

**Negotiating voices through embodied semiosis: the co-construction of a science text**

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## **Negotiating voices through embodied semiosis: the co-construction of a science text.**

### **Abstract.**

*This article presents a rich description of an everyday, paired learner interaction in class. In contributing to debates on collaborative classroom interaction, this article presents a micro-analysis of the work of embodied modes employed in face-to-face interaction. Through ethnographically-contextualised Multimodal Discourse Analysis (EC-MDA), a partial understanding of the ways in which two learners interact through embodied semiosis is reached. The originality of this article lies with the insights gained from multimodal discourse analysis which show how (in textual terms), even in a less creative space, learners negotiate personal, individual 'ownness' alongside academic genres in the co-construction of a science text. Three key aspects to paired classroom interaction are identified, namely: multiple voices, multimodal inference and modal synchrony. Through exploring the intricacies of social interaction, we can recognise the detailed multimodal contributions of individuals engaged in collaborative construction of text.*

**Key words: multimodal interaction, modal synchrony, multimodal inference, material haptics, multiple voices**

### **1.1 Introduction**

In education research, classroom talk is frequently analysed with the aim of evaluating a teaching strategy or intervention that might contribute to the on-going search for an 'ideal' pedagogic approach in an era of assessment-driven, curriculum-led education (Jay et al, 2017, Hanley et al, 2015). The focus tends to be on teacher-learner talk, although there are studies focusing on learner-to-learner interaction with the aim of examining the quality of that talk in educational terms (see Gilles and Pierce, 2003, Mercer and Howe, 2012). With the exception of Maybin's (2006) notable work on children's talk in unofficial school spaces, there has been little research on casual talk in the classroom. In a culmination of 40 years research on oracy (Barnes, 1976, Wells, 1986, Norman et al 1992, Haworth, 2001, Snell, 2013, Jones, 2017), the inclusion on the curriculum of learner collaboration and 'talk for learning' in the classroom has again been advocated strongly by educationalists

(Littleton and Mercer, 2013; Alexander, 2010, Skidmore and Murakami, 2016, Phillipson and Wegerif, 2017). The skill of collaborative problem solving is valued globally (PISA 2015, Scott, 2015) and 'group work' has found its way back into some national policy documents and frameworks (DfE 2014, CCSSO/NGA, 2018). This paper argues that the negotiation of meaning between peers through the employment of multiple semiotic resources needs to be understood by educators asking learners to work collaboratively in the classroom and illuminates the roles of multimodal inference and modal synchrony in that collaborative work.

The purpose of this article is to closely examine the process of interaction between two learners in everyday encounters in order to understand the contribution of embodied modes to engaged, collaborative learning. Whilst some talk in classrooms is teacher talk, teacher directed, or task-oriented, much takes place between two working partners which is social and casual, and this has been largely unexamined. This study aims to get closer to 'the nature' of social interaction following Erikson's (1996:30) concern that '...it is possible that unexamined assumptions about the nature of social interaction (and of conversation) as a medium for learning and teaching may be constraining the ways in which pedagogical transactions are being viewed'. Maybin's (2006, 2012) studies of children's off-record talk in this area celebrate the contribution of informal talk to children's construction of knowledge. Maybin states her interest as what children can do with talk 'not from their rather muted role in dialogue with the teacher, but from their own undirected conversations elsewhere where they pursue their own questions and preoccupations' (2006:2). Casual conversation, specifically where 'socially close' participants talk in an informal context, has been identified by Carter (2004: 165) as the most creative space, in terms of linguistic creativity. Furthermore, Eggins and Slade's (1997) work on analysing casual conversation argues that 'despite its sometimes aimless appearance and apparently trivial content, casual conversation is, in fact highly structured, functionally motivated, semantic activity' (1997:6). Attention to 'the mundane, the taken-for-granted, the ephemeral' is advocated by Parry, Burnett and Merchant (2017:241) in examining carefully 'what assembles through communicative practices in and out of school'.

The contribution of this study is that it addresses a hitherto relatively underexplored area by attending to casual, social conversation, both on-task and undirected, from a

multimodal perspective. This is because frequently language is accepted as the dominant mode in classroom interaction. And not just any language: as Gee (2004:3) points out, there is a particular variety of language which is required - an academic register - which is 'integrally connected... to complex and technical ways of thinking'. A multimodal perspective which values embodied semiosis does not negate concerns such as those raised by Gee (2004) regarding learners' employment of academic register but discusses them in relation to a multimodal perspective on communication.

There is a growing corpus of research examining classroom interaction from a multimodal perspective (Flewitt, 2006; Mavers, 2009; AUTHOR, 2014 (a and b), 2016) aligned with the principle that 'embodied representational activity includes language, rather than is language' (Flewitt et al, 2009:44). This multimodal perspective involves the examination of embodied modes of meaning making such as gesture, posture, facial expression, gaze, touch and the manipulation of material objects as well as spoken or written language. The ways in which we make meaning through embodied modes is termed 'embodied semiosis' in this article. This is to differentiate the multimodal approach taken here from 'embodied sociolinguistics', (Bucholtz and Hall, 2016) a term which foregrounds the centrality of language. Violi (2013) acknowledges that the term 'embodied semiosis' is talked about from multiple perspectives within a range of disciplines (such as cognitive science, philosophy semiotics, anthropology) and therefore does not refer to one thing. The way that I am using the term embodied semiosis in this article is grounded in a social semiotic view of communication, first set out by Halliday (1978) in his conception of language as a social semiotic, and further extended by Kress and Van Leeuwen ( 2001) and then Kress (2010) with a social semiotic theory of communication, which attends to multiple modes. In short the social semiotic approach holds that meaning making is a social process and the modes of communication we use are shaped by social processes. As the focus for this study is specifically face to face communication, the body and the modes of communication enacted by the body are seen as central to what is taking place between learners.

## 1.2. Conceptual Framework

The framework for this study draws together concepts on interaction from social semiotics (Kress 2010, Kress and Van Leeuwen 2001), functional linguistics (Halliday 1978, 1985/2004) and sociolinguistics (Bakhtin,1999; Gumperz,1999) within a multimodal perspective on interaction. In this section I outline three core concepts in this study, namely, social semiotics, mode and voice.

### 1.2.1. Social Semiotic Understandings of Communication

The Hallidayan (1985) view of language is focussed on semantics, meaning, rather than syntax, or grammatical structures. By this I mean the focus is on the way humans choose to communicate through semiotic resources, those meaning-making resources available in specific cultural contexts, rather than on the notion that structures or grammars themselves construct and determine meaning. All meaning is made in context: Context can be examined at macro and micro levels, for example, in terms of the *context of culture*, the wider influences on communication such as community, policy, global, and in schools, curriculum, which shape the choices of semiotic resources available within a particular culture and in terms of the *context of situation*, the particular set of circumstances in which a communication event actually takes place (Halliday, 1985/2004:32).

