behaviour.

Key feature	Target groups		Control groups	
	Pre	Post	Pre	Post
because	62	175	92	66
agree	7	89	13	21
I think	51	146	31	52
Totals	110	411	136	139

Table 2a: Total incidence of key linguistic features in the talk of Target and Control groups while engaged in the Raven's test, before and after the implementation of the *Thinking Together* programme

	Target 1		Target 2		Target 3		Control 1		Control 2		Control 3	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
because	25	100	12	45	25	30	34	25	28	17	30	24
agree	7	87	0	0	0	2	12	20	1	0	0	0
I think	7	87	0	12	44	47	27	44	3	5	1	3
Totals	39	174	12	57	69	79	73	89	32	22	31	27

Table 2b: Incidence of key linguistic features in the talk of each Target and Control group while engaged in the Raven's test, before and after the implementation of the *Thinking Together* programme (Adapted from Mercer, Wegerif & Dawes, 1999)

Another quantitative feature of the methodology was also referred to earlier in the paper, namely the assessment of learning outcomes for *individual* children who had, or who had not, been participants in the *Thinking Together* programme. As with the measures of relative incidence of key terms, this depended on the use of a quasi-experimental research design whereby children in target classes in which the intervention had taken place were compared in their performance with children in matched control classes on the same talk activities and outcome measures. Although there is not space to discuss this aspect of the methodology in any detail, the kinds of results obtained are illustrated in Table 3.

	Numbers	Pre-intervention: mean scores	Post-intervention: mean scores
Target classes	119	3.97	5.70
SD		2.323	2.424
Control classes	129	4.22	5.04
SD		1.997	2.206
Effect size	.29		

$F(1, 245) = 10.305$; two-tailed $p = 0.002$

Table 3: Children's performances on a test of their study of the science curriculum (Adapted from Mercer, Dawes, Wegerif & Sams, 2004)

7 Discussion and conclusions

In this paper, I have tried to explain how a particular methodology was created for the analysis of talk as a social mode of thinking. Its nature reflects both

(i) a particular perspective on the nature and functions of language and its relationship to individual and collective intellectual activity and

(ii) a particular set of research questions about how language is used to enable joint intellectual activity and carry out the process of teaching-and-learning in school.

I have illustrated the procedures of this sociocultural discourse analysis, using data extracts from research in which it was employed to show how it can reveal ways that language is used for thinking collectively in educational settings. I have focused mainly on the temporal aspects of the discursive processes whereby teaching-and-learning is carried out and intellectual problems are

tackled, in order to show how the methodology can be used to track the development of common knowledge amongst the teacher and students of a class, to examine the ways that a teacher seeks to guide students through a series of related educational activities and to induct them into new ways of using language as a tool for thinking together. I have also shown how the analysis can be used to assess the quality of the interactions of students, to study how the quality of interactions may change over time and – an important feature – to make quantitative assessments of those changes and of the outcomes (in terms of learning and problem-solving) of engagement in different types of dialogue. Finally, I have described its use to assess the impact of a planned intervention in which the results of earlier observational research were used to design and implement a teaching programme for improving the quality of classroom dialogue as an educational tool.

I have used educational examples, but this methodology has relevance to the study of collective thinking activities in other settings. Through a sociocultural discourse analysis we are able to examine and assess the linguistic process whereby people strive for intersubjectivity. We can see how they use language to introduce new information, orientate to each other's perspectives and understandings and pursue joint plans of action. Various methods for studying talk also deal with these concerns. But the methodology I have described here also enables those processes of communication to be related to thinking processes and to learning outcomes. In this way, we can examine what is achieved through involvement in discussions, in classrooms and elsewhere – and perhaps offer constructive advice about how discussions can be made more effective. Constraints of space have inevitably limited what I could show of the methodological procedures, but I hope that what I have provided is sufficient to enable other researchers to understand this methodology, to examine it critically and perhaps build upon it in the pursuit of their own research questions.

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