

**Talking the talk: A longitudinal case study of the
development of early career science teachers' knowledge of
the nature and purposes of classroom talk.**

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Abstract

The complexity of teacher professional knowledge is well established in a range of models of professional knowledge (Shulman, 1986; Engeström, 1987; Eraut, 2014) and a number of studies have examined models of science classroom talk (Mortimer and Scott, 2003; Viiri and Saari, 2006; Lehesvuori et al., 2013). However, research that tries to use models of classroom talk to develop classroom practice has identified challenges in the complexity of developing teacher knowledge in this area (Viiri and Saari, 2006; Lehesvuori et al., 2011; Chen et al., 2016). This study uses a longitudinal case study approach to examine the development of early career teachers' understanding of the nature and purposes of science classroom talk. Seven case study teachers were interviewed over a three-year period from their initial teacher training until the end of their second year of employment. Alternate semi-structured and unstructured interviews explored the teachers' views of how and why they used talk in their classrooms. The interviews present a complexity of interaction between training experiences, individual identities and the multiple communities of practice in which the teachers work. These interactions create tensions and conflicts for the case study teachers as they develop their understanding of the nature and role of classroom talk. The experiences of the case study teachers suggest that for research on classroom talk to influence teachers' practice there needs to be a recognition of the important influence of teachers' own identity and ideas about learning. A model of science classroom talk is developed that integrates theoretical frameworks for science classroom talk with insights into how early career teachers think about classroom talk in their practice. The findings also provide insight into the complexity of teacher knowledge in an area of practice that is both fundamental to the role of a teacher and underdeveloped as an area of professional development.

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Chapter 1

Introduction

This study follows several teachers through the early phase of their career to examine the development of their professional knowledge, beliefs and practice regarding the nature and purpose of different forms of talk in science classrooms. Seven longitudinal case studies examine the teachers' knowledge of classroom talk from initial teacher training through the first two years of employment in teaching. The starting point for developing the research questions in this thesis lies in my own reflections on experiences working with both student teachers and experienced teachers in developing their understanding of how they used talk in science classrooms. Introducing the framework for describing the communicative approach developed by Mortimer and Scott (2003) to both trainee and experienced teachers, it was striking that the response from the two groups was very different. The experienced teachers responded positively to the theoretical framework for describing authoritative and dialogic interactions and were able to reflect on their own practice in the light of the framework. In contrast groups of trainees struggled to engage with the framework and understand how it might provide an analytical lens on their own practice. Perhaps this is not surprising but it left a sense of curiosity about the nature of the changes that need to take place in terms of experience and an ability to reflect on one's own practice that lay behind the difference in these experiences. Reflecting on my own development as a science teacher there were some critical changes in my own understanding of the nature of learning and how this influenced my teaching. Most notable of these were engagement with constructivist theories of learning during my PGCE course and an introduction to the work of Vygotsky (1962; 1978) which resulted in a recognition of the significance of pupils' own talk in the development of their understanding of science concepts. For me these seemed like personal threshold concepts (Land et al., 2008) that changed irreversibly the way I understood my role as a teacher. These experiences and connections led me to consider how different my own experiences are from other science teachers?

Whilst the National Strategies Materials (Department for 2011a) are now archived and acquiring the status of historical documents, they have had an influence on what was considered good practice in schools over the last decade. One element of the strategy materials drew upon the work of authors such as Robin Alexander (2001) and Douglas Barnes (1976; 2008) who have written extensively about the importance of dialogic teaching.

Conversations with science teachers during CPD sessions suggest that much of the good intentions to develop more dialogic practices in the classroom are drowned under a perception of the need to deliver the content of an overloaded GCSE specification and to prepare pupils for an examination that still places an emphasis on the recall of knowledge. Over the last five years there has been a drive by the current government to increase the importance of the school based element of teacher training, and with this the potential to reduce the opportunities for trainee teachers to reflect on theoretical aspects of their developing professional knowledge. More recently, policy statements have indicated a desire for teachers to engage with research evidence but in terms of 'what works' rather than reflecting on the complex nature of learning. As a result new teachers will, more than ever, be reliant on the community of practice within which they work in school. In this context longitudinal case studies will be used to explore the development of early career teachers' understanding of the forms of classroom talk and the purposes of these different forms of talk.

In the course of the case study teachers' progress through initial training, induction and early career, this study will examine factors that influence their developing knowledge of classroom talk. The study will look for evidence of personal beliefs, previous experience or school context that influence their development of professional knowledge of different communicative approaches in science lessons. The study will also explore whether theories of professional learning facilitate an understanding of the development of teachers' knowledge about classroom talk.

Chapter 2

Literature review

I have chosen to draw upon two bodies of literature to develop a framework within which to site the research questions of the study: firstly research and theoretical perspectives on the nature of teacher knowledge and secondly literature on talk in science classrooms.

In the first part of the literature review I examine a number of theoretical perspectives and research studies on the nature of teacher knowledge. In setting out and examining these perspectives I aim to provide a theoretical perspective against which the study will explore the development and transformations of the professional knowledge of teachers in the area of classroom talk. The complexity and contextual nature of teacher knowledge is discussed in order to develop an argument for siting the study within an interpretivist paradigm and provide a justification for using a case study approach to addressing the research questions. In presenting the literature on professional knowledge I have positioned the discussion of professional knowledge between the internalised individual nature of teacher knowledge suggested by frameworks of professional knowledge such as that of Shulman (1986) or Bourdieu's idea of habitus (1977) and situated contextual forms of professional knowledge that might be provided by the literature on communities of practice in schools following the work of Wenger (1998) .

In the second part I examine the literature on theoretical perspectives relating to talk in science classrooms and dialogic teaching in science. Different approaches to analysing science classroom talk are discussed and in the final section the small body of literature where the two themes of classroom talk and teacher knowledge overlap is reviewed. In this section I have focussed on the literature on talk in science teaching specifically and have not discussed the wider literature on classroom talk. This decision is partly based on the range of theoretical perspectives with which the teachers' are expected to engage during their training. However it may be that the transformation of these ideas from initial training to practice sees a broadening of the scope of understanding of classroom talk in science lessons to cover more general themes such as questioning.

2.1 Frameworks for defining Teacher knowledge

Various frameworks have been suggested for structuring and examining research and ideas about the nature of teachers' professional knowledge. These various frameworks in the literature show that there is a tension which lies in differing views of professional knowledge and even how to conceptualise knowledge (Munby et al., 2001). Identifying the nature of teacher knowledge also opens up the question of the nature of the development of teacher knowledge, both in terms of individual knowledge development as reflective practitioners and the way in which this personal development interlinks with the individual's knowledge community; the school and department in which they work. There is a contrast between perspectives on teacher knowledge that seek to define the nature of a shared body of professional knowledge that might be considered common to all teachers (Shulman, 1986; Grimmitt and Mackinnon, 1992; Abell, 2007) and constructs of teacher knowledge that situate individual teacher's knowledge firmly with their own personal experiences and workplaces (Engeström, 1987; Wenger, 1998). There are also a number of studies that explore professional knowledge through processes of transformation of knowledge that reflect on the nature of teacher knowledge (Cove et al., 2008; Berry et al., 2009; Clarke and Fournillier, 2012). Whilst there is no clear distinction made between these differing perspectives with considerable overlap between many of the conceptualisations made of teacher knowledge, the following sections of this review identify a range of perspectives that emphasise the professional, personal and contextual elements of teacher knowledge. Some studies and theoretical perspectives focus on attempting to describe a universal form of knowledge that is located with the profession, others see professional knowledge as held within individual identities and some see knowledge as situated with interactions between individual teachers and school communities. In summarising some of the theories of professional learning, Philpott (2014) identifies dimensions of difference among these theories according to whether they:

- foreground individual learning processes or social interactions and social organisation;
- take account of personal differences in learners;
- foreground how learning happens or what needs to be learned;
- are generated from empirical evidence or from the elaboration or synthesis of other theories. (Philpott, 2014, p.4)

As part of this study theoretical models for professional learning will be explored in relation to the development of teacher knowledge of classroom talk in science classrooms. In doing so, these dimensions may prove to be significant in the extent to which the teachers' knowledge of the nature and purpose of classroom talk lies within social professional dimensions of learning or with individual ideas about classroom talk. This study also offers an opportunity to consider whether the findings provide any evidence to support a particular theory of professional learning or indicate limitations of these theories.

2.1.1 Professional structural forms of teacher knowledge

Some authors have attempted to describe and define a body of professional knowledge that describes the nature of teacher knowledge in a way that locates it with the profession rather than with the individual teacher. As such, these conceptions of teacher knowledge argue a degree of universality across the teaching profession and a distinctness to teacher knowledge against other professions. One of the most influential theoretical perspectives on teacher knowledge in the last thirty years (Abell, 2008; Mecoli, 2013) has been the work of Lee Shulman (1986; 1987). In offering a theoretical framework for considering teacher knowledge Shulman separated the domains of teacher knowledge into pedagogical knowledge and content knowledge. Content knowledge is further subdivided into three divisions. Subject matter content knowledge is of the subject discipline in which the teacher was working. Curricular knowledge is knowledge of general teaching strategies and techniques and pedagogical content knowledge is the subject specific ideas, strategies and techniques that relate to the teaching of specific aspects of the subject discipline. Shulman goes on to suggest a framework for considering the forms of teacher knowledge. The categories of teacher knowledge, both domains and forms are represented in figure 1. Of Shulman's domains the one that has proven the most influential in later research (Abell, 2007) is the concept of pedagogical content knowledge (or PCK) which he described as "the missing paradigm". This is the area of teacher knowledge where the teacher's own subject matter knowledge and their understanding of pedagogy and successful teaching strategies are integrated. The notion of PCK has become strongly embedded in much research on teacher knowledge over the last twenty years (Abell, 2008; Mecoli, 2013).

Teacher knowledge domains						
Content knowledge			Pedagogic knowledge			
Subject matter content knowledge	Pedagogic Content Knowledge (PCK)		Curricular Knowledge			
Teacher knowledge forms						
Propositional knowledge			Case knowledge			Strategic knowledge
Principles	Maxims	Norms	Prototypes	Precedents	Parables	Professional judgement
Empirical and philosophical inquiry	Practical experience	Moral or ethical reasoning	Exemplify theoretical principles	Capture practice	Convey values	

Figure 2.1 Theoretical framework of teacher knowledge from Shulman (1986)

PCK is useful as a construct of teacher knowledge in that it locates that part of teachers' knowledge in a domain that lies between, and overlaps with, previous domains of subject knowledge and pedagogic knowledge and helps to define the aspects of teacher knowledge that are contextual to specific subject teaching. However, I do feel that a limitation of subsequent interpretations of Shulman's knowledge domains is that it offers a somewhat positivist epistemological position on teacher knowledge (Abell, 2008; Lee and Luft, 2008; Loughran et al., 2008). This may be the reason why so much research on PCK is in science and mathematics where there is a synthesis of PCK with the literature on pupil 'misconceptions' that appears to describe PCK in terms of the problematic areas of the subject where everyday pupil ideas differ from the science view. The less often cited aspects of Shulman's work, his idea of knowledge forms as including aspects such as precedents and parables alongside practical and empirical knowledge, offer a more realistically complex map of teacher knowledge. Teaching involves actions that are rooted in a complex interaction of knowledge, experience, personal beliefs and identities. As such, an analysis of the individual sense of professional knowledge that teachers hold may need to draw upon a more complex and less rationalised model of knowledge development that fuses a range of sources of knowledge with a set of held views and values relating to classroom practice. Some of the authors discussed in this thesis

(Fenstermacher, 1994; Clandinin and Connelly, 1996; Davis, 2004; Berry et al., 2009) contend that the clear cut notions suggested by Shulman's knowledge domains need to be considered in more practical and contextual terms. Teachers describe their knowledge, not in an abstract manner, but in relation to their daily experiences and practices. It is interesting that the less well known aspects of Shulman's description of knowledge forms, which include propositional knowledge and case knowledge, recognise this whilst still providing a clear theoretical sense of the particular nature of teacher knowledge. Indeed I would argue that one of the problems that besets the teaching profession in England and Wales is a lack of professional identity in so far as the profession struggles to recognise explicitly the distinct nature of its own professional knowledge. This underlying sense that professional knowledge can only be gained through classroom experience in the form of parable and case study with no recognition of a theoretical perspective on teacher knowledge is implicit in changes to teacher education laid out in the recent government white paper (Department for Education, 2010) and subsequent changes in the landscape of teacher training in the UK (Furlong, 2013; Maguire, 2014). In this study I am especially interested in the process of transformation and development of individuals' knowledge over the early part of their career and in the issues that existing ideas and knowledge about teaching prior to training have on the development of knowledge.