Context of situation can be characterized in terms of *field*, what is going on, or in other words, the subject matter, *tenor*, the participants and their relationships, and *mode*, the organisation of semiotic activity (Halliday, 1985/2004:33). As Halliday explains 'Together they define a multi-dimensional semiotic space - the environment of meanings in which language, other semiotic systems and social systems operate' (2004:34). Each of these aspects to communication are realised through the ideational (subject related), interpersonal (participant relationship) and textual (organisation) metafunctions, which correspond to the characteristics of field, tenor and mode. Halliday uses the notion of metafunction to distinguish these overarching functions of communication from the specific communicative functions identified through socio- linguistic analysis such as demanding, requesting, categorizing and so on (Halliday:2004: 31).

A further aspect to our communication is *coherence*, the overall sense of congruity within *context of culture* and *context of situation*. In order for meaning to be made, the subject matter (Field), the relationships between participants (Tenor) and the textual organisation (Mode) need to be culturally recognised to be intelligible and also harmonious with the immediate context of situation. One of the ways in which coherence is achieved is through the textual metafunction and the use of cohesive devices such as referencing and repetition therein. This is discussed more fully in section 2:2 Research Method which explains the Multimodal Discourse Analysis approach and presents the procedural framework employed in this study.

### **1.2.2 Modes**

Modes in this study are understood to be heuristic devices used to describe culturally-shaped means for making meaning in interaction. For example, gestures can be conceptualised as representational, symbolic or speech-coordinated hand movements ‘in air,’ such as those identified by Kendon (1997) and McNeil (1992). However, modes and the boundaries between them can be seen as socially constructed. Following Halliday's (1985/2004:33) notions of context of culture (CoC) and context of situation (CoS), material haptics, for example, can be seen as a spontaneous embodied meaning-making act in the moment (CoS), which is nonetheless shaped by cultural expectations or propriety (CoC). In school contexts, what learners are expected or invited to touch shapes the meaning potential afforded to the individual learner. Using the concept of *material haptics* to signify the touching of objects, as opposed to using the concept of gesture, allows me to think differently about gestures in air and touch. Bezemer and Kress (2016) differentiate between implicit and explicit touch: the former being for internal thought and the latter for communicative purposes. I find it problematical to draw a line between embodied modes which articulate meanings externally and those which are just ‘being’ in the moment as this implies a duality of mind and body. When one is talking about embodied semiosis, the body *is* the sign. When we are engaged in interaction we see and hear as much as we look and listen. That is to say, our sensory bodies attend to moments, persons or materials of interest to a greater or lesser extent, wrapped up in the affective ephemerality of spontaneous interaction. From this social semiotic stance embodied modes can be seen to be conceptualised categories of ways of making meaning through the body.

### 1.2.3. Voice

The conceptualisation of *voice* in this paper is broadly socio-cultural, bringing together Halliday's (1985) discoursal aspects of field, tenor and mode with Bakhtin's perspectives (1986) on the negotiation of speech genres, or the ways in which a speaker makes their speech their own. *Voice* is a metaphor here, not referring directly to the interpersonally moderated sounds emanating from the throat, but broadly to the articulation of an idea or thought, paying attention to the audience and the way in which semiotic resources are assembled. It is in this *assemblage of semiotic resources* that Bakhtin's influence can be seen. Bakhtin (1999) conceptualises speech genres whereby

Each separate utterance is individual...but each sphere in which language is used develops its own *relatively stable types* of these utterances. These we may call speech genres

Bakhtin (1999:121)

In other words, our voices are our own, but they follow recognised patterns associated with particular contexts of situation. Whilst Bakhtin makes it clear that the patterns of speech genres are diverse and heterogeneous, he argues that it is still possible to distinguish 'a common *verbal* nature' (199:122). Some genres allow for individuality of style, others such as business documents or military commands, or in this study, academic texts, less so. From a Bakhtinian perspective, in collaborative work learners are required to negotiate their own 'voice' as well as that of their peer (s) and the authoritative 'academic voice' of the texts and teachers they encounter. Voice in this paper may align more with our own interests or those of others. Therefore, from a multimodal perspective, the notion of 'learner talk' incorporates others' gestures, postures and gaze as well as words. Furthermore, voice is knowing: It is "the speaking personality, the speaking consciousness," (Holquist, 2006:434).

Voices can be attributed to characters or identities. As each of us expresses multiple identities (for example friend, student, daughter, part-time shop-worker), it can be argued we require multiple voices to articulate those identities. Furthermore, as Maybin's (2006) study of children's voices demonstrates, voices are always relational. Our voices shift in interaction according to the people we are communicating with and the context we are interacting in. In this way, voice is the manifestation of genre in the context of situation: voice connects identity, culture and situation. That is to

say, voices are acculturated into generic patterns which we embody in our everyday interactions. From this perspective, the interactions analysed in this paper can be seen to comprise **multiple voices** which are articulated multimodally. To be clear, at every point *talk* is conceptualised as a multimodal activity and *voice* is held to comprise all embodied meaning making resources and therefore includes posture, gesture, eye gaze, facial expression, haptics and proxemics.

From this position, **Academic voice** encompasses more than a conceptualisation of 'academic language' (Snow and Uccelli, 2009) as I take a multimodal stance on communication. The conceptualisation of academic voice in this paper comprises a combination of semiotic resources normally associated with education contexts (settings and participants) and education functions. For example, learners may use particular forms of language, dress, posture and gaze to communicate with teachers in schools in order to question, explain, or report on a particular subject. Academic voice may include semiotic resources such as lexis from school subject disciplinary fields, grammatical forms such as passive voice, school postures (not lounging in a chair), schooled gaze, directing attention to sanctioned objects of gaze (and not out of the window), and an appropriate tone and volume of voice in spoken interaction. Academic voice is normally reserved for the communication of theorisation, conceptualisation, analysis, critique and interpretation in educational contexts, although it is accepted it may also be used in other circumstances such as a parody for humour. Academic voice is not normally the voice of home or community. For many it is a challenge to learn this way of articulating thoughts.

In terms of differentiating the academic voice from any other voice, Snow and Uccelli argue there is no binary opposite of 'academic language' and propose instead a continuum from more colloquial, to more academic (2009:120). Using a continuum places the researcher investigating interaction in a difficult position as one must identify the point on the continuum where the interaction may reside. In this study, the interaction is conceived of as a 'fabric' which is identified as consisting of 'multiple voices', that is, academic voice, and personal, informal voice, which more or less align with generic qualities of academic communication and personal communication determined by lexis, postures, gestures, grammatical structures, proximity and haptics. In this way I attend to the interweaving of voices in an interaction which then allows an approach to face to face interaction as



simultaneously both sequential and synchronic. The texture of the interaction is woven by the learners from threads which belong to them, their personal voice, and to others, their academic voice.

### 1.3 Research Questions

This article examines a routine, everyday interaction between two learners as they work together in a science lesson. It illuminates the process of interaction in terms of the modes employed, personal relationships and histories, and subject content. The research project from which this data is taken asks the questions:

1. In what ways do learners use a range of semiotic modes in their collaborative construction of text?
2. How do the learners negotiate their 'voices' in their paired interactions through embodied semiosis?
3. What are the implications for educators?