A more grounded examination of teacher knowledge based on analysis of teachers' own discourse about practice is developed in a study by Adoniou (2015). In an examination of the development of teacher knowledge of Literacy teaching among a group of Australian primary school teachers in their first year of teaching Adoniou used the thematic analysis of the teachers' discourse about their teaching to develop a framework of teacher knowledge that overlays six identified domains of teacher knowledge with three discourses of knowledge: 'Know what, know why and know how'. The six domains identified in the context of this study were:

- Knowledge about content;
- Knowledge about theory;
- Knowledge about teaching;
- Knowledge about learners;
- Knowledge about school context;
- Knowledge about sociocultural politics.

In the study these domains are interconnected and are not intended to be seen in isolation from an individual's motivations and situational context. The findings of the study in relation to this framework identified limitations in teacher knowledge in terms of limitations in their discourse of 'knowing what' and 'knowing how'. In the domains of the framework significant gaps in knowledge were seen in sociocultural politics, school context and, to a lesser extent, content and knowledge about learners. Adoniou makes connections between these knowledge domains and the Australian teacher standards in arguing for a less reductive view of teacher knowledge. It may be that at the point in the career of the participants of the study, moving from training to their first teaching post, a focus on developing the areas identified in mandatory teacher standards has an influence on the breadth of teacher knowledge. In the UK, a similar set of teacher standards places a particular emphasis on the expectations of trainee and early career teachers in terms of the nature and enactment of their knowledge. It is certainly the case that the sociocultural politics and school specific context are areas that are not recognised in these standards.

In his review of the conceptions of knowledge apparent in research on teaching and teacher knowledge Fenstermacher (1994) makes the distinction between formal and practical knowledge. Formal knowledge he describes as the established canon of research based teacher knowledge that underpins policy decisions in the US in areas such as teacher accreditation and assessment and research based teacher training programmes. There is a clearly different relationship in the US between education research and the professional knowledge culture of policy makers and teacher educators. Fenstermacher cites David Berliner's (1987, p.6) contention that "we are on the threshold of creating a scientific basis for the art of teaching that will be acceptable to the general public as truly specialized knowledge" and William Gardner's preface to the title Knowledge Base for the Beginning Teacher commissioned by the AACTE¹ "This book seeks to demonstrate that teaching does have a distinctive knowledge base.... This knowledge base has been generated in research" (Gardner, 1989, ix). I would argue that the extent to which teacher knowledge in the UK is recognised as research based is very much less evident than the North American context described by Fenstermacher. There is, for example, no explicit demand on trainee teachers to engage with

¹ AACTE: the American Association of Colleges for Teacher Education

research evidence in meeting the previous (pre 2012) or new (Sept 2012 onwards) Teachers' Standards required for recommendation of qualified teacher status. Fenstermacher also examines research into what he calls practical knowledge. This is knowledge held by the teacher as a result of contextualised experiences in the classroom. Practical knowledge is defined by Fenstermacher as:

... knowledge (...) developed from participating in and reflecting on action and experience. It is bounded by the situation or context in which it arises, and it may or may not be capable of immediate expression in speech or writing. [Practical knowledge] is generally related to how to do things, the right place and time to do them, or how to see and interpret events related to one's actions. (1994, p.12)

Similarly Schön (1983; 1987) makes a clear distinction between the epistemology of practice and theoretical, formal knowledge. Fenstermacher, Berliner and Gardner all share an aspiration to identify and describe a formal construct of professional knowledge that is common to all teachers regardless of context and experience.

In their review of the literature on teacher knowledge Grimmatt and MacKinnon (1992) argue that what they describe as an applied science approach to teacher knowledge based on Shulman's (1987) categories of teacher knowledge can lead to teacher education that attempts to construct principles of professional knowledge that can later be applied in practice. Their argument is that Shulman's notion of pedagogic content knowledge is more analogous to a craft knowledge, one acquired through practice. They suggest that in taking a craft based view of teacher knowledge there is an additional category of professional knowledge, that of pedagogical learner knowledge. This they define as: "pedagogical procedural information useful in enhancing learner-focused teaching in the dailiness of classroom action" (Grimmett and Mackinnon, 1992, p.387) . They are clear that this form of knowledge is contextual and can only be acquired through experience and reflection on practice. If their view of professional knowledge is reasonable there are clear implications for teacher education and limitations on the extent to which the introduction, early in training, of theoretical perspectives on teaching can influence the development of professional knowledge. This is a troubling notion given the tendency of current PGCE courses to follow a theory-into-practice model that places the majority of university based teaching components of courses in the first few months of training.

Other authors go further in emphasising the personal and narrative structure of teacher knowledge. Clandinin & Connelly (1996) have described the way teachers understand and communicate their experiences through stories. They have come to see teacher knowledge in terms of personal narratives that reflect both individual personal histories and cultural contexts within which the teacher lives. Clandinin and Connelly use the term 'personal practical knowledge' to describe the narrative understanding that guides teachers' practice: a personal knowledge that is shaped by an individual teacher's 'practical knowledge landscape' (Clandinin and Connelly, 1996). There is an apparent parallel here with aspects of Shulman's (1986) domains of parables and precedents.

Davis (2004) makes an argument for an emphasis on the situated and context specific nature of teachers' knowledge. Davis uses a knowledge integration perspective developed by Linn et al (2004) to analyse teachers' knowledge development. In a case study an undergraduate student teacher early in their training, prior to any teaching practice, was followed through developing a unit of work as part of their study. In examining the extent to which the case study teacher's subject knowledge and pedagogic knowledge are integrated, the findings were that, whilst the student had strong subject knowledge in the areas addressed and was able to identify and remedy areas of weakness, strong subject knowledge was not sufficient to enable the student to design an effective teaching unit. However, the focus of the study was to use a knowledge integration perspective to examine how a student teacher's pedagogic content knowledge develops. In this case the main links between subject knowledge and instructional practice were in the student's ability to make connections between areas of strong subject knowledge and real-world experiences that might give learners access to the ideas. The detailed analysis does not produce generalizable conclusions about patterns in students' development of PCK. However, Davis' analysis does highlight how situated and context specific each individual's developing knowledge is. In the same way that effective teachers need to recognise learners' individual starting point and existing ideas, so teacher educators, Davis argues, need to identify their students' foundational knowledge to enable them to be aware of the integration of developing ideas with their existing knowledge. Student teachers need to be able to improve their knowledge through adding and linking new ideas to existing knowledge – knowledge integration.

2.1.2 Situated forms of teacher knowledge

Whilst there is not a clear distinction between personal and situated forms of professional knowledge with all authors recognising aspects of both in the complex development of teacher knowledge, there is a difference in emphasis and the studies in this section emphasise a situated characteristic of teacher knowledge. Two perspectives on situated knowledge drawn from roots in the psychology of learning are influential in a number of studies in teacher knowledge development: Communities of Practice (Wenger, 1998) and Cultural-Historical Activity Theory (Luria, 1974; Leont'ev, 1981; Engeström, 1987) .

The concept of Communities of Practice developed from work on the nature of professional knowledge by Etienne Wenger. Lave and Wenger's initial work was on other employment practices: midwives, tailors, quartermasters, butchers and non-drinking alcoholics (Lave and Wenger, 1991) but from this research Wenger developed a broader definition of communities of practice defined by three key elements: the *domain*; the *community* and the *practice* (Wenger, 1998). These elements describe the domain as an aspect of shared interest, the community as the actions of joint activities, discussion and sharing of information by its members and the practice as requiring the members to have developed a "shared repertoire of resources: experiences, stories, tools, ways of addressing recurring problems" (Wenger, 2006, p.1). Wenger envisages teacher knowledge development as a living process that emerges from complex and multi-participant interactions with other practitioners. More than this there is also a recognition of the possibility of interactions between multiple communities of practice with practitioners working in multiple contexts and moving between communities with possibly conflicting patterns of interactions, a process described as "boundary crossing"(Tuomi-Gröhn et al., 2003). Brouwer et al. (2012) explored the extent to which communities of practice occurred in a secondary school workplace in the Netherlands. Questionnaires and observation instruments were used to analyse seven teacher teams within a single school. In their study they found that there was some observed indication of communities of practice occurring as evidenced by mutual engagement yet the teacher teams' perception of community of practice dimensions in their workplace setting were only modest with moderate perceived mutual engagement and limited perceived shared repertoire. In the Netherlands context it can be argued that, whilst there is some evidence of communities of practice in a school setting, this is less evident in the extent to which it is perceived by the

teachers within the workplace. Another conclusion of Brouwer et al. was that the composition of the teams was influential in the extent of perceptions of positive communities of practice. In particular they found that diversity in some respects (gender, education level) was a positive influence but that diversity in length of experience both in teaching and in the school studied was a detracting factor in perceptions of aspects of communities of practice. The extent to which this finding is generalisable to the UK setting of this study is questionable, I would suggest that differences in political and cultural factors would have a significant influence. As Ball (2003) argues, there is an increasing culture of performativity in English schools and this may limit the extent to which Brouwer et al.'s findings relate to the context of this study.

A number of authors (Edwards, 1997; Maynard, 2001; Hodkinson and Hodkinson, 2004; Woodgate-Jones, 2012) researching aspects of early teacher professional development in the UK have applied Wenger's idea of a Community of Practice (COP) to schools. In adopting Wenger's framework of communities of practice, these researchers emphasise the situatedness of teacher professional knowledge formation within the schools in which the teachers are working. There is a focus in these studies on the relationship between the individual teacher and the context and culture of the workplace within which they learn. Levine and Moreland (1991) make the argument that the cultural aspect of teacher knowledge is tacit and implicit in the talk and actions of members of the community and that, rather than presenting a framework of knowledge, this offers a lens through which to examine teachers' knowledge.

Maynard (2001) reports a study into the stages of development of trainee teachers' acquisition of understanding of aspects of teaching and their sense of identity as a teacher. She explores findings from three related studies combining observations of trainee teacher and school mentor meetings, observations of lessons, training documents and interviews and group discussion with trainee teachers. Maynard identifies elements of transition toward a personal teacher identity that is strongly influenced by the need to participate in a community of practice that is defined by the expectations of the trainee teacher's mentor. Maynard identifies an emergent teacher identity that develops through 'fitting in with the class teacher's style' and an appropriation of the forms of discourse from their mentor teachers even where their own conceptual understanding differed from the teacher's. Maynard's findings show a tension for the trainee teacher as a peripheral

participant in the community of practice of the school that they negotiate through a process of fitting in with the experienced teachers. In Woodgate-Jones' study (2012) the mentors and headteachers were asked about their perceptions of trainee teacher involvement in the school community of practice. A clear finding of her research was a perception from headteachers of a positive contribution of trainee teachers in bringing new ideas and practice. This suggests that, from some experienced teachers at least, there is willingness to involve trainee teachers as a more central participant in the community of practice, bringing in their own ideas and understandings.

Cultural-Historical Activity Theory (CHAT) originates from developments of Vygotskian perspectives on social dimensions of learning and development leading to the conceptualisation of individual actions as being embedded in collective activity systems. The development of Activity Theory by Engeström (1987) describes six interconnected components in an activity system. In addition to the *Subject*, *Object* and *Instruments* of early forms of Activity Theory, Engeström situates these within a *Community* with its own *Rules* and *Division of Labour*. In Activity Theory, learning is seen as embedded in activity systems described by these six components (see figure 2.2). Communities in Activity Theory defines the collective social basis of activity, the Rules mediate the relationships between individuals within the system and the community and the Division of Labour describes the organisational elements of the community. These three elements define the unobservable parts of the activity system and interact with the goal-oriented actions that result from the subject, object and mediating instruments of the activity system.

A number of studies have applied Activity Theory as a framework for analysing the development of teacher knowledge through school and university partnerships. Tsui and Law (2007) used Activity Theory as a framework for the analysis of the development of knowledge amongst trainee teachers in Hong Kong, using a lesson study to create a 'boundary-crossing' context between school based and university based elements of the trainee's development. Tsui and Law describe findings that show how trainee teachers were supported through the mediation of the university tutor within a complex connection between two activity systems in order to establish new roles and relationships within the activity system of their setting. The authors argue that this process enabled participants to re-negotiate what they see as learning and thus to begin to resolve contradictions around their own professional knowledge. In their conclusion

Tsui and Law highlight their view of professional learning as boundary-crossing in relation to coupled activity systems. There is perhaps a parallel here with the concept of threshold concepts, discussed in the next section, but in a form that is situated in professional context within communities of practice.

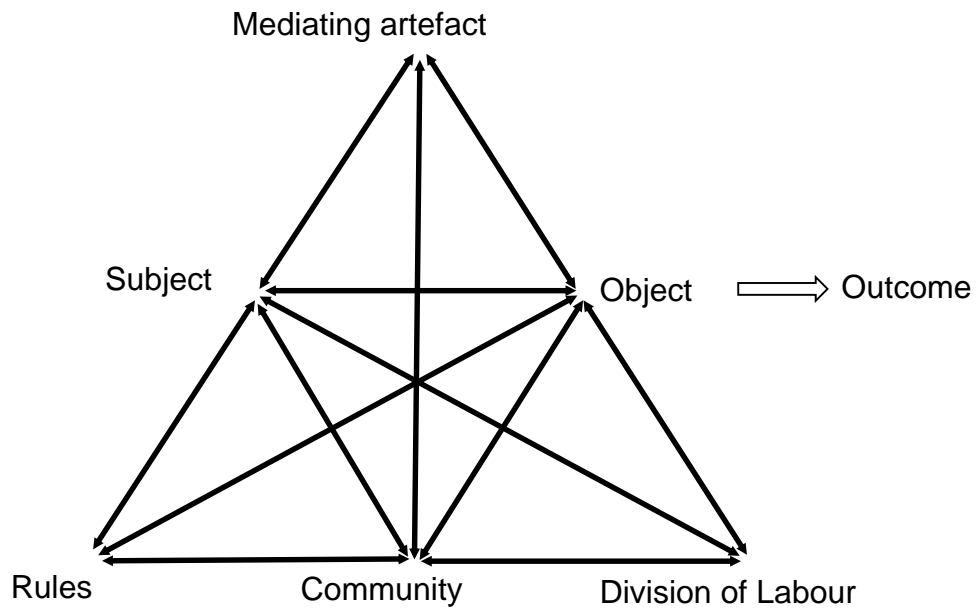


Figure 2.2 Components of an Activity System (Engeström, 1987).

Barma (2011) used CHAT as a framework for a case study of a young high school biology teacher in Quebec developing a new teaching sequence. Semi-structured and informal interviews were used to examine the teacher's experiences of planning and implementing a new teaching sequence. Barma made a detailed analysis of an individual case study using CHAT to describe the process of change that resulted from planning a new teaching sequence. It is particularly interesting to note that of six intended case studies, only in the one reported was the researcher able to complete data collection and a characteristic of this case study seems to be a congruence between the teacher personality in relation to an orientation towards change and matching aspects of the community of the school that were similarly oriented towards change. In terms of CHAT it would be interesting to explore tensions that might exist between the individual elements in the top of the framework and Engeström's community components from the base of the model. In a similar study, this time of two beginning science teachers in the US, Saka et al (2009) used a CHAT framework to analyse the experiences of the two teachers during their first year in teaching. Data collection included

questionnaires, semi-structured interviews with the participants and co-workers and classroom observations. The components of CHAT were used in an analytical induction to identify features of CHAT that were experienced by the participants. These features were conceived by the authors as:

1. *Subject*: The novice science teachers as well as these teachers' collective participations within the activity systems.
2. *Object*: The science teachers' goals and teaching practices.
3. *Rules*: The validation system of the district in which the school is located, the rules and regulations of the state for becoming a teacher, financial and other incentives for teaching, and the rules of the school where the beginning teacher is employed.
4. *Community*: The culture of school, the value of its members, and even the value system of the researcher.
5. *Division of labor*: The role of mentors in the school, the role of induction programs, the role of administrators of both the school and the district, the role of other teachers, and the role of the researcher.
6. *Mediating artifacts*: The tools of the activity system including lesson plans, documents, class materials, and textbooks.
7. *Outcomes*: Novice teachers' enactment of science with regard to consistent reform based practices. (Saka et al., 2009, p.1001)

In their discussion of the findings from these two case studies, Saka et al. drew out the complex inter-relationship between the individually situated components of the activity system and those of the community of practice. In the two cases there were clear differences in the communities, rules and division of labour and the influence of this was in the extent to which the community of practice contradicted the personal orientation of the teacher. For one the lack of contradiction between these two halves of the activity system led to the development of a personal sense of 'teaching effectiveness' and for the other an experience of 'internalisation of compliance-oriented leadership. Saka et al. also noted the lack of engagement in other activity systems beyond the context of their own school setting.

2.1.3 Transformational forms of teacher knowledge

Another perspective on teacher knowledge comes from examining the transformation of professional knowledge through the process of research or teacher inquiry. Cochran-Smith and Lytle (1999) suggest that teacher action

research generates local knowledge where the most significant aspect is the process by which individual teachers are able to inform their own practice through inquiry that is not directed by 'university discourses' but is mediated through more general professional discourses. Here it is the transformative effect for individuals in engaging with inquiry that is the significant feature of developing professional knowledge. Cochran-Smith and Lytle are sceptical about the imposition of norms of academic research on teacher inquiries, seeing the development of professional knowledge as better examined through a distinct form of teacher research and inquiry. This claim has implications for this study given the potential influence of the study itself on professional knowledge that may come about as a result of the continuing dialogue between researcher and practitioner over the duration of the study.

Picking up on a connection with the previous section, Clarke and Fournillier (2012) used Cultural-Historical Activity Theory as an analytical lens with which to examine a first and second order action research study of pre-service mathematics teachers in the US. Documents from the pre-service teachers own course in action research and mathematics pedagogy were used as data sources for the action research project into the professional development of the teachers in the study. The intention of the authors was to develop high levels of cognitive demand for the pre-service teachers by engaging them in developing their own action research rather than learning the rules and practices of their school settings as novice teachers. In their discussion Clarke and Fournillier make a case for the use of action research as a tool for developing a greater degree of reflectiveness on their own learning and professional knowledge. Their use of CHAT as a framework highlighted the complexity of teachers' professional knowledge development. This suggests a potential role of the university setting in providing a second activity system within which the pre-service teachers work and whilst this creates some conflict, the movement between the two activity systems, boundary-crossing, is seen as a fruitful challenge in developing reflective teachers.

In a three-year professional learning project Berry et al. (Berry et al., 2009) worked with teacher researchers to build case studies of the development of particular aspects of professional knowledge. The teacher researchers that were the participants in the case studies were part of a professional learning programme that engaged them in writing their case studies with the aim of translating reflections on their professional knowledge into improvements in

their practice as teachers. Berry et al. then examined the teacher researcher cases for broad themes revealing three categories:

- Developing practice: here there was a focus on the teacher's role and mode of working e.g. taking risks in teaching; providing intellectual challenge.
- Developing student understanding: in this theme a focus on learning was exemplified by issues such as assessing student knowledge, linking learning experiences.
- Pedagogical development: where a focus on teaching and learning are linked, for example through issues relating to unpacking student understanding. (Berry et al., 2009)

The cases show a considerable level of development in terms of teachers' understanding of teaching and of learning as separate themes. Less common was evidence of a combination of these areas. In describing the third theme emerging from the cases Berry et al. offer a number of examples where the process of reflecting on their teaching from a different perspective was a major influence on individual teacher's awareness of the links between their own practices and the students' learning. For some this was through an opportunity to step back from their teaching role, for others it was through an opportunity to reflect as a learner on how their own students might experience learning in their classrooms.

This emergent theme of the teacher as reflective teacher researcher being able to make connections between their practices and behaviours and the learning of their students has significant implications for the development of professional knowledge. If this finding is generalisable it implies that for teachers to be able to explicitly recognise changes in their pedagogy that might have an effect on learning, they need to have an intellectual space to examine their own tacit and habitualised knowledge and practices. Without this opportunity for reflection the tacit nature of teacher knowledge would be reinforced by the professional isolation experienced by practicing teachers. Berry et al. conclude that

being encouraged to develop a teacher researcher stance (...) has given time and space for participants to develop their professional autonomy and, in so doing, to reflect on their practice in ways that are not always possible in the normal busy life of teaching (2009, p.592).

So, for some researchers, teacher knowledge seems to be defined by its change and this may be significant in the context of this thesis which seeks

to examine teacher knowledge through the experiences of early career teachers. It seems likely that in some respects these individual teachers will come to know about their own knowledge, at least in part, through the experience of change.

A potentially fruitful framework for considering the development of professional knowledge where there is a strong theoretical underpinning is that of threshold concepts. This understanding of problematic areas of undergraduate learning was developed in the last decade in relation to teaching in further education but is increasingly being applied to wider areas of knowledge development. Threshold concepts were defined by Meyer and Land as:

...akin to a portal, opening up a new way and previously inaccessible way of thinking about something. It represents a transformed way of understanding, or interpreting, or viewing something without which the learner cannot progress. (2003, p.412)

These “conceptual gateways” are characterised by their transformative, integrative and irreversible nature. Threshold concepts entail a considerable shift in perception of a subject in a way that links together relationships between aspects of previous knowledge; leading to a persistent change in the conceptions and thinking of the learner. What is offered here is a powerful notion of the dual aspects of professional understanding, the complexity of these areas of knowledge and the transformative nature of moving beyond the threshold to a new way of knowing that suggests that regression to earlier states is not likely. The potentially powerful aspect of the framework of threshold concepts lies within, what Perkins (1999) described as, the troublesome nature of knowledge that surrounds a threshold concept. Given the experience of many trainee teachers who often become ‘stuck’ in their development or reach plateaus of development beyond which they find it difficult to progress, I suggest that it may prove fruitful to consider areas of key professional knowledge held by teachers as constituting threshold concepts.

Threshold concepts have been applied to teacher education by Cove et al. (2008) through a project in which they explore the theories of threshold concepts and social capital to examine data collected through focus groups, questionnaires and semi-structured interviews with a cohort of 24 PGCE students into their probationary year. The authors’ intention in this study was to:

explore the intersections between the threshold concepts discerned by beginning primary and secondary teachers and their tutors during their (...) PGCE course, and by their professional mentors during the school session immediately following. (Cove et al., 2008, p.198)

Through analysis of interviews and focus groups with both PGCE and beginning teachers and the use of Likert Scales to identify recognition of possible areas of troublesome knowledge, Cove et al. (2008) identified ten threshold concepts that were recognised by beginning teachers as areas that had begun to change their understanding of learning in a classroom context. A number of the threshold concepts identified by Cove et al. (2008) relate to a wider scope of professional knowledge and understanding than is the focus of the proposed study. However, several of these threshold concepts either relate directly to understanding the nature and role of talk in the classroom and how to plan for effective talk in classrooms, or underpin a view of learning by the teacher that implies recognition of the complexity and problematic nature of learning. Two of Cove et al.'s threshold concepts recognise the troublesome nature of the learning process for beginning teachers and the need for them to shift their sense of what learning is about to a complex professional context. For many beginning science teachers this is their first experience of learning in a complex and real professional environment and the demands this places on their own identities as learners can be very significant. I would argue that teachers' use of talk is underpinned by their personal epistemologies and beliefs about the nature of learning. Thus, if there are threshold concepts relating to understanding the complexity of learning in science classrooms, these will have an influence on teachers' understanding of the use of talk in classrooms. Blackie et al. (2010) argue in a paper on the development of academic staff in higher education that a notion of student-centeredness is a threshold concept for teachers in higher education. There are parallels here with the suggestions of Cove et al. around problematizing the role of the teacher and 'student-centeredness' that would have an influence on the way in which teachers approached ideas of classroom talk. If there is evidence that becoming student-centred is a threshold concept as defined by Meyer and Land (2003) then this could be significant in the development of new teachers' ideas about classroom talk. The transition from a teacher-centred to student-centred view of the teacher's role would have an influence on the way classroom talk is conceived by the teachers. Whilst Blackie et al make the argument that this change is transformative, irreversible and integrative, characteristics outlined by Mayer and Land as indicative of the notion of a

threshold concept, they do not offer any evidence of the recognition of this by academic teachers. Indeed, a problem with Threshold Concepts seems to be the difficulty of identifying them through evidence from the learners themselves. This may be a feature of Threshold Concepts, that they are difficult to identify from the liminal space of one who has recently crossed a threshold. Or it may be that Threshold Concepts are merely an articulation on the part of the teacher of problematic areas of learning that they experience in their subject discipline. Most of the literature on Threshold Concepts is within higher education teaching. Again, in a higher education context, Zepke (2013) examines the possible implications of a synthesis of threshold concepts and pedagogic content knowledge (PCK). In exploring the overlap Zepke defines PCK as existing in the intersection both of content and pedagogy as described by Shulman (1986) and a dimension of teacher as designer and learner as engager envisaged by Entwistle (2008). As in Blackie et al's (2010) paper, Zepke is endeavouring to describe a sense of the specialist and problematic knowledge that is held by the teacher and suggests that it has the potential to enable "content experts to explore ways of helping students understand a difficult subject" (Zepke, 2013, p.100) .

In their conference paper, Atherton et al. (2008) take a different approach to exploring threshold concepts in teacher education. They address the issue of supporting the engagement of teacher training students in post-16 education with aspects of their own vocational or academic discipline by identifying threshold concepts in the discipline taught by the students. On the evidence of their study Atherton et al. suggest that threshold concepts are more problematic to identify in areas with a strong vocational element. In vocational domains the identified threshold concepts were less well defined and often involved an affective rather than cognitive change in understanding of the discipline.