The focus for analysis in this article is paired discussion between two learners in a science lesson. I begin by outlining the context, methodology and approach to data generation and analysis, and then present a narrative account of one lesson under consideration, before focussing on fine-grained analysis of extracts from the interaction and the implications of this. The original contribution of this analysis is that it highlights the way in which the articulation of multiple voices is accomplished through embodied semiosis in the co-construction of a science text. It demonstrates the ways in which inference, identified by Gumperz as the way in which 'participants in a conversation assess others' intentions, and on which they base their responses' (1999:98), is accomplished multimodally, and the roles of material haptics (the touching of artefacts) and modal synchrony (contemporaneously repeated gaze, gesture, posture) in the assemblage of semiotic resources.

### 2.1 Research Context

The data examined in this article are drawn from a larger study which took place in a secondary (11-16) school in a post-industrial city in the north of England. The interaction comes from one lesson in a corpus of 38 observed lessons of a cohort of 12 students across a range of subjects (Maths, English, Science, History, Religious Education, Sociology, Engineering and Personal, Social and Health Education

(PHSE) and 21 videoed learner-to-learner interactions over a period of 4 months. In this extract two 15-16 year old students preparing for a Science examination in the UK (GCSE Biology) were filmed working on a paired activity. The research project builds upon multimodal analysis of learner-to-learner interaction begun in earlier studies involving the same children when they were in primary school aged 6 (Taylor, 2006) and 10 (Taylor, 2014 (a,b), 2012). This lesson was chosen from the corpus because it offered an opportunity to study interaction from what might be considered a mundane, everyday experience. In 30 of the 38 lessons observed, the students in this study were asked to complete tasks which involved practice examination questions in preparation for public examinations at the end of the school year. I would argue that the relatively high frequency of this type of writing activity meant this could be considered an 'everyday' occurrence. Garrett and Baquedano-Lopez (2002) explain how an analysis of everyday activity can aid the interaction researcher in understanding social activity. 'Close analysis of the routine and everyday allows the researcher to make inferences about the 'background' knowledge that guides and organizes all social activity but is rarely articulated' (2002: 343).

The video data is rich and requires an understanding of the cultural and historical location of the semiotic resources used, which is where an ethnographic approach to data generation becomes important. Examples of the articulation and negotiation of multiple voices through a range of semiotic modes are presented from the data.

## **2.2 Research Method: Ethnographically-Contextualised Multimodal Discourse Analysis (EC-MDA)**

In this section I set out the methodological approach, a multimodal discourse analysis informed by Halliday's (1978) functional perspective on communication and Kress' (2010) Social Semiotic theory, combined with an ethnographic approach to data generation. I have termed this Ethnographically-Contextualised Multimodal Discourse Analysis (EC-MDA).

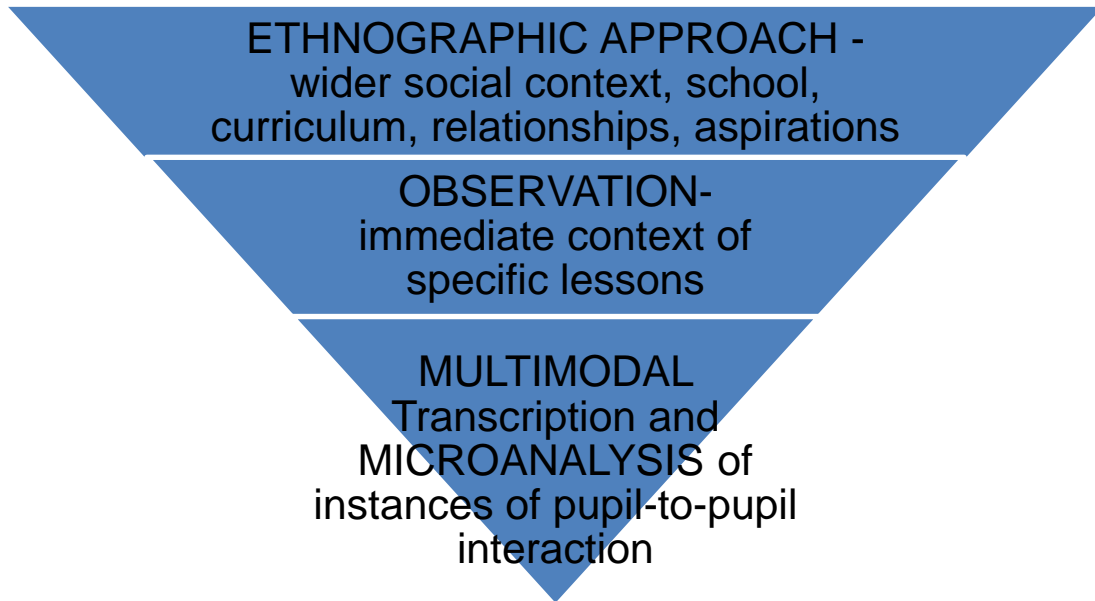


Fig 1: Research Design (EC-MDA)

Figure 1 sets out a visual depiction of the relationship between the ethnographic approach with foci on wider social (macro) contexts of curriculum and school community together with the immediate context of situation observing interaction in lessons, and the multimodal micro-analysis of selected instances from observed lessons. By 'ethnographic approach' I mean an approach to data generation and analysis from a perspective which is 'inside' the geographical locale and community and 'outside' the participants' friendship groups and cultural practices. Kress (2011) acknowledges the complementarity of ethnography and social semiotics as approaches to researching objects, participants and their interactions (2011:252). However, this complementarity may not be straightforward. Dicks et al (2011) set out the perceived compatibility issues with ethnography's central interest in insights into social order, and multimodality's interest in insights into meaning-making. The ethnographic perspective in this study allows me to describe the cultural or generic understandings of 'voice', which are articulated through multiple modes in this classroom, by these learners.

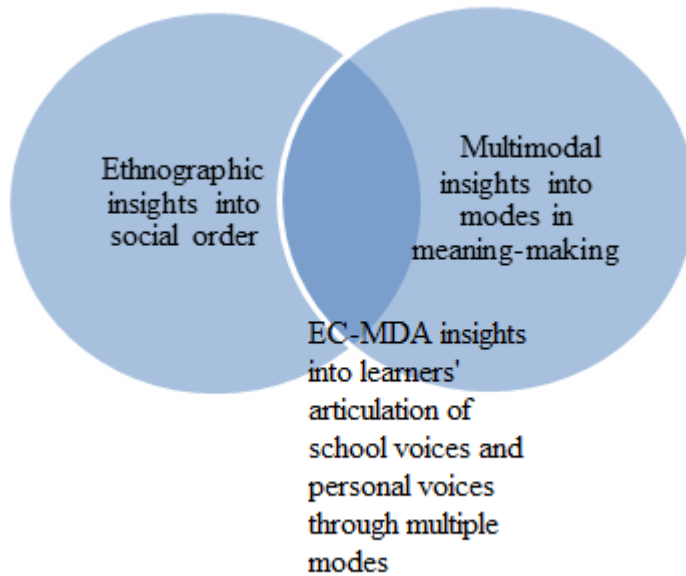


Figure 2: The ethnographic contextualisation of multimodal discourse

The methodological process involved making contemporaneous and reflective notes during and after the observations in order to help contextualise the partial account of the action afforded by the video-recordings. In addition to observing the participants in class, a more relaxed opportunity for informal discussion occurred over two lunchtimes when I brought pizza and orange drink in for lunch and we watched film footage from the previous project. This enabled deeper discussion of the purpose of the current project with the participants and ensured informed consent to take part was ongoing in addition to the permissions obtained from the outset of the project. (The project had undergone ethical review through Sheffield Hallam University Research Ethics Committee and all the participants in the project were fully briefed and gave permissions for the filming and for photographic stills to be used subsequently in publications). The 12 participants also attended one of three focus group discussions aimed at enquiring into their perspectives on school and future ambitions.