The integrative nature of threshold concepts offers a useful way of thinking about teacher education. In the context of undergraduate study of economics Davies (2006) suggests this integrative nature makes a threshold concept troublesome since it requires students to acquire "pieces of declarative knowledge and understanding" and then at a later stage to re-interpret their current ideas in the light of the threshold concept. Davies makes the point that if this fails the teacher and student may "settle for the appearance of understanding" . For trainee teachers the integrative nature of threshold concepts may indeed offer a way of making sense of the often dislocated and diverse aspects of emerging professional practice with which

they grapple in the early stages of their training. For example, recognising the interplay between planning lessons to give individual pupils access to the intended learning and the interactions with these pupils during lessons may be underpinned by a shift in the teacher's focus from the learning of the whole class to that of individuals within the class. Threshold Concepts offer a potentially interesting lens through which to look at what is clearly a problematic area of professional learning. There are, however, some problematic aspects of the notion of a threshold concept that emerge from the literature. The difficulty of defining the exact nature of a threshold concept is evident, especially in the context of professional knowledge rather than more clearly defined academic disciplines such as economics. It may be more difficult again in this study where the evidence of threshold concepts will, by the nature of the study, come from the concepts of classroom talk held by the teachers whose knowledge is being studied. Threshold Concepts as an approach appear to offer more to the teacher educator in identifying problematic but transformative areas of professional knowledge than they do to the teacher as the learner. There is a peculiarity of studying teacher knowledge development that is attempting to describe the pedagogy of pedagogy. This meta-level of developing the learning about learning of teachers may be part of the difficulty in establishing what are the threshold concepts relating to teacher knowledge.

Eraut's (2000; 2007; 2014) work on professional learning may offer a synthesis of both the situated or social aspects of professional learning and the personal forms of knowledge held by professionals which individuals bring to a practice situation. Eraut also makes a distinction between codified forms of knowledge and uncoded or cultural knowledge. From his studies of professional workplace learning Eraut identifies six strands of personal professional knowledge:

- Codified knowledge ready for use;
- Knowledge acquired through enculturation;
- Knowledge constructed from experience, social interaction and reflection;
- Skills developed through practice with feedback;
- Episodes, impressions and images that provide the foundations for informal knowledge;
- Self-knowledge, attitudes, values and emotions. (Eraut, 2014, p.48)

Mode of Cognition			
Type of Process	Instant/Reflex	Rapid/Intuitive	Deliberative/Analytic
Assessment of the situation	Pattern recognition	Rapid interpretation	Prolonged diagnosis Review with discussions and/or analysis
Decision-making, single or serial	Instant response	Intuitive	Deliberative with some analysis or discussion
Overt actions or sequences of actions	Routinised action	Routines punctuated by rapid decisions	Planned actions with periodic progress reviews
Metacognition	Situational awareness	Implicit monitoring Short, reactive reflections	Conscious monitoring of thought and activity Reflection for learning

Figure 2.3. Interactions between time, mode of cognition and the nature of practice from Eraut (2007, p.407)

A feature of Eraut's approach to professional learning is that he treats socio-cultural and individual theories of learning as complementary and attempts to unify these elements of learning in his approach to analysing professional learning. Eraut emphasises the significance of cultural knowledge held by professionals that is not, and perhaps cannot, be codified or described in written form. This tacit knowledge is arguably significant to teachers in their practice and actions, what Eraut terms their:

... 'performance' in a broad sense that includes those thoughts and actions, which take place within a chosen performance period, or which focus primarily upon preparing for, or reflecting on, that period. (Eraut, 2007, p.406).

In analysing the 'performance' of professionals in the workplace Eraut identifies three dimensions of cognition in four elements of practice. These are summarised in table 2.3.

The elements of practice described here are seen as distinct for the purpose of analysis but likely to exist within complex and interleaved performances by the professional. The types of processes within which these elements of performance are enacted by professionals exist in different time frames, from *instant/reflex* to *deliberative/analytic* which also indicate a dimension of tacitness and consciousness with which the individual draws on their knowledge. *Instant/reflex* processes will be routinised and largely unconscious, *rapid/intuitive* involves greater self-awareness but remains semi-routinised and is characterised by drawing on experience of similar situations in order to determine performance and *deliberative/analytic* involves the conscious use of explicit knowledge, often applied to new situations. This framework has interesting implications for the nature of teacher knowledge on classroom talk. Much of the decision making in relation to classroom talk is likely to exist in the *instant/reflex* and *rapid/intuitive* processes of classroom performance. If this is the case then the extent to which the teachers in this study are able to describe their knowledge of classroom talk may be limited where the knowledge that is operated on in classroom performance is routinised and unconscious. It leaves a question as to the extent to which the teachers will be aware at a reflective level of their own performance in respect to classroom talk. This is further highlighted by the third dimension of professional knowledge suggested by Eraut, that of context for new practitioners. Eraut identifies the problems of cognitive load on new practitioners in nursing in their first weeks and their need to survive depending on them "*being able to reduce their cognitive load by prioritisation and routinisation during their first year of employment*" (Eraut, 2007, p408). This need to routinise aspects of practice to survive the challenges of early stages in a new profession is compounded by the difficulty that experienced professionals can have in explaining what have become tacit routines to new trainees. Eraut describes these findings in relation to studies of newly qualified nurses but also draws on similar findings from teachers.

Eraut's conceptualisation of the transformation of professional knowledge draws in the earlier work of Broudy et al (1964) and Dreyfus and Dreyfus' (1986) five level model of progression in professional knowledge development. The model suggested by Dreyfus and Dreyfus highlights the

transition of professional knowledge to a stage of expertise where a tacit understanding of holistic situations is rooted in intuitive decision making. Proficiency in Dreyfus and Dreyfus' model is seen as a move from adherence to rules to an intuitive mode of reasoning and action. Action around classroom talk by teachers will clearly require a degree of intuitive knowledge as a result of the need for rapid decision making in the moment of transaction of classroom talk. However, what seems less likely is that there is a clear transition from following rules of classroom talk to an intuitive mode of knowledge. Perhaps one of the problematic features of the development of early career teacher knowledge is the need to act in holistic and intuitive modes at the stage of novice teacher. However, application of Dreyfus and Dreyfus model to the context of early career teachers seems problematic in that it fails to recognise the need to act intuitively at a novice stage. Eraut's conceptualisation of professional knowledge offers a perspective that attempts to avoid over-simplification and capture the complex interaction of tacit and codified knowledge in professional practice. In this respect it may be a useful perspective in examining the development of the case study teachers' knowledge of classroom talk over the length of the study.

2.2 Knowledge of Classroom talk in Science Lessons

In UK schools there has been a degree of recognition of the importance of discourse in classrooms, largely through the influence of the Qualifications and Curriculum Authority (2003) and the National Strategies materials (Department for Education, 2011a). The National Strategies materials to support the primary phase made explicit mention of the role of classroom talk and gave advice for teachers in developing their use of talk for learning. National Strategy materials in the secondary sector did not include this explicit reference to talk, per se, but included embedded notions of the role of teacher talk in materials designed to support assessment for learning. These professional development materials and discussion documents were informed by an emerging literature in the UK on classroom talk that stemmed from the work of Douglas Barnes (1976) and more recently of Rupert Wegerif (2006; 2008) Robin Alexander (2001) and Neil Mercer (1995). These authors are part of a move away from examining how individual students engage with ideas and concepts in their learning to recognise the importance of the social plane of the classroom and drawing on sociocultural learning perspectives with a Vygotskian emphasis on the role of language, both social and internal, in learning. The philosophical framework of dialogic or dialectic approaches to teaching stem from a sociocultural or neo-sociocultural paradigm of education. This paradigm recognises the significance of language in learning advocated in Vygotsky's dialogic process and Bakhtin's dialogic process. In this literature review I have focussed on the overlap between understanding of teachers' professional knowledge and research into teachers' use of 'talk' in the classroom that is informed by more philosophical literature on educational dialogue.

2.2.1 Frameworks of analysis of classroom talk in science lessons

In their book *Meaning Making in Secondary Science Classrooms*, Mortimer and Scott (2003) present an analytical framework for analysing interactions between teachers and pupils in science classrooms. In their framework they outline five aspects of analysis relating to the focus, approach and action of the interactions. These aspects are: the teaching purposes; content; communicative approach; teacher interventions and patterns of interactions (see figure 2.4). Mortimer and Scott place communicative approach at the centre of these interlinked aspects of analysis. They define communicative approach as whether the interaction is authoritative or dialogic in nature and

as to whether the teacher interaction with pupils is interactive or non-interactive.

In this analytical framework patterns of interaction are identified according to the nature of initiation-response-evaluation (IRE) or initiation-response-feedback (IRF) triadic patterns of talk between teacher and pupils. Mortimer and Scott adopt an approach similar to Wells (1999) in distinguishing between the nature and purpose of the third move in a triadic pattern of discourse. Where the third move functions as an evaluation of the pupil's input against the science view, the talk can be considered authoritative: where the feedback in the IRF mode is intended to elicit further ideas and responses from the pupils it is seen as dialogic. Thus, as Mortimer and Scott (2003) describe, triadic patterns of authoritative talk are typified by closed triads in the IRE form whereas dialogic teacher talk is characterised by extended triads in the form I-R-P-R-P- (initiation, response, prompt, response, prompt etc.). The chain pattern development of triadic discourse has further possibilities of analysis, chain patterns can be described as open or closed depending on the inclusion of a final evaluation (I-R-P-R-P-E) thus closing the chain or where there is no evaluation the chain is left open. Chains of interaction may also involve more than one respondent or be initiated by a question from a pupil.

Aspect of Analysis		
Focus	<i>Teaching purpose</i>	<i>Content</i>
Approach	<i>Communicative approach</i>	
Action	<i>Teacher interventions</i>	<i>Patterns of interaction</i>

Figure 2.4. Analytical framework suggested by Mortimer and Scott (2003)

The teaching purposes strand of the framework identifies six purposes to the interactions. These are all directly related to the learning intended by the teacher and do not address other purposes such as social interactions with pupils, a point I will return to later. The six purposes identified by Mortimer and Scott (2003) are:

1. Opening up the problem;
2. Exploring and probing students' views;
3. Introducing and developing the scientific story;
4. Guiding students to work with scientific ideas and supporting internalisation;

5. Guiding students to apply, and expand on the use of, the scientific view and handing over responsibility for its use;
6. Maintaining the development of the scientific story.

These six purposes are informed by both observations of lessons and a Vygotskyian perspective on teaching and learning. Given that the focus of this thesis is on the development of teachers' understanding of the nature and purpose of talk it might be useful to re-examine these purposes in the light of the interviews with the case study teachers in the early phase of their career. I suspect that few student teachers enter the profession with anything like a Vygotskyian perspective on teaching and learning.

<i>Talk type</i>	Characteristics
Teacher presentation	<ul style="list-style-type: none">• Instructional• May be a mini-lecture consisting of only some sentences• No questions and no hint of students taking part in the discussion• Students' previous answers may affect teacher talk
Teacher guided discussion	<ul style="list-style-type: none">• Described with the IRF structure• Feedback from the teacher is evaluative
Authoritative discussion	<ul style="list-style-type: none">• Students' answers may affect the teacher's talk following the student's answer• Does not mean that the teacher is following a ready-made sequence of questions
Dialogic discussion	<ul style="list-style-type: none">• The feedback supplies elements for a further extension of the response by the students or elicits new ideas
Peer discussion	<ul style="list-style-type: none">• Students are talking in groups• Discussion is very often teacher-guided• Has a specific purpose (e.g. the teacher has given students a problem to discuss)
Other	<ul style="list-style-type: none">• Teacher talk not related to the topic• Talk related to students' social affairs

Figure 2.3. Characteristics of the different talk types identified by Viiri and Saari (2006).

There are similarities with the level of analysis of classroom talk undertaken by both Mortimer and Scott and Viiri and Saari (2006) in an analysis of teacher talk patterns that compared an experienced teacher tutor with a student teacher. Since the intention was to examine the characteristics of the teachers' interactions with pupils around learning activities, the analysis was done at a level that was intended to be accessible to student teachers as part of a teacher education programme. Their categories of talk were also informed by the distinction between authoritative and dialogic purpose in the talk in the way that this was indicated by the nature of the third move in a triadic patterns of discourse. They used IRF triads as indicators of authoritative and dialogic talk patterns using the two part classification suggested by Mortimer and Machado (2000). Viiri and Saari build these characteristics into three categories of talk based on the organisation and purpose of different parts of the lesson, teacher presentation, teacher-guided discussion and peer discussion. Teacher-guided discussion is further separated into authoritative and dialogic discussion. In the peer discussion category their analysis is of teacher interactions during this mode, rather than analysis of the talk of all the participating pupils. The characteristics of each type of teacher talk are presented from analysis of video and audio recordings of the teacher (see figure 3).

In another analysis of classroom talk patterns of Finnish teachers, Lehesvuori et al. (2013) focus on a temporal analysis of the cumulative patterns of discourse in science lessons during episodes of whole class teaching, again following an analysis framework based on Mortimer and Scott's communicative approach framework. The analysis of talk patterns in this study also addresses the temporal patterns of talk during the lesson in terms of Scott and Ametller's (2007) structure of 'opening up' and 'closing down' of discourse in presenting the science in a lesson. In their analysis Lehesvuori et al. identify the temporal 'opening up' and 'closing down' elements of teacher interaction as seen in moves from Authoritative Interactive (A/I), through Dialogic Interactive (D/I) and Dialogic non-interactive (D/NI) to Authoritative Non-interactive (A/NI). Where dialogic episodes occurred in the analysed lessons there did seem to be a pattern of oscillation by teachers through this cycle of interactivity from Authoritative, through Dialogic and back to Authoritative approaches. The authors recognised a scarcity of dialogic episodes in the observed lessons and suggest one of the key implications of the graphical representations of the patterns of teacher talk during the sequence of a lesson might act as a way to enable teachers to visualise patterns of talk in their planning. Given the

complexity of teacher knowledge explored earlier it would be a problematic tool of analysis to operate as a practicing teacher. The authors also made a contrast between case study teachers with more and less dialogic patterns and suggest this may relate to their epistemic view of the classroom, either of covering content or the process of making science.

Walsh (2003), in his work on developing teachers' understanding of discourse in second language classrooms, uses self-evaluation of teacher talk (SETT) as a tool to promote discussion and reflection by teachers on their classroom discourse practices. This self-evaluation framework is built around a need to recognise the pedagogic purpose of different contexts within which teacher talk occurs, to provide a framework for teachers to reflect on their own use of interactions and teacher talk in lessons. Whilst the framework is intended to be specific to second language learning the notion of identifying modes of teacher talk by their pedagogic purpose is potentially useful and could be transferred to the context of a science classroom, particularly since the design of the SETT framework is intended to prompt reflections by teachers on their own practice and understanding of the nature and purpose of their classroom talk. In the SETT framework the managerial mode, where the goal is defined as "the organisation of learning" talk features a "single extended teacher turn (usually an instruction or explanation) and an absence of learner involvement" (Walsh, 2003, p.130). In materials mode, intended learning outcomes are taken from materials-focused language practice. Here, typically, the IRF sequence dominates. The skills and systems mode follows a similar interactional organisation to materials mode. However, pedagogic goals are not determined by the materials, but from "teacher and learner agendas". In classroom context mode there is a shift from teacher controlled short turn sequences to providing an opportunity for learners to develop fluency through extended learner turns and minimal repair. These modes, which relate to pedagogic goals and are typified by certain interactional features, have parallels with the analytical framework developed by Mortimer and Scott (2003) but in their design as a self-evaluation tool for teachers may offer something in the way they attempt to present modes of teacher talk and interactions in a simple framework.

2.2.2 Studies of science classroom talk

In this section of the review a range of studies that describe the nature of science classroom talk in contemporary classrooms is explored. There has

been an increased value placed on dialogic teaching over recent years (Mortimer and Scott, 2003; Alexander, 2008) but to what extent has this focus in the literature transferred to secondary science classrooms? There is a somewhat limited literature that describes the nature of classroom talk in modern secondary science classrooms, and what there is suggests that there is little change in the kinds of talk employed by teachers.

An ethnographic study by Bleicher et al. (2003) examined the discourse strategies used by students and their US high school chemistry teacher over a four week period. They used field notes, video recordings and interviews to focus in particular on a description of discourses used to support experimentation in the classroom. Discourse analysis was employed with the video transcripts to examine small chunks of interactions and non-verbal communications. The case study teacher in this study used tightly controlled discourse that was focussed on question and answer sessions based on assignments and practical demonstrations. There was a sense in the interviews, with both the teacher and students, of an agreed focus on covering curriculum content in a short time with the teacher both seen by students and by themselves as a transmitter of knowledge. The detailed description of a tightly controlled authoritative discourse that is driven by the need to get curriculum material covered resonates with the current situation in England with a focus on the national curriculum in science and the introduction of performance targets for teachers.

Pimentel and McNeill (2013) studied the whole class discussion elements of high school science classrooms within the context of a pilot of an issue based urban ecology curriculum designed to engage under-represented students in science study in the US. There is a clear difference in context from Bleicher et al.'s (2003) study in that rather than a typical teaching sequence within a science curriculum, Pimental and McNeill's study is within a teaching sequence with a more issues based discursive focus. There are similarities in that the study examined the beliefs of the teachers about their own classroom talk. Pimental and McNeill found that the classroom talk was characterised by student responses that were predominantly single words or short phrases and lacked any extended reasoning. This is despite the provision of professional development for the case study teachers in the context of the curriculum development that was intended to highlight strategies to support students in showing extended reasoning in their responses. The study found that whilst the teachers all used an interactive approach to whole-class discussions they all positioned themselves as the

directors and feedback providers during discussions. Triadic discourse dominated discussion with students almost exclusively addressing the teacher and not each other. The analysis of teacher moves within the discussion found that these played a role in either limiting or encouraging student responses with cutoffs of student answers or elaborations that provided the reasoning for students' short responses being evident in the talk patterns within the lessons. In the interviews with the teachers, the participants recognised the limitations of their classroom talk practices and were self-critical in identifying the need for better structures in the classroom to support discussions and a lack of skill in facilitating discussions. The most pressing constraint identified by the teachers was time, with a sense of pressure to cover content described as identified by Bleicher et al. (2003). In Pimentel and McNeill's study this pressure is alleviated somewhat by focussing on a new curriculum context with a focus on issues in ecology and attempts to develop teachers' skills in discussions.

Hanrahan (2006) uses critical discourse analysis to examine two lessons by different practicing science teachers in the Australian independent school sector. The teachers are part of a larger sample selected on the basis of nominations by educators and a self-evaluation of the level of engagement by pupils in their lessons. The lessons were chosen as representative of the secondary context of schooling in Australia and hence suggested to be easy for secondary teachers to relate to. In each instance a detailed textual critical discourse analysis (CDA) was made of a single extract from the beginning of the lesson. The audio taping was of the teacher's talk and no analysis was made of student talk in these extracts. The two teachers analysed had noticeably different teaching styles in these lessons and it seems reasonable to infer that elements of their discourse were characteristic of their lessons more generally. These contrasting approaches were used to illustrate a diversity in the extent to which the lessons were 'access-limiting' or 'access enhancing' for student engagement with science. The use of CDA provides a highly detailed analysis of the linguistic characteristics of the teacher talk of two contrasting teachers in the early part of their lesson. Hanrahan contrasts features of the authoritative talk, or hegemonic discourse, that typify what Lemke (1990) termed the stylistic norms of school science with a more dialogic approach that deviates from these norms. However secondary science classrooms in the UK have been through a period of change in the last decade with an increasing awareness through professional development of a wider range of teaching approaches than might have been recognised two decades ago. Hanrahan also draws conclusions relating to the extent to

which students are engaged by the implied level of student autonomy where the teaching is more dialogic and draws similar contrasts between a classroom environment as a 'work-place' and as a 'learning community'. In interviews prior to the lesson observation Hanrahan explores the teacher's own understanding of their role in the classroom and personal epistemologies of science. Here contrasts are drawn between a self-view of the teacher as 'technical expert' and presenter of knowledge, where the personal epistemology was of a passive relationship between students and science knowledge and a self-view of that of a classroom manager, communicator and learning facilitator. This more complex view of the teacher's roles is described by Hanrahan as a hybrid identity. The move in professional identity from that of 'presenter of knowledge' to Hanrahan's hybrid identity could be viewed as a possible threshold concept, it might be expected that the development of such a hybrid identity would be transformative, integrative and irreversible. In drawing conclusions from the study Hanrahan discusses implications for professional development of the traditional stylistic norm of science teaching in limiting access to the science curriculum for students. The point is made that the authoritative teacher/passive student roles create a discourse environment that is difficult for many students to succeed in. Thus the implication is that a shift to more dialogic teaching styles is advantageous for engaging more pupils in successful science learning. Hanrahan believes that the shift to more dialogic modes is something that can be learnt by teachers but is clear about the potential barriers to achieving this; in particular where the context with which the teacher works will tend to support a stable absence of change. It is interesting to reflect that the case studies were from the independent school system in Australia, and it may be that there are similar pressures in academically successful schools in the UK to maintain a status quo that is already succeeding in producing the limited outcomes in terms of student understanding of science that is assessed in examinations that tend to focus on recall of factual knowledge.

Wegerif (2008) explores the ontological assumptions of research on educational dialogue. In doing so, he makes the argument that the term dialogic is often used in education studies in a way that doesn't make a clear distinction between Vygotsky's use of dialectic and Bakhtin's dialogic. Wegerif's argument in making the distinction more explicit is in recognising the ontological difference between discourse with a dialectic purpose in mediating ideas toward an authoritative view and that with a dialogic purpose in recognising multiple views or of an agreed but inter-animated

view that is constructed by the participants in dialogue. There is a tension for science classrooms between philosophical views of ontology and learning in this sense and of the need to engage children with a canon of science knowledge. Studies that examine the space for more Bakhtinian dialogue in science classrooms have looked at the use of argumentation in science as providing an opportunity for more dialogic teaching.

In their case study Christodoulou and Osborne (2014) follow an experienced teacher's attempts to use argumentation in their science lessons over the course of a year. Six argumentation focussed lessons were video recorded and the discourse in the lessons was analysed for epistemic operations. In focussing on argumentation in lessons the study found that the most common epistemic operations from the teacher were around the idea of providing and using evidence to construct arguments. These operations were in the form of either a modelling of discourse around argument in science by the teacher or in prompts for argument from the students. The authors define argument as "any attempt by the teacher to put forward a viewpoint, which is supported by evidence" (Christodoulou and Osborne, 2014, p.1294). The focus on the chosen lessons allowed the authors to show the possibility of a change in the lesson objective, in this case to more epistemic aims, resulted in changes in the nature of classroom talk on the part of the teacher. There was evidence of a move away from the usual focus on declarative knowledge to encourage students to engage in more discursive talk in the context of epistemic practices in science. In this case study the level of commitment of the teacher to argumentation as a positive shift in classroom practice may be influential in the extent of change in talk practices.

In an earlier study, Newton et al. (1999) found that argumentation in secondary science classrooms was rare and classroom discourse tended to be teacher led and not to foster discussion of scientific issues. In a cognitive appraisal interview study of 30 secondary teachers, Sampson and Blanchard (2012) found that the teachers relied on prior knowledge in evaluating the validity of explanations and perceived the integration of argumentation into their teaching as beyond their students' ability levels. This suggests that for many teachers, a lack of argumentation or epistemological teaching in their own education is a constraining factor on classroom talk. Oulton et al.'s (2004) study examined the broader issue of public attitudes to controversial issues in science. In their discussion the authors advocate an alternative pedagogic model that refocuses intended learning outcomes on developing

critical thinking in pupils in response to controversy in science. An alternative pedagogy suggests by implication a challenge for teachers. Whilst the authors identify a need for curriculum reform I would suggest a parallel barrier in teachers' knowledge and familiarity with teaching approaches such as debate, role-play and discussion. Zeyer and Dillon (2014) argue for the inclusion of more environmental and health education within the science curriculum, in part, with the aim of creating more space for argumentation within science lessons.

Kind and Kind (2011) studied the success of adapting typical investigative science activities to facilitate argumentation in science classrooms. Their study made comparisons between different groups of students and between different tasks for the same group. The extent of argumentation in the lessons studied was limited. In their discussion of the findings, Kind and Kind point to two constraining features of students work: uncritical acceptance of measurements made in the context of a science lesson; a lack of hypothesising during experimentation and data collection. In this study the teaching was undertaken by one of the researchers. Given the potential challenges to teachers in explicitly addressing argumentation in lessons the constraints on argumentation in practical science may be even more significant than the authors found.

Ryder and Leach (2008) analysed the teacher to student talk in lessons where the teachers were using a set of developed resources designed to address the nature of science with post compulsory age students. In this study they found that, supported by the epistemology focussed resources, the teachers were successful at making the epistemology of science a strong feature of their classroom discourse. There was, however, some tendency to present epistemological statements about science in a simplified form that lacked the required contextualisation.

Whilst there are only a few studies that focus on describing the nature of classroom talk in secondary science lessons, all the studies present a view of limited levels of dialogic teaching in science and a tendency by science teachers to focus on short triadic interactions in the context of declarative science knowledge. Pressures of time in the curriculum, a teacher identity as disseminator of knowledge and assessment models that emphasise curriculum content over epistemological aspects of science appear to constrain teachers from more dialogic approaches to classroom talk. Where there is a re-focussing of teaching aims on epistemological aspects of

science teaching, argumentation or the nature of science, dialogic classroom talk seems to be more accessible to teachers.