The Ethnographically-Contextualised Multimodal Discourse Analysis (EC-MDA) framework used is based on the principles that meaning is always made in context and meaning is always made multimodally. Jewitt (2009) identifies 3 main approaches to multimodal analysis depending on the interest of the researcher: The first of these is social semiotic multimodality (Kress, 2010) with a focus on 'how meaning potentials

are selected and orchestrated by people in particular contexts to realise specific social meaning' (2009:31) The emphasis here is on the social. Secondly, Systemic Functional Multimodal Discourse Analysis (SF-MDA (O'Halloran, 2007) is based upon a systemic functional approach to analysing at micro-level semiotic resources such as mathematical symbols and film texts, and is interested in systems and structures. Thirdly, Multimodal Interactional Analysis (MIA) (Norris, 2004) combines interactional sociolinguistics and mediated discourse approaches (Scollon and Scollon (2003) with an emphasis on meaning made in the moment by social actors. The methodological approach used in this study does not fit neatly into one of these identified categories because, whilst I create a transcription grid which identifies modes and then analyse those modes using metafunctions (as with SF-MDA), I am principally interested in the meanings made in the moment by social actors (as with MIA). Analysing modes employed in any single instance systematically is not conflated in this study with a conception of communication as arising from a pre-determined semiotic system.

Furthermore, the rationale for including an ethnographic approach to data generation, through observation and focus groups, is based on the principle that to interpret meaning made in context authentically the researcher needs to be familiar with that context. In addition to naturalistic observation, instances of pair or group interaction among participants were videoed. Using the observation notes, specific instances of interest were selected and transcribed verbally onto a transcription grid which identifies modes such as gaze, gesture, posture and spoken language, (See Table 1). These modes are not seen as prescriptively defined and strictly bounded elements but as heuristic devices used by the researcher for the close examination of face to face interaction.

Table 1: Multimodal Transcription Grid

Turn/counter 1 second	Gaze direction	Gesture/ hands	Posture/ body	Speech and vocalisations
00.01				

On the transcription grid (Table 1) the column 'gaze' notes the direction of gaze, 'gesture' notes hand movements and includes haptics or touch, of which material haptics, the touching of objects, plays a significant part (see section 3.2.2 for a fuller discussion of gaze and material haptics); 'posture' notes the body's orientation, movement and proximity to other people and objects and finally, 'spoken language' also includes vocalisations such as sighs and laughs. The grid may be adapted to include material artefacts or spatial element according to the specific research questions.

The multimodal transcripts were then examined through the three metafunctions at work: the ideational (the subject matter of the interaction), the interpersonal (the relationships between participants) and the textual. This third metafunction, the textual, is described by Halliday and Hasan (1989:45) as 'a resource for ensuring what is said is relevant and relates to its context'. The textual metafunction was explored multimodally through close examination of Cohesion within the text through devices of repetition, reference, conjunction, substitution, metaphor and intertextual referencing. The Coherence of the interaction was examined through the lenses of context of situation, 'the immediate environment in which a text is actually functioning' (Halliday and Hasan, 1989:46) and context of culture, which incorporates the wider context as defined in section 1.2.

Any actual context of situation, the particular configuration of field, tenor and mode that has brought a text into being, is not just a random jumble of features but a totality- a package, so to speak, of things that typically go together in the culture. People do these things on these occasions and attach these meanings and values to them: this is what culture is.

Halliday and Hasan, 1989:46

Coherence of a text is achieved at textual level through the organisation of the text i.e through cohesive devices. But Halliday and Hasan (Halliday and Hasan 1976:2: Eggins, 2004:24) are clear that coherence must be related to context of culture as well as the immediate realisation of the text in the context of situation. The development of this framework for discourse analysis has precedents in the Critical Literacy frame of Hyatt (2007). The EC-MDA procedural framework showing the relationship between metafunctions and generation, analysis and interpretation of data is presented in Table 2 below and described in section 2:3.

Table 2: The EC-MDA Procedural Framework

Lenses for Analysis of Meaning	Ideational Metafunction	Interpersonal Metafunction	Textual Metafunction
Focus	The activity, events or entities which make up the subject matter of the interaction	The emotional, hierarchical or identity relations between participants and their negotiation of meanings	The modes which the participants shape to make meaning and create coherent texts which communicate their thoughts
Sources of Generated Data	Researcher notes and video including IWB, school text book, worksheets, students' exercise books, student spoken language, embodied modes.	Researcher notes and video of images of posture orientation, touching of hair and pens and books, gesture, gaze direction, spoken language.	Extracts from video of instances of interaction (2-3 minutes) from which modes and movements are identified and transcribed on to a multimodal transcription grid.
Tools for Analysis and Interpretation Process	Rough transcription of spoken language and immediately obvious gestures and postures.  Re-presentation through summary narrative account	Rough transcription of spoken language and immediately obvious gestures and postures.  Re-presentation through summary narrative account	Rough transcription of spoken language and immediately obvious gestures and postures. Re-presentation through multimodal transcription grid. Close micro-analysis using the cohesive devices such as repetition, reference, and metaphor to look for patterns, collocations, regularities, contradictions, congruity/incongruity.
Concept of	The articulation of subject matter and	The articulation of relationship and	The articulation of choices in organisation

Voice	thematic content of interaction	social distance through register and proximity	of mode
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### 2.3 Process of Transcription and Analysis:

A narrative account of the lesson explored in this paper was composed from observation notes and first viewings of the videoed lesson. Following several further viewings of the videoed interaction between two students working together, a rough transcription of the interaction was made, including spoken language and observable use of other embodied modes. From this a detailed multimodal transcription, (using the transcription grid (Table 1) described in 2.2 above) of three selected extracts of 2-3 minutes was made which used turns of roughly one second to delineate the transcription. The transcribing of videoed interaction multimodally is an integral element of the analytic process. I selected the extracts because they were examples of engaged, paired interaction (not independent working), the spoken words were mostly audible and actions, postures or gestures occurred which I wanted to examine more closely. This transcript was scrutinised using the multimodal discourse analysis procedural framework described in 2.2 (Table 2). I identified the ideational and interpersonal functions at work in the different semiotic modes. I then examined the textual metafunction through *cohesion*, the way the text fits together through the use of cohesive devices, and *coherence*, the context of situation and context of culture. In this paper I focus explicitly on examples from analysis through the cohesive devices of repetition and reference as indicative. As Table 2 illustrates, the full analytic potential of the grid is broader than the focus of this paper. A more extensive analysis, drawing on other analytical categories of cohesion, is beyond the scope of this paper, though is examined in complementary publications.

### 3.1 Research Data: An everyday lesson

This lesson was selected not because it offered anything out of the ordinary, but because, in its focus on practice exam questions, it seemed from my observations to be a frequent occurrence for these learners in their eleventh year of formal schooling at this school. This lesson offered opportunities to study in detail the moment-by-



moment interaction which was representative of their more 'mundane', everyday, lived experience of classroom interaction. The two students were afforded what might be considered a less creative space for classroom dialogue in that the students were working on practice exam questions. The task of individual or paired writing of practice exam questions and paired review of answers was observed across the subject range of lessons. I describe it as 'less creative' as the students were working to tightly prescribed, predetermined answers. As this was typical of the interactions observed over the four months I felt it was important to examine closely what peer-to-peer interaction on 'routine' activities of answering exam questions, evaluating and building on peer written work, and collaboratively writing an answer based on a model example looked like. The two girls in this interaction are anonymised as K and O, as I do not wish to suggest names which may ascribe alternative identities.

### **3.2 A Narrative Account of the Lesson**

The narrative account of the lesson offered here is a re-presentation of *what* was communicated (ideational metafunction) between *whom* (interpersonal metafunction) and has been generated from researcher field notes and rough transcription of videoed interaction.

The Biology lesson, which took place in the afternoon from 1.20 to 3.10pm, comprised three main teaching points and activities, namely: Insect Pollination, Prey and Predators, and Competition. The teacher began the lesson with a diagram of catkins on the whiteboard. This was annotated with comments:

*Small dull coloured petals*

*Anthers hang loosely outside flower*

*Huge numbers of light pollen grains*

*Long feathery stigma hanging outside flower so pollen can be trapped.*

As instructed, students cut out a photograph of a catkin flower and copied the notes on pollination from the whiteboard. This was followed by a pair-work activity writing an answer to a six-point exam practice question and then reviewing peer answers.

*In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Plants and animals have become adapted in many different ways to reduce the risk of being eaten by predators.

Describe these adaptations.

Give examples of animals and plants adapted in the ways you describe.

GCSE Biology Higher paper June 2012

Fig.2: The Practice Exam Question

Their written answers were then exchanged with another pair for them to review each other's work. The teacher's guidance was to 'add' to the answer. The teacher allocated 6 minutes to the students to write their answer and 4 minutes to review their peer's work. The girls collaborated and co-constructed the answer to the question on the paper provided. They studied the question, checked their exercise books and discussed what they should write. O was unsure of the question and how they should answer it. She asked 'Do animals get eaten by predators? Are we predators? Do we eat plants?'. There was much hilarity when she answered her own question with "Basil" followed by "Rosemary". They decided prey needed to be fast and needed camouflage and they agreed they needed an example for plants. At K's urging, (K: You write...your writing's better than mine), O wrote while K suggested or dictated what to write. O probed and pushed for more information (O: Yeah but that's not all and O: Yeah but that's just for animals...they need for plants, tapping her book.). This pattern, of K telling O what to write, and O asking for more, continued throughout this lesson. They were then given 4 minutes to review another pair's work and they annotated this with an example of a cactus and the additional information that "for example, it needs a waxy surface to reduce water loss, deep roots and a large root span". The teacher then instructed the class to "*pass to your right one more time. The question, remember, does mention plants as well...read it carefully*". The girls had difficulty reading the boys' writing, in particular 'elk' which they read as 'auk' and suggest 'antelope' and 'anteater', adding a 'dung beetle' in to the mix to confuse the issue further.

The girls' interaction throughout the lesson was focussed on each other, with some exchanges with the teacher, the girl sitting to their left and some boys sitting behind them. The girls' friendship was enacted through their eye gaze, haptics (touch)

postures and spoken language (I expand on this in the next section). In terms of collaboration, they showed respect for what they considered to be each other's strengths; O regarded K as a better speller, K regarded O as a better writer. When they wrote collaboratively O took up the pen, and when writing constantly checked with K what she was to write, and how she was to spell certain words. They probed and questioned each other. K said 'And you have to put, like, why?' (13.46) and O reminds 'That's just for animals, they need for plants' (13.48). They had a comfortable space in which they could express ideas and weren't inhibited about revealing a lack of knowledge. In this respect, their interaction was unique to their private discourse and they didn't interact in this way with the wider class as a whole. Woven in to their academic discourse relating to the exam question, their personal talk was of hair appointments and split ends, other girls and relationships, document printing glitches, arrangements for going somewhere, the advent of Christmas and seasonal television advertising, and the disposal of waste paper.

As they completed their own written answer and subsequently reviewed their peers work they repeatedly referred to their own exercise books and the notes contained therein. This will be discussed in further detail in the following section.

### **3.3 Micro-analysis of two extracts**

I now present a detailed analysis of two extracts. This analysis comprised interrogation of the textual metafunction. This was realised through analysis of the cohesive devices of repetition, reference and metaphor applied to the multimodal transcription grid, and consideration of how this is articulated through the learners' voice. Whilst the analytical focus here is on the textual metafunction, this cannot be disaggregated for the ideational and the interpersonal, which, through a social semiotic lens, are always inextricably linked. The first extract is a personal exchange about hair and the second an interaction at first sight focussed on the writing activity, but rich with personal inflections and orientations. They have been selected to illustrate the ways in which the girls' multiple voices are realised multimodally through the interaction.

#### **3.3.1. Personal Voices: Hair**

Towards the end of the first activity of cutting and sticking the photograph of the catkin, I noticed an occurrence, which I felt warranted further, closer investigation. O

picked up the scissors and snipped a split end from her hair. In order to investigate how this unfolded I micro-analysed, using the multimodal transcription grid and the cohesive devices of repetition and reference, and coherence, three minutes of action.

From the language the girls use we can see reference at work (Table 3). From a purely linguistic perspective the references (the pronoun, one) are exophoric, which means that they refer to an element in the text, which is not specified and therefore inference is required.

Table 3: Linguistic Reference

***07.18 O I need to try and find some split ends..***

***07.19 O...there's one here***

***07.20 K You can't...***

***07.21 K .. just cut each one!***

***07.23 O Yes I can***

But in face-to-face interaction all modes available are employed. From a multimodal point of view this reference is no longer exophoric. This raises the question that what may be considered exophoric linguistically is not exophoric when the data is analysed multimodally. Multimodal discourse analysis therefore changes how we see reference working in spoken texts. Table 4 provides a transcription of the moment where K infers that O is about to cut her hair. It illustrates how reference operates across embodied modes and how inference in interaction is a multimodal act. I now explain how this works in this instance.

I first discuss the work of haptics, or touch with regard to inference. The 'one' which O refers to is the hair strand she holds in her thumb and forefinger. This means that, as well as her choice of words, K has her gesture to inform her. Exactly as O stretches out her hand towards the scissors, K says 'You can't just cut each one' the 'one' being the split end still in O's thumb and forefinger to which her gaze is directed. K infers correctly O's intentions in reaching her hand out towards the scissors (Table 4).