2.2.3 Transformation of professional knowledge of classroom talk

In this final section I review a number of studies that engage with the issue of developing teachers' knowledge of classroom talk in different ways. There have been some attempts described in the literature to use interventions of one kind or another to develop teachers' understanding and use of different forms of classroom talk. Viiri and Saari (2006), in the previously mentioned paper, went beyond simply observing the talk patterns of the case study teachers, including student teachers, and attempted to inform the student teacher of the talk pattern analysis used. The approach they took was for the student teacher to observe one of their tutor teacher's lessons, discuss the talk patterns they used and then analyse a video recording of their own lesson. Subsequent changes in the talk pattern employed by the student teacher in the following lesson were highlighted by mapping the movement between the talk categories outlined earlier in figure 2.5 against a timeframe for the lesson. Following the intervention, Viiri and Saari's case study student exhibited more dialogic discussion and moved more frequently from one talk type to another. There were also periods when both authoritative and dialogic talk occurred which were not evident in the first lesson. In the interview with the student teacher they described the methodology of analysing talk patterns as interesting but they found it difficult to plan the talk pattern and saw it as problematic to 'change one's own way of talking'. This contrasts with the tutor teacher who was able to plan the kinds of discussion he would employ in the lesson and give clear reasons in subsequent discussion for the talk patterns used, relating these to improving students' learning.

These findings raise the question as to whether it is possible to succeed in introducing sophisticated notions of classroom talk patterns to student teachers early in their careers. The suggestion that talk patterns are something that cannot be planned for or adapted easily but are somehow part of one's character as a teacher is an interesting one and will be worth pursuing in this study. It may be that planning for changing instinctive patterns of talk may be something that can only come with experience and a certain level of mastery of other aspects of teaching.

A study by Lehesvuori et al. (2011) reported on the experiences of science student teachers who were introduced to an approach to science education drawing upon dialogic teacher-talk and authoritative teacher talk. The authors drew upon video data from the student teachers' lessons and interviews with the participants to explore the impact of an interventional program that ran parallel to the student teachers' practice. This intervention aimed to highlight, for the students, the presence and practice of a communicative approach in each planned sequence of their teaching. The communicative approach that was provided was based on Mortimer and Scott's analytical framework (2003). Overall, the study indicated that explicit teaching of a specific communicative approach to science teaching on a teacher training course was successful in raising the student teachers' awareness of teacher talk and for some students, at least, enabled them to use untypical dialogic approaches in their practice. Perhaps more interesting, given the nature of the study as an interventional approach to changing classroom talk practices, were the cases where participants were not able to implement dialogic approaches despite their intentions and the reasons they gave as constraints. The implementation of dialogic approaches tended to be limited to collecting, rather than exploring, pupils' ideas. The authors suggest a lack of confidence in subject knowledge as a limiting factor here. The student teachers frequently gave timing, discipline and lesson content as reasons for not adopting dialogic approaches in their lessons. There is also some comparison made between a sceptical and positively oriented student teacher, for the former the intervention raised awareness but had less influence on practice, and for the latter, positive experiences with the new approaches appeared to be a significant nudge. In this study a planned intervention to challenge student teachers' typical classroom talk practice highlighted the problematic and complex issues that determine individual teachers' classroom talk practices.

Pimentel and McNeill (2013) used a case study approach to explore both the patterns of talk in whole-class discussion and the case study teachers' beliefs about science talk. The five teachers in the study were high school teachers from the US with between two and thirteen years teaching experience. In their analysis of lessons student responses were coded as showing both thought and reasoning, complete thought resembling a sentence, a word or phrase or no response. The analysis of the teachers' talk focussed on parts of the lesson that expanded on pupils' responses and coded what the authors term 'teacher moves' as either: elaboration (occurs following a student response), cutoff (interruption of student response),

probe (request for student to expand their response) or toss back (passes response to other students). In addition the proportion of teacher-student interactions typified by IRE patterns was reported along with the social framing (teacher focussed or student-student interactions) and the epistemological framing of the lesson. The authors' findings highlighted limited extended reasoning responses from students and teacher approaches to talk that typically limited student responses. The social framing of lessons was almost always teacher focussed and entirely so for some of the teachers. As with the findings of Lehesvuori et al. (2013) the epistemological framing of the lesson appeared to have a significant effect, with a focus on covering 'factual information' by the teachers influencing the extent of their interactions with pupils. Interviews with the case study teachers found that with one exception they all saw the talk in their classrooms as less than ideal. Reasons that emerged in the interviews were categorised into three groups of constraining factors: student, teacher and time. In relation to students the teachers attributed limited talk to limitations they perceived in their students: either in a sense that there was a lack of motivation to be involved in talk with students seeing it as needing more effort, or a lack of subject knowledge with students seen as not having the knowledge resources to contribute meaningfully or being concerned to get it wrong. Both these seem to suggest a particular epistemological view of the classroom as having a focus on the content rather than the processes of science. This was despite the context of the study in developing the teaching of ecological issues. Some of them expressed a lack of self-efficacy in facilitating discussions and generating more student-driven talk. One of the teachers expressed a belief that it would be beneficial for him to talk less but found it problematic to do this in a whole class discussion. The most common limitation referred to by teachers was a time pressure and a tension between talk focussing on students' meaning making versus a focus on content and assessment of content knowledge.

Christodoulou and Osborne (2014) also worked with an experienced teacher but with the explicit aim of changing classroom discourse practices through a focus on implementing argumentation as part of the teaching approach. The authors observed an experienced teacher who had been involved in a professional development project to implement an argumentation approach to science teaching within his lessons. Examination of the teacher-initiated discourse during argumentation focussed lessons showed that as a result of engaged participation in developing an argumentation approach to some science lessons, there was a shift in the focus of talk toward a teacher role

as 'constructor' of knowledge and a change in the extent to which classroom discourse mirrored the epistemic practices of science. In the observed lessons there was a change in the teacher's role in negotiating rather than declaring the correct scientific meaning of ideas with students. In this study, changes in the kind of prompts and questions used by an experienced teacher changed in response to a clear epistemic focus to lessons rather than the learning of science curriculum content. A similar epistemic focus on the development of argumentation in classrooms is evaluated in a multiple case study reported by Chen et al. (2016). In their study Chen et al. used a mixed methods approach to examine the changes in elementary school teachers' development of the use of questions in response to a 4-year professional development project. This development project attempted to support teachers in developing argument-based inquiry instruction using the five stage Science Writing Heuristic (SWH) approach (Norton-Meier et al., 2008). The SWH approach presented in the professional development project attempted to introduce new language practices and pedagogical approach around dialogic interactions and questioning. Lesson observations were analysed for the teacher role in questioning based on a conceptualisation of questioning roles around the ownership of ideas (teacher or pupil) and the ownership of activities. These were defined as dispenser, moderator, coach and participant. Analysis of the case study teachers involved in the project show a shift in the dominance of the different roles of questioning from dispenser, where the ownership of both ideas and activity lies with the teacher, to moderator and coach where the ownership of ideas and activities respectively, lie with the students. Increasingly multiple roles in questioning were used by the study teachers as they implemented an argument-based inquiry approach. Whilst there is a notable shift to the use of multiple roles in questioning in the case studies presented by Chen et al. the authors still identify limitations in the shift for the teachers. The role of participant where ownership of both ideas and activities are with the student made up a small proportion of the classes and the coach role was uncommon in the classes of two of the four teachers reported on. Chen et al. suggest that the challenge in the coach and participant roles is in the extent to which non-specialist teachers were comfortable challenging and critiquing the ideas of students where there was a need to resolve differences between the students' thinking and the science view. They also suggest that there is a challenge to shifting the ownership of talk to the students in an environment of accountability and testing, an aspect of teaching that

suggests parallels between issues for teachers in both the US and UK context.

As part of the evidence based practice in science education (EPSE) project (Ametller et al., 2003) on designing teaching that drew upon a range of research evidence, teaching sequences were developed to be used by experienced teachers to enhance pupils' understanding of conceptually difficult topics in science. Part of the evidence base drawn upon in these sequences was on the importance of classroom talk and attempts were made to embed this, both in the nature of the activities planned and explicitly in supporting guidance notes. In a report on the outcomes of this process in one of the sequences (Hind et al., 2002) the changes in the pattern of talk of the teachers enacting the sequence are compared with a lesson by the same teacher in a similarly conceptually demanding lesson and with the pattern of interactions as envisaged by the teachers and researchers who planned the sequence. The three case study teachers analysed all showed very different patterns of interactions: all three changed the pattern of talk in response to the nature of the planned interventions and the guidance notes. The way in which they responded to this guidance depended on their own typical patterns of interactions. In particular the extent to which their interactions were normally conceptually focussed rather than on managing the classroom environment had a strong influence on the way they responded to the teaching sequence. This reinforces the suggestion that the nature of the interactions employed by the teacher is somehow tied up in their classroom persona and their beliefs about effective teaching.

In work with both secondary and primary teachers in science lessons, Mercer et al. (2009) describe a project that both analysed the talk of volunteer teachers who were interested in developing dialogic teaching and attempted to provide support for them developing their use of talk through the employment of '*Talking points*'. These talking points are a series of statements about a science topic that range from accurate, through contentious to incorrect. These statements are intended to be used by the teacher to stimulate discussion with pupils that is more dialogic by giving an increased focus to the pupils' ideas in the classroom. Without these statements they found that much of the teacher-pupil interactive discourse was rooted in IFR triads based on generally closed questions and seemed intended to check pupils' knowledge of the topic. They concluded from their study that even where teachers are motivated enough to volunteer to participate in a study, they seemed to require reassurance that dialogic

teaching is an appropriate way to foster children's understanding of science and lacked an awareness of the nature and importance of their own participation in classroom talk.

Newton and Newton (2001) examined the relationship between teacher subject knowledge in science and teacher-pupil interactions in primary classrooms. They found that those teachers with post compulsory science qualifications, deemed 'more knowledgeable' engaged in more subject relevant discourse in lessons than the less knowledgeable teachers. More knowledgeable teachers were engaged in more causal explanations and questions. Whilst there is a clear difference in terms of the subject knowledge background between primary and secondary teaching (all secondary science teachers in England are required to hold a science related degree level qualification to train) Newton and Newton's findings may suggest implications for the nature of classroom talk of the teacher's subject knowledge.

These studies all highlight the complex interaction between a teacher's recognition of the importance of talk in science classrooms and the existing beliefs and patterns of behaviour of teachers. In all these studies the participants had a particular interest in research as a potential source of knowledge with which to improve their own practice. In this study the participants are willing to engage in the case study but may have no such commitment to research and theory as a source of professional knowledge. They also lack the experience that the teachers in these studies had on which to draw.

In conclusion the literature makes a clear case that professional knowledge and knowledge of classroom talk in particular is problematic and complex. It involves a synthesis of: theoretical understandings (such as learning theory and subject knowledge); belief or identity of the individual; situation and experiences. For transformation of the kind that would be a feature of a threshold concept there needs to be a coming together of these different elements in such a way as to give a confluence of transformative 'nudges'. Where researchers have engaged with experienced teachers in developing more dialogic modes of talk in science classrooms there are commonly limitations on teachers' ability to implement more dialogic teaching. Some of the self-analytical tools presented to teachers are complex and would be difficult to use in any active self-monitoring of talk patterns. In other cases there were varying levels of success in involving teachers in professional development that introduces new teaching contexts with an more epistemic

than content focus. Even in these cases, underlying teacher beliefs place more emphasis on content and there seems to be a lack of experience at orchestrating more dialogic talk.

All of the studies into contextual teacher knowledge of talk in science classrooms focus on specific interventions intended to effect talk practices in the classroom. There is no research on the development of teachers' views on the role and purpose of classroom talk that sits outside such interventions or follows the formative development of practices and knowledge in the training and early career of science teachers. It seems reasonable to expect that the issues identified by experienced teachers in terms of knowledge of pedagogic practice around classroom talk will be amplified for new teachers developing early levels of autonomy and mastery of science teaching, but will they hold such intractable beliefs about the epistemic focus of school science on the transmission of authoritative curriculum science content?

Chapter 3

Research methodology

3.1 Overview

The overall design of this research takes the form of nine longitudinal case studies following the first three years of the professional development of teachers from their initial teacher education year through their induction (NQT) year up to the end of their second year in employment. The data sources will build a longitudinal narrative case study of these science teachers' perception of their developing understanding of the modes of classroom talk used in their teaching. The case studies will consist of: an account of the participant teachers' developing professional knowledge of the role of talk in science classrooms; the transformation of this emerging knowledge into classroom practice; and the contextual situation regarding the school community within which this development takes place.

3.1.1 Research questions

RQ1: How do science teachers' conceptions of the different kinds of talk and the purposes of talk in science classrooms develop during their teacher training and induction?

As trainee, and subsequently newly qualified, teachers develop their professional knowledge and expertise during an initial teacher education course, the study will attempt to identify and track the strands of this professional knowledge that relate to classroom talk. It will examine the ways in which individual teachers' conceptions of the nature and purpose of classroom talk develop during their training and over the early years of their career.

RQ2: How do sources of knowledge about the forms and purposes of classroom talk in science and influences on practice relate to the professional knowledge of early career teachers?

The study will examine the nature of influences on the teachers' knowledge development. Influencing factors on teachers' use of classroom talk will be explored. The study will also examine the sources of professional knowledge that are perceived by teachers as influential in their development of the use of classroom talk over the early part of their careers.