Table 4: O cuts her hair. (07.20-07.23)

counter	gaze	gesture	posture	Spoken language
07.20	K looks across room then at O's hand reaching for scissors, O at hair	O isolates one hair O stretches hand out to left on table for scissors	K left arm up resting on elbow	K you can't
07.21	O at hair, K looks at O's hair	O holds hair between finger and thumb O picks up scissors	K left arm up resting on elbow	K... just cut each one!
07.22	K looks at O's hair O at hair	O holds hair between finger and thumb O picks up scissors	K left arm up resting on elbow	
07.23	K looks at O's hair O glances to left across room	O holds hair between finger and thumb O positions scissors	K left arm up resting on elbow Both girls slightly leaning in to each other elbows touching	O Yes I can!

Gumperz (1999) points out that in conversation we don't react; instead, we make predictions or infer what is about to happen. 'Conversational inference ...is part of the very act of conversing. One indirectly or implicitly illustrates one's understanding of what is said through verbal and non-verbal responses, by the way one builds on what one hears to participate in a conversation...' (Gumperz 1999:98). In order to be able to infer, as well as linguistic information we also need to be able to consider 'physical setting, participants' personal background knowledge and their attitudes toward each other' (1999:98). There was mutual anticipation in that K didn't react to O, but rather she *anticipated* or inferred what she was about to do. This prediction was based upon prior interaction and the nature of their close personal relationship as longstanding friends. Before O cut her hair, she glanced in the direction of the teacher. Cutting hair is not part of school discourse, it is not part of GCSE Biology discourse and the use of scissors to cut hair is not a school practice. K's exclamation of 'you can't just cut each one' was in fact reference to O's outstretched hand (Table 4). This means the reference was to a perceived intended action by O. K could only know what O was about to do from their close relationship and the context of situation. She could only say the strong, imperative words because they were close friends and she knew they would not be misinterpreted as censorious or disapproving. The material haptic of reaching out and picking up the scissors is part of meaning made in context.

If we are to agree with Gee and Green that meanings are situated, are 'assembled on the spot' (Gee and Green 1998:122) based on our construal of that context and our

past experiences, then understanding what led K to infer O's action needs further unpicking though consideration of coherence in this text. In Hallidayan (1978) terms, coherence is achieved through the context of situation and the context of culture.



Fig. 4: O and K use scissors to cut paper (a schooled voice)

In considering coherence, I needed to consider how the affordances of material objects may have had an influence upon the unfolding interaction. I am interested in the role of the scissors in this interaction. I am mindful of Flewitt and Kurcikova's view that 'All human experiences intertwine in the corporeality of the body and the objects humans interact with, giving rise to embodied lived experiences where the materiality of the physical world becomes entangled with the minds and bodies of individuals'. (2014:108). Applying this perspective to the scissors we can see that at the moment in which O cuts her hair, the scissors meant 'cutting hair', they didn't mean cutting paper. O chose to use the scissors to cut hair. In the school world children are encultured into using scissors for cutting paper from an early age. This means that the cutting of hair, rather than paper, with scissors belongs either to one's personal world, or, if one is a hairdresser, to a professional world. Just as languages occupy different genres, the academic genre and the intimate and personal conversation, so the material haptic encounter with scissors embodies a personal genre and not, to borrow Maybin's (2006:140) term, a 'schooled voice'.

The girls' postures could be seen to be aligned (see Fig. 4), that is oriented in the same direction, or converged, that is leaning in towards one another. Repeating, or

mirroring another's postures (or gestures or language) have been noted in the work of Scheflen (1964) and Beattie and Beattie (1981) as a means of establishing rapport, or convergence of ideas. O initiated the examining of hair, which K eventually joined in with. It is worth noting that in all the other lessons observed K did not touch or play with her hair, but once or twice in each lesson as a way of composing herself before writing, O rose in her seat, sat upright and smoothed down the long hair flowing down each shoulder. This series of movements could be a habituated way of being such as a favourite discourse marker (eg Well.. or Now... ) or facial expression. At the moment where O held up the ends of her hair and cut the end, K picked up her hair and examined the ends (Fig. 5 and Table 5: 07.36).



Fig. 5: Mirrored material Haptic - K mirrors O holding hair 07.36

Table 5: K mirrors O holding hair (07.34 - 07.36)

	Gaze	Gesture/haptics	Posture	Speech/facial exp.
07.34	K looks at O's writing to her left O examines her hair	K drops pen K strokes hair on left shoulder	K shifts slightly up and away from O, left arm up resting on elbow	<i>K opens mouth slightly, breathes in and closes mouth, pursing lips.</i>
07.35	K looks at her own hair	O hair in fingers K picks up and holds ends of hair	K leans back slightly, then up	O Kxxx, see any more?
07.36	O and K both look at their own hair	O and K holding ends of hair in fingers	Both girls sit up with both elbows on table, hands up, examining hair ends	

By picking up her hair in this way (07.35), K was mirroring her partner, and she was signalling her togetherness, or empathy, with her partner (Table 5). La France noted (1985) that there is greater mirroring when participants are co-acting or cooperatively working. Additionally, congruent postures indicate rapport or relatedness. Mirroring is an indication of the degree of involvement, that is to say more mirroring relates to more involvement. Participating, taking part, or 'being involved' in interaction is a pre-requisite for pair or group work in class. In order to take part, the learners need to know what is expected of them culturally and socially and they also need to be able to infer what their partner is about to communicate to them. This example illustrates how communication is achieved through mutual understanding of the semiotic resources which each partner employs.

### 3.2.2. Academic Voices: Cactus

This extract (see Table 6) explores interaction which is more focused on the writing task. In this extract the girls' attention is largely on the negotiation of collaboratively writing a text and specifically the form of the singular and plural of cactus.

Table 6: Collaborative writing (03.28 - 03.33)

Counter	Gaze	Gesture/ haptics	Posture	Spoken language
03.28	O looks back to writing  K looks at exercise book	O pen in hand, fingertips of right hand on paper, poised to write  K fingertips of left hand touching exercise book,	K fingertips of left hand on right page of exercise book	K For example .. (dictating tone)



		wrists crossed		
03.29	O at writing, K at exercise book	O right hand moves hair back	Both girls lean back together slightly then forward	
03.30	K looking at book O at writing	O writing K right hand lifts page	O and K lean in slightly	K ..it needs
03.31	K looking at book O at writing	O writing	O and K lean in slightly	A waxy
03.32	K looking at book O at writing	O writing K lets page go	O and K lean in slightly	Surface O Forrrrr (speaking softly as writes)
03.33	K looks at O and then at writing	O writing	O and K lean in slightly	K To reduce O Example

Gaze can be an indicator of focus or direction of attention (Norris:2004:36), and in this interaction the attention is frequently on each other. The girls locked gaze twice in the first 20 seconds of this extract, which is an indication of working very closely together. Gaze can also be into space (middle distance) during a moment of contemplation or being deep in thought (Sidnell, 2006). This can be seen in Fig 6. Middle distance gaze occurs repeatedly in the first 20 seconds: first O then K, then O and K at the same time, then O, then K and then O again. The synchronic middle distance gaze is an indication of both girls simultaneously being deep in thought.



Fig 6: Synchronic middle distance gaze 03.06

The examination of the mode of gaze direction through the cohesive device of repetition tells us about the degree of empathy and rapport between the two girls as they work – remembering La France's (1985) observation that 'more is more', meaning the more convergence and alignment in interaction, the more rapport and empathy is present .

This rapport and sense of empathy between the girls was further realised in the spontaneous synchronic vocalisation of O and K: 'I have two cacti!' (03.17 ; Table 7).

Table 7 Synchronic vocalisation (3.15 - 03.18)

03.15	K flicks glance to O's face O looks up to left	K r. hand holds page and left hand flat on pages of exercise book O pen poised in hand	O leans back, head up	K I said cactuses
03.16	O looking mid dist. K looks at O	O pen poised in hand	Both girls oriented facing forwards	Not cacti
03.17	O looking mid dist. K looks at O	K hand to face	Both girls oriented facing forwards	O and K (unison) I have two cacti
03.18	O turns gaze to K	K left hand touches hair at right shoulder	Both girls turn to face each other O and K both laugh	O and K laughing

Not only are the same words spoken but the prosodic elements of tone, pace, volume and rhythm are aligned. The moment of synchronic locked (03.18) gaze and laughter comes about as a result of the synchronic vocalisation. This is again an indication of how closely the girls are working – their **mutual anticipation** leads them to say the **same** words at the **same** time with the **same** prosodic qualities.

In this extract, two genres can be heard: the personal, dialectal ‘What’s one o’ them?’ and the academic code of the GCSE genre ‘For example, it needs a waxy surface to reduce water loss’. These genres can also be seen to be invoked through embodied semiosis. To illuminate this, I turn to the mode of haptics, or touch. I’ve used the term haptics, rather than gesture or hand action (Sakr, Jewitt, Price 2016), because the action is sensory involving the touching of a material artifact, K’s exercise book, by hand. I have called this **material haptics**, the touching of an object, to distinguish from interpersonal haptics, the touching of another person.

K touches the page with her right hand and then she lifts the page of her exercise book with her left hand (Table 7). In this example K’s words (‘*For example it needs a waxy surface to reduce water loss*’ lines 03.28-03.34 ) are rooted in the GCSE Biology genre and she is dictating but at the same time she is invoking the authority of her written notes through her touching or material haptics. Bakhtin (1999) writes of multiple voicing:

Our speech...is filled with others' words, varying degrees of otherness or varying degrees of our own-ness, varying degrees of awareness and detachment.

Bakhtin: 1999:130

The 'otherness' and 'own-ness' is being realised multimodally in this episode. Multiple voicing according to Bakhtin (1999) is where our words are imbued with meanings from prior utterances; in the case of K's words she has written these words, copied from the whiteboard annotations. They are both her own, but also someone else's: they belong to her and the exam board, the author of the science book, and the science teacher simultaneously. She refers to their/her written words both orally and haptically, though her touching of the pages of the exercise book.

#### 4.1 Discussion

The ethnographically-contextualised multimodal discourse analysis (EC-MDA) of this everyday interaction has illuminated the embodied semiosis at work in the co-construction of text. It is mindful of the complexity of the wider social and immediate context of peer to peer classroom interaction. In Johnson's (2017) multimodal study of peer correction in picture book reading, she warns that "we gain a partial and inadequate view of what children are doing with one another when we consider academic outcomes without accounting for the complex milieu in which they are constituted" (2017:34). This research has not set out to evaluate a teaching strategy or the effectiveness of an intervention. It is not driven by a quest for behaviours which will result in higher attainment in standardised testing. Instead it has set out to follow a hunch that there is a richer story to be told about paired interaction through attending to multiple modes of communication. Its intention was to explore the intricacies of social interaction and hence reach a deeper understanding of social learning, and to recognise the detailed, multimodal contributions of the individuals engaged in collaborative construction of text.

This study has applied an EC-MDA (Taylor, 2014, 2016) and a perspective on interaction informed by the work of Hasan (1996), and Halliday and Hasan (1976) on cohesion, coherence and context in meaning making. It is underpinned by an assumption that in any interaction the participants involved make decisions about

what is relevant to the context (Hasan 1996:37). It is in this way that the unfolding 'text' is bound to the situation in which it occurs.

When considering the girls' interaction I am aware that I start with individuals who can be seen 'as a being that is actively shaped by the sum of his (sic) own interactions and hence by the nature of the semiotic codes prevalent in his community' (Hasan 1996:38.) That is to say that the girls do not break into a rap song, or stand up and dramatically gesture or speak in German because these resources are not perceived by them to be available to them in this situation. This is due to their perceptions of social conventions in this situation. The context of situation here relates to the 'material situational setting', that is, the classroom, but also the context of culture, that is the wider situation of a GCSE Science revision class in a UK secondary school in 2013. It also includes the interpersonal aspects of the relationships between teacher and other learners in the classroom, and, in fact, the researcher in the room.

The girls make decisions about the relevance and appropriacy of their contributions to and involvement in the interaction. This suggests individual autonomy and yet the girls are not free to do exactly as they please: 'Individual autonomy operates only in the realm of learned behaviour' (Hasan 1996:44). Hasan recognises the close relationship between individual autonomy, variation and acculturation. The girls are therefore acculturated to schooled voices and their ways of being 'in the moment' are spontaneously created, drawing from patterns laid down by previous relationships and past experiences, or 'ways of knowing', which shape their sense of identity in the interaction.

In examining the context in which the girls find themselves in these interactions, one can see it can be considered institutionalised (Hasan, 1996). However the interactions do not subscribe to a pattern of low autonomy, but rather genuine turn-taking. Using Carter's notion of creativity as 'demotic and endemic to everyday discourses' (2004:49) the interaction can be seen to be creative, with moments of humour, novel language use, and a range of subject matter, or themes. Hasan advises that 'For genuine turn-taking there needs to be a cooperative negotiation of context' (1996:46). One can see how tensions can arise between pedagogies which are institutionalised and therefore do not allow for individual negotiation, and young adults who bring a range of experiences and ways of knowing into the classroom. In the examples

analysed here, there is a task set by the teacher and institutional powers (of exam boards) and yet the interaction is dynamic and fluid rather than constrained within the single genre of 'discussion of a Biology practice question'. This is because of the autonomous, individual negotiation of meaning between two socially close individuals. Hasan is clear that

When the context is cooperatively negotiated, the text and context evolve approximately concurrently, each successive message functioning as an input to the interactants' definition of what is being achieved.

Hasan, 1996:48.

The girls do not only talk about the task at hand, they do not only use the lexis of GCSE Biology exam questions, they do not only use academic register in their interaction. The girls' interaction is rich and varied in its employment of semiotic resources. In other words, in order to achieve their aim, of writing their own answer collaboratively, and of joint peer review of others' writing, they need to step outside of the institutionalised context and integrate their own personal contexts of situation.