3.1.2 Rationale for the methodology

In seeking to identify aspects of new teachers' understanding of the role of talk in science lessons I am looking for a range of possible evidence in a complex and multi-variant context. From their initial images and beliefs of the role and actions of an effective teacher, through the influence of their initial teacher education on a wide range of professional skills to the influence of the culture and practices of their first employing schools there is an almost limitless range of influences on an individual teacher's development. In this study I aim to identify strands of this professional development that relate to the recognition of the importance of classroom talk and how this influences the practice of individual teachers. The complexity of the nature of teacher knowledge that I have highlighted in the literature review has led me to adopt a case study approach for a number of reasons. Cohen et al. (2007, p.256) identify among the strengths of a case study approach:

- Case studies allow generalizations either about an instance or from an instance to a class. Their peculiar strength lies in their attention to the subtlety and complexity of the case in its own right.
- Case studies recognize the complexity and 'embeddedness' of social truths. By carefully attending to social situations, case studies can represent something of the discrepancies or conflicts between the viewpoints held by participants. The best case studies are capable of offering some support to alternative interpretations.
- Case studies (...) form an archive of descriptive material sufficiently rich to admit subsequent reinterpretation.

The case study approach offers the opportunity to explore a richness of data in a complex situation in a way that is rooted in the reality of the experience of teachers and is open to re-interpretation as aspects of the experiences emerge from the case studies. Cohen et al. (2007, p.256) also make the point that "[case studies] can be undertaken by a single researcher without needing a full research team", a pragmatic point of clear relevance to this study.

Different approaches to categorising case study research in education have been made by different writers. Stake (1995) makes a distinction between intrinsic and instrumental case study. The former being case study research undertaken without regard for outside concerns whereas the latter uses case study to understand an issue or concern external to the case itself.

Stenhouse (1985) identified four categories of case study research:

ethnographic; evaluative; educational and action research. Of these Stenhouse locates the latter three within the remit of educational researchers whilst ethnographic case study is seen as holding an outsider's perspective. Yin (1993) also identifies four forms of case study: exploratory; explanatory; descriptive and evaluative. Yin describes exploratory case study as "aimed at defining questions and hypotheses of a subsequent study (Yin 1993: 5) including the discovery of theory as it might emerge from observation of social phenomenon. Yin identifies a connection between exploratory case study and the grounded theory approach of Glaser and Strauss (1967). Merriam (1988) describes three types of case study: particularistic; descriptive and heuristic. Here particularistic examines a particular singular phenomenon and descriptive attempts to provide a detailed, 'thick', description of the case being studied. Merriam's heuristic case study emphasises the exploratory and discovery aspect of case study research in seeking some preliminary theoretical construct, similar to the exploratory case study defined by Yin. Within these three categories Merriam describes several case study designs drawn from other disciplines of research: ethnographic; historical; psychological and sociological and further describes case studies based on the intent of the research as descriptive, interpretive or evaluative. In defining case study in education research Hamilton and Corbett-Whittier outline five models of case study: reflective; longitudinal; cumulative; collective and collaborative. The latter three of these could be seen as overlapping forms of multiple case study within a defined theme or focus.

In looking for an understanding of a complex area of professional knowledge and changes in this knowledge over time, multiple longitudinal cases studies offer methodological strengths in relation to the research questions of the study. The approach taken in this study might be considered a hybrid of part ethnographic case study and part educational case study (Stenhouse, 1985). There is an apparent conflict here with Stenhouse's view of ethnographic study as that of the outsider, however, as with the work of Andrew Pollard there are situated elements of the approach in this study that draw on the traditions of ethnography in exploring the complex context within which the individual case studies play out. In this study the longitudinal case studies are used to establish both a narrative account and to explore theoretical frameworks for the development of teacher knowledge. The latter intention could be described as an explanatory (Yin, 2016) or interpretive (Merriam, 1988) case study. This approach seeks to examine the practice and knowledge of the case study teachers in a way that attempts to draw

conclusions that go beyond the awareness of the case study participants by examining the context and community within which the case study exists. Bassey (1999) points to a lack of a coherent framework within which to define and locate an approach to case study, but in identifying valid approach to the research questions of the study it is helpful to identify the methodological choices that have been made in this study.

Other possible methodological approaches that might have been adopted in addressing the research questions in this study are grounded theory, ethnography (in a more anthropological form) and action research. What are the reasons for rejecting these methods and to what extent are aspects of them drawn upon to strengthen the case study method adopted? I would argue that in each case the problems with each of these methodologies lie in limiting the potential implications of the findings from the study. Ethnographic and grounded theory approaches are firmly within an interpretive research paradigm (Bassey, 1999) and thus entail problems of generalisability. From my own epistemological standpoint, whilst the complexity and contextualised nature of the area of my research makes an interpretivist approach seem alluring, I am not comfortable as a teacher educator letting go entirely of a need to seek a transferable understanding of what might facilitate or impede professional knowledge transformation. Without the possibility of findings from the study suggesting transferable implications arising from an analysis of the development of teacher knowledge about classroom talk the implications of the research would be limited. For this reason I have approached the research questions with a sense that current theories of professional knowledge may be useful in exploring the transformation of teacher knowledge in a way that suggests possible implications for teacher knowledge development. Grounded theory, whether following the approach of Glaser (1978) or Strauss (1987) or the refinement of constructivist grounded theory (Charmaz, 2000) in an effort to provide methodological rigour, emphasises the importance of approaching the data 'theory free'. This presents a constraint that I have rejected, instead intending to examine the data for evidence in relation to theoretical models of teacher knowledge (e.g. Shulman, 1986; Land et al., 2008) and the extent to which these connect to the personal experiences of the development of professional knowledge in the case studies. I do, however, adopt some elements of a grounded theory approach in its widest sense in some of the data analysis through an open coding structure that responds to the emerging themes in the interviews. A more ethnographic methodology would have the strength of examining the "*dailiness*" (Grimmett and Mackinnon, 1992) of a craft

knowledge since it would explore what Cohen et al. describe as the “*mechanisms by which participants achieve and sustain interaction in a social encounter*” (Cohen et al., 2007, p.24). However, adopting a more ethnographic approach would only be appropriate if the wider sense of the theoretical frameworks of professional knowledge were put to one side. An action research approach may have held some merit had I not begun the study with a sense that interventions that I was making as a teacher educator into teacher knowledge about talk were ineffective rather than effective. Action research “*recognises a role for the researcher as facilitator, guide, formulator and summariser of knowledge*” (Cohen et al., 2007, p.230) whereas in this study I am motivated by a need to better understand the nature of transformations of professional knowledge as a precursor to the kind of reflective intervention needed in action research.

A case study approach also creates a problematic basis for generalisation and has the potential to become an unwieldy and descriptive account of individual events. However it does provide a way to examine in detail a complex contextualised situation and has the potential to offer insights into the process of acquisition of professional knowledge. Yin (2016, p31) argues that it is inappropriate to make the kinds of statistical generalisations that can be argued from quantitative studies where “a previously developed theory is used as a template with which to compare the empirical results of the case study. If two or more cases are shown to support the same theory” some replication of findings may be claimed. Stenhouse (1985) suggests that case studies ‘invite judgement and offer evidence to which judgement can appeal’. Indeed, not all authors who have written about the case study method see a lack of generalisation as a necessary outcome. Sturman (1994, p61) argues that:

The distinguishing feature of a case study is the belief that human systems develop a characteristic wholeness or integrity and are not simply a loose collection of traits. As a consequence of this belief, case study researchers hold that to understand a case, to explain why things happen as they do, and to generalise and predict from a single example requires an in depth investigation of the interdependencies of parts and of the patterns that emerge.

In the context of this study the case study approach also offers the advantage of a longitudinal element. The complexity of development of professional knowledge is often embedded within the complexity of the professional context. This study seeks to explore the development of

understanding of talk and the influences on this within the wide range of other professional knowledge with which a teacher must engage. The longitudinal nature of the study presents an opportunity to explore the changes and developments in both the case study teachers' professional knowledge and the influencing factors over the formative early years of the teachers' careers. The ability to analyse change is a strength of the longitudinal case study highlighted by Hamilton and Corbett-Whittier (2013). The longitudinal study provides a methodological approach that allows a rich examination of the authentic development of professional knowledge over time. As a result of the benefits of a longitudinal study and the multiple cases within the design of the study, interpretation of the case studies offers a degree of trustworthiness. This trustworthiness as an alternative to quantitative concepts of validity and reliability is advocated by Lincoln and Guba (1985) and Bassey (1999). The methodology of this study establishes trustworthiness through prolonged engagement with the sources of data; persistent observation of emerging issues; triangulation between data sources and analytical statements and a sufficiently detailed account of the research findings (Bassey, 1999, page 75).

3.2 Research design

3.2.1 The sample

Given the demands of a longitudinal case study in terms of the length of the commitment from the participants and the need to maintain data collection over a period of three years, a convenience sampling method was adopted. The case study teachers were all part of two consecutive cohorts of nineteen and twenty trainee teachers following a Post Graduate Certificate in Education (PGCE) in Science with a specialism in Biology, Chemistry or Physics at Newman University. Newman University is the author's employer thus facilitating access to the sample group. All the members of the sample cohort were asked to participate in the study as full case studies. Initially nine students agreed to take part in the longitudinal study, seven from the PGCE course and two from an Employment-based Initial Teacher Training (EBITT) course. However, as these participants progressed through their training year, several withdrew from the study leaving five participants. Subsequently the trainees in the subsequent cohort were asked to participate the following year and a further four agreed to take part in the study. Of these four, one withdrew from the study after leaving teaching during the first year of employment. Overall, seven teachers remained in the study for the full three years, with a further two taking part in the first year only. It was not possible to include any further cohorts of trainees in the study within the time constraints of completing this thesis.

3.2.2 Data sources

Case study Teacher Interviews

A combination of interview formats were used to enable analysis of common themes across the case studies whilst leaving open the possibility of the interviews throwing up issues and themes that had not been anticipated. Five interviews were undertaken with the participants over the duration of the study. Following the basic approaches described by Patton (2002) these alternately used a general interview guide approach for semi-structured interviews and an informal conversational approach for unstructured interviews. The interviews were conducted at approximately six month intervals during the case study period. The timing of the interviews was intended to establish the patterns and forms of change in the participants' understanding of classroom talk and to identify factors that influence changes in this knowledge. The timing and frequency of data collection was designed in an attempt to balance the need to capture any critical moments

in the narrative of the case study with the need to minimise the effect on the case study participant. This issue is discussed in more detail later. Through the repeated interviews at the end of each year some common questions enabled tracking of any changes in the case study participants' views about the role and significance of different kinds of talk.

Near the end of each year of the study, i.e. at the end of the training year, induction year in school and at the end of the second year of employment, a semi-structured interview was undertaken. These semi-structured interviews included a number of questions that were common across the three interviews with the aim of exploring changes in views over the duration of the study. Other questions in these interviews related to the particular stage of the study. For example, the first interview addressed aspects of development related to the training year, whereas the final interview included a question on the extent to which the participants recognised aspects of threshold concepts in their understanding of classroom talk. The semi-structured interviews (interview 1, 3 and 5, see appendix A) probed the development of the case study teachers' understanding of the role and nature of talk in science classrooms. Interview questions addressed:

- the case study teachers' conceptions of the nature and purpose of different kinds of classroom talk;
- changes in the teachers' ideas about the nature and purpose of classroom talk over the period of the study;
- the sources of the case study teachers' professional knowledge about classroom talk.