One of the limitations of this study is that it is not possible to generalise from micro-analysis of one interaction in a lesson. However, this analysis can illuminate the ways in which the work which is going on in paired interaction is not restricted to completing the task which has been set. It is a glimpse into their world and further analysis of such interaction is needed. In order to understand the processes involved in the construction of knowledge, further detail is required on the sophisticated integration of prior learner knowledge and official school discourses. However, from this snapshot it is possible to see a number of achievements. In accomplishing the task set by the teacher, the writing of their own 6-point answer and the peer review of another two pairs' answers, the girls achieve a number of additional personal acts, namely multimodal inference, negotiation of voices, and rapport and empathy through modal synchrony, which appear integral to their collaboration.

Firstly, inference is commonly regarded as a linguistic act, based upon our understanding of reference for example, or from prior linguistic encounters in a context of situation. When one enters a shop one might expect the shop keeper to say "Can I help you?". On one level, K could not reasonably have expected O to cut her hair in the classroom situation. Her inference in this moment was based upon her

attention to O's bodily orientations and her prior relationship with her over 10 years of friendship. Inference in face-to-face interaction can therefore be understood as multimodal and arising from embodied semiosis and shared personal knowledge.

Secondly, in their text construction, the girls negotiate the academic register of school texts and GCSE Biology examinations intertwined with their own personal interests. These registers are being negotiated at the same time, synchronically, and sequentially, or diachronically, in a manner which attests to Poveda's (2011) observation that "classrooms are complex communicative spaces in which official teacher-led discourse co-exists and intertwines with peer structured discourses" (2011:80). This analysis has shown some of the ways in which the learners have accomplished this multimodally. These registers are realised through their spoken and written language but also through, for example, material haptics, that is through the touching of scissors (both on and off-task) and the touching of exercise books.

Thirdly, the girls articulate their rapport and empathy in their interaction through their aligned and converged postures and gaze. In the personal act of attending to hair where K mirrors O's inclination to stroke and examine her hair, this was not part of her habituated ways of being in the classroom and yet she mirrored O's actions in an act of mutual empathy. The girls orient themselves to each other's perceived strengths and weaknesses with writing and spelling. As K tells O what to write she pauses and offers words at a pace which she knows her friend can follow. The girls could be said to be involved in a 'solidarity motivated' (Eggins and Slade, 1997:12) conversation whereby the interaction is a joint endeavour with shared goals. In the examples shown here they engage each other with humour, laughing at their spontaneous synchronic vocalisation of 'I have two cacti' for example.

In sum, their embodied semiosis is a powerful expression of the textual metafunction, in the organisation of the co-created text through modal synchrony, of the ideational metafunction through the articulation of themes, ideas and concepts, and the interpersonal metafunction through the negotiation of text through rapport and empathy.

## 5.1 Implications

This study has implications both for understandings of face to face interaction and methodology. In terms of understanding interaction, it is possible to see three key elements of close collaborative work in class between participants: *Inference and mutual anticipation*, *Negotiated voices* and *Modal synchrony*. Although Inference is usually associated with language, this analysis shows some ways in which this aspect of interaction is realised through a range of embodied modes. Further research is required to investigate the implications of a multimodal perspective to linguistic understanding of exophoric reference. If a requisite of academic written discourse is the absence of a requirement for inference (by which I mean written academic discourse is required to be explicit, fully informative and does not require the reader to infer) and yet in face-to-face interaction we have resources which we employ to explicate our discourse, then this has implications for how we conceptualise exophoric reference in different texts. It may in fact be that there are two types of exophoric reference, those for which genuine inference is required and those in which inference is guided by or nulled by modes other than language.

There are also methodological implications of this research for an education researcher. This article has presented an ethnographically-contextualised Multimodal Discourse Analysis approach. I make no claim that it is an ethnographic study, but I draw upon principles from ethnography regarding the study of social interaction between participants, specifically an interest in meanings made locally, naturally occurring interaction and detailed description of everyday life (Gubrium and Holstein (2000:491). I argue such an approach is entirely congruent with the philosophical stance of this study as I have created a rich description of multimodal meanings made in context from observation, analysis and interpretation of naturalistic everyday classroom interaction. As an interpretivist, working with social constructivist understandings of meaning making, I am as much the 'tool' of this research as my multimodal transcription grid. The reason that I claim authenticity for my data is because I contemporaneously observed the interactions that took place. The presence 'in the moment' guided the selection of instances to focus on and the interpretation of what took place from a uni-directional video with a partial angle on the interaction. It is the 'marrying' of ethnographic approaches of observation of naturalistic, everyday encounters with multimodal discourse analysis which allows rich description of



learners' articulation of school voice and personal voice through multiple modes. Cohesion, (the cohesive devices of repetition and reference) in conjunction with Coherence (context of situation and context of culture) enable a researcher interested in collaboration in class to uncover the ways in which action in the moment, interpersonal relationships and social and cultural histories come together in co-construction of text.

For teacher educators and literacy educators, this study asks teachers to consider the embodied semiosis at work when they ask learners to work in pairs. Private interactions are part of the construction of understanding. Paired work in class operates multimodally in a carefully negotiated social space, which is both 'school' and personal. I did not set out to investigate approaches to pedagogy but this research may indicate that if teachers wish to facilitate rich, creative, spontaneous dialogue, negotiation, turn-taking (i.e. listening and reacting to each other) and individuated context of situation, then they need to attend to the interpersonal relationships in the classroom. They may wish to consider placing together learners who are socially close. One might, then, conversely extrapolate from this that if the aim of a lesson is institutionalized interaction, generically restricted, constrained by formalised codes then an approach sitting socially distanced learners next to each other may be the preferred strategy.

Whilst further study is required to evaluate the appropriacy of these strategies, this study does begin to offer research-informed insights which may counter educators' and policy makers' assumptions about the mechanics and implications of multimodal classroom interaction. Mercer and Howe (2012) reviewed studies of classroom talk and are concerned that "much classroom -based talk among students may be of limited educational value" (2012:16). In this study, through permission given by the participants, we have been afforded a glimpse into otherwise private interactions and the ways in which the learners interweave academic and school voices in a far from straightforward manner. This research shows that notion of 'working in pairs' may not constitute the bounded, regulated, given which operates along known, institutionalised, acculturated lines as perceived by policy and curriculum documents. Social learning is by definition 'social' which means that learners bring their whole selves to the conversation - their embodied minds- and share and interact with others in order to think more widely, take on other people's ideas and deepen their

interpersonal relationships. For the curriculum to be understandable, it needs to be relatable and imaginable, and relating and imagining, as seen here, are arguably embodied acts.

In conclusion, this paper does not address issues such as whether the educationalist needs to attend to the multimodality of interaction, or whether it is sufficient to focus simply on language, or whether we disregard voices in the classroom variously termed as off-task or casual. This paper has illuminated the ways in which learners collaborate in the multi-voiced, multimodal fabric of classroom interaction. It has demonstrated that classroom talk is a space for the expression of both school and personal knowledge through multiple voices and multiple modes, that it requires social skills of negotiation articulated through embodied semiosis, and that humour, friendliness and mutuality play an inextricable role.

#### Endnote

The project, Teenagers Talking in Class (2013-present), was funded by Sheffield Hallam University Small Grant Scheme and underwent full ethical review through Sheffield Hallam University Research Ethics Committee. The participants in this project gave full permission for photographic images to be reproduced in academic journal articles.

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