The initial questions in the first and second semi-structured interviews included more open questions about the teachers' sense of changes in their understanding and practice that provided a more general context to questions that related specifically to the research questions in the study. This facilitated interactions between the participant and interviewer in the more problematic area of classroom talk. These opening questions then led in to questions about the participant's understanding of the nature and purpose of classroom talk. This part of the interview used open questions with hierarchical focussing elements. The open questions allowed the participant to articulate their ideas about classroom talk. These were then followed by two card-sort ranking exercises. A number of modes of classroom talk grouped as teacher-class interactions; teacher-pupil interactions and pupil-pupil interactions were presented as card statements (see appendix A.4). Interviewees were asked to rank these firstly by the

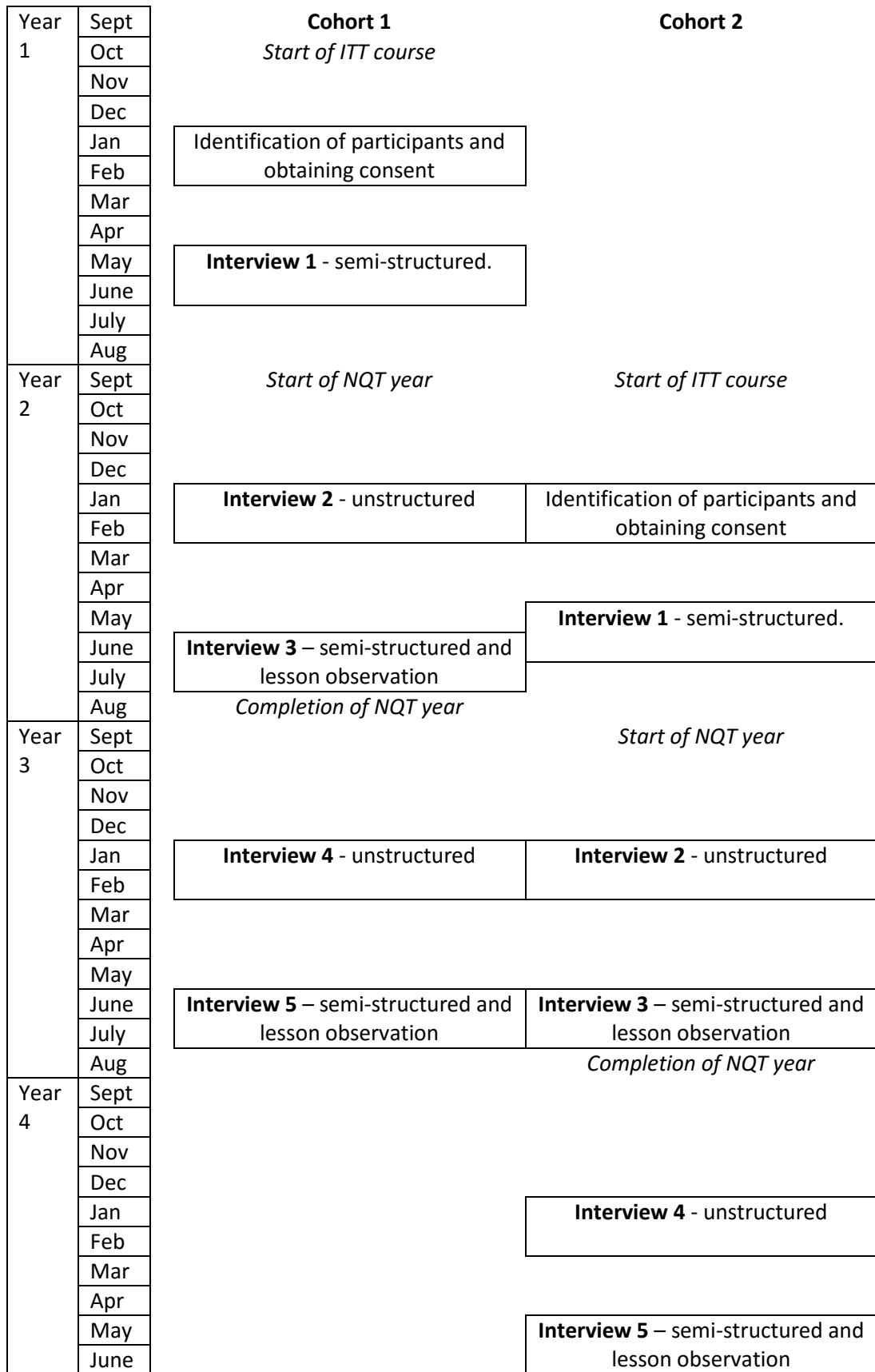


Figure 3.1. Timeline of interviews with case study teachers.

This figure shows the timing of the interviews with each cohort of teachers.

perceived frequency of use and then by the participant's view of the effect on pupil learning of each mode. A similar ranking task was then undertaken addressing sources of knowledge about classroom talk. Participants were given cards with descriptions of different sources of professional knowledge (see appendix A.4) and asked to rank them in order of their perceived influence as a source of knowledge about the use of classroom talk. This latter section of the interviews provided a consistent thread throughout the case studies to enable changes in the views of individual teachers to be tracked across the duration of the study as well as to draw comparisons between the participants. The same statements of modes of classroom talk were used in all three semi-structured interviews. The cards describing sources of knowledge about classroom talk included additional sources in the second and third versions that included sources of knowledge that would not have been experienced during the training year.

At approximately six month intervals between the semi-structured interviews, less formal unstructured interviews were undertaken. These unstructured interviews (interview number 2 and 4, see appendix A) held between the end of year interviews were designed with a more open style of question and a less structured approach. The aim of these intermediate interviews was to ensure that any significant developments over the course of the year were picked up before these were forgotten by the participants. This provided an opportunity to explore the teachers' views in a way that is led more by the interviewee. In taking this approach it is hoped that opportunities to capture evidence of critical incidents and experiences were created without excessive repetition of questions designed to follow changes in professional knowledge. This use of mixed interview methodology was also designed to limit the effect on the case study participants of frequent repetition of the questions used in the interviews. No formal schedule was used for the unstructured interviews. Instead the transcript of the previous interview was reviewed and notes made of what appeared to be significant emerging themes for the individual participant. These notes from the previous interview were then used as supporting prompts in an unstructured interview.

In the final interview schedule five statements were presented to the participants describing the features of threshold concepts as identified by Meyer and Land (Meyer and Land, 2003). The characteristics of threshold concepts were described in five statements designed to be comprehensible

to the participants and they were asked to respond to any statements that they felt described changed in their use of classroom talk.

Audio and field note records of trainees' lessons:

As close to the date of the initial interview as was possible one of the case study teachers' lessons was observed and audio recorded. The choice of lesson was left to the participant who was asked to select a lesson that they felt was representative of their usual classroom practice. They were encouraged to choose a lesson where they felt confident and comfortable with the presence of the researcher. The first lesson observation was made as late in their training course as possible so that it took place after final assessment of their classroom practice had occurred and they knew that the outcome of the placement was successful. The intention here was to reduce the influence of the previous relationship between the participant as trainee teacher and the researcher as supervising tutor.

A digital voice recorder and tie-clip microphone was used to record the teacher during the lesson. Observation notes were taken during the lesson by the researcher. The purpose of the lesson observation was not to act as a primary data source in the study but to inform the interviews with the teachers. Where it was possible to observe the teachers in the classroom it assisted in providing contextualisation for the interviewer in talking to the teachers about their use of classroom talk and on occasions provided a shared experience of practice between the teacher and researcher that facilitated the construction of meaning in relation to practice during the interview. Practical issues with the timing and duration of the study meant that observation of lessons prior to interviewing was not always possible.

In the design of the study, consideration was given to more extensive collection of lesson observation data to triangulate the findings from the interviews. This was rejected on two grounds. Practical time constraints of undertaking data collection as a part time researcher with the possibility of participants being widely dispersed geographically over the three years of the study meant that extensive lesson observations were not feasible. There are also questions over the extent to which a limited number of lesson observations would provide a valid triangulation to the interview data. Given the complexity of practice it would be difficult to make valid generalised conclusions about the nature of participants' classroom talk from a limited number of observations, particularly where there were tensions in the

account of practice given in the interview. Instead the lesson observations were used to inform some of the questions and subsequent probing in interview to support the elicitation of the participants views about their own practice.

3.2.3 Piloting of data collection instruments

The interview schedules were piloted with both a trainee teacher not involved in the study and an experienced teacher before implementation to ensure the questions received a meaningful response. Changes were made to the schedule to clarify aspects of the questions. Pilot interviews were not transcribed but field notes taken in these pilot interviews reinforced the effectiveness of the card sort exercise in focussing discussion in the second half of the interview. As a result of piloting the ranking tasks were incorporated along with an open question on the influence of different sources of professional knowledge on talk. An initial open question about changes over the year without specific reference to talk was also added to stimulate a more general discussion about changes in professional knowledge.

3.3 Ensuring the validity of the findings

As discussed earlier, one of the criticisms of a case study approach is the limitation in the extent to which findings might be generalisable. In aiming for what Bassey (1999, p.46) describes as "*fuzzy generalisations*" the design of the study seeks to establish the credibility of the findings rather than attempting to borrow the language of a more realist epistemological standpoint or a quantitative approach to the research questions. Yin (2016) suggests four strands of qualitative research design in aiming to strengthen the study's credibility: trustworthiness, triangulation, validity and rival thinking. In taking a more relativist approach to the complexity of professional knowledge that is examined in this study I would argue that it is the first of these, credibility and trustworthiness, that are the most important in establishing the reliability of the findings from this study.

The most significant aspect of this study, in establishing the trustworthiness of the findings, is the longitudinal nature of the data collection. A significant period of time was spent with the same participants re-visiting the research questions through similar interview protocols over the period of the study. This meant that not only is there opportunity to examine changes in the

participants views but the credibility of their responses as trustworthy representations of their views is strengthened. Lincoln and Guba (1985) identify the opportunity of prolonged engagement with the research subjects for detecting distortions in the perspective that might otherwise occur. A potential source of this kind of distortion might be the relationship between the researcher and participant and the power dynamic that might be evident in the initial stages of the research. It is hoped that by continuing the data collection well into their early career this has enabled such distortion to be detected and addressed. The relationship between the researcher and participant is discussed further in section 3.5. The structure of the study with alternating semi-structured and unstructured interviews strengthened the trustworthiness of the participant's response by providing an opportunity for more open discussion. In the unstructured interviews the participant had the opportunity to lead the focus of the interview to a greater extent. In addition to the open unstructured nature of alternate interviews, in preparation for these interviews, notes were made by the researcher from the previous interview transcript and these informed the questions used in the interview. Issues that appeared to be important to the participant in the previous interview were raised by the researcher to invite further comment or discussion.

In studying the way in which the teachers' knowledge of classroom talk developed over the duration of the study the focus on triangulation is arguably less significant than other aspects of credibility. Consideration was given to seeking triangulation with other data sources in the study, particularly observations of the participant teaching and interviews with the teacher's school mentors. The former was seen as problematic in establishing sufficient observation of practice to provide a credible positivist source of triangulation within the scope of data collection available to the researcher. Instead individual lesson observations were used to provide researcher insights into the context of the participant that informed the interview questions and facilitated the development of shared meaning in the interviews through reference to experiences observed by the researcher. With the first cohort, some access to the participants' school NQT mentor was possible and the opportunity to interview the mentor was taken. These interviews provided limited insight into the context and presented ethical issues where the relationship between the participant and the mentor was problematic. As a result these were not undertaken for most of the participants. The triangulation that is possible within the design of the study comes from the longitudinal nature and the repeated interviews. Using a

similar interview protocol over three years allows for some triangulation between the interviews with an individual participant. Triangulation from merging findings across the cohort of participants enables some examination of particular issues, not from a quantitative perspective, but recognising the opportunity to see qualitative connections between the data from interviews with multiple participants.

The complexity of establishing the validity of findings from qualitative research undertaken from a relativist perspective, as is the case in this study, is highlighted by Yin (2016, p.88) who argues the need for relativist studies to address the validity of findings. However, I would argue that the relativist researcher should seek alternatives to the paradigms and language of the positivist realist researcher that sits within the scientific methodology of science research. Maxwell (2013) offers eight strategies to combat threats to validity in qualitative research. Of these, intensive long-term involvement addresses trustworthiness as much as it does ideas of validity. Other strategies such as respondent validation, intervention and the use of numbers instead of adjectives in describing data do not, I believe, present appropriate approaches to establish validity in the context of this study. The cycle of interviews with participants provides the establishment of valid findings in relation to the teachers' own views of their professional knowledge development and to add the additional level of engagement of returning to them to seek further feedback on their expressed views in interviews was not seen as an appropriate use of the participants' time. In the context of this study I avoided the translation of adjectival descriptions of the data into numbers beyond reference to the number of participants. It would be a misappropriation of quantitative methods to ascribe numerical value to iterations of a particular theme in the interview data. The context and nature of the teachers' discussion is more significant than might be indicated by a count of coded references. This is discussed further in the section on data analysis.

The fourth of Yin's (2016) strands to strengthening the credibility of quantitative studies is to engage in rival thinking during the research process, both in the collection and analysis of data. Yin argues that this needs to exist in a continual sense of scepticism throughout the study, not just in presenting a rival interpretation in conclusion. The longitudinal interview process with the participants needs to navigate a tension between establishing an effective relationship between the researcher and participant over time and establishing an appropriate level of scepticism in probing the

interview responses. Where it was judged appropriate to do so, the semi-structured and unstructured interview protocols allowed for some probing of responses where possible rival thinking was apparent.

Ultimately the credibility of the findings of this study rest on the extent to which the responses of the teachers in describing their own professional knowledge represent a trustworthy account of their own perceptions of knowledge development. Perhaps the greatest challenge in this research design is the extent to which the teachers' accounts of their own knowledge of classroom talk relate to their classroom practice. It is beyond the scope of this study to establish a reliable account of the participants classroom practice through direct observation. In taking a relativist position in seeking to answer the research questions of the study through the complexity of individual case studies, this research design recognises the limitations inherent in this aspect of the findings of the study. The extended engagement with the participants does offer a trustworthy and credible series of accounts of the development of professional knowledge of classroom talk over the early career of the case study teachers.

3.4 Ethical considerations

Ethical approval for the study has been granted by both institutions involved in the study, The University of Leeds and Newman University. Two key aspects of ethical consideration have been taken into account: the potential for the study to impact in terms of both workload and increased stress on the case study participants and the need for consent from pupils in school who are present in observed lessons.

Participants in the case study were briefed on the expectations of the study and gave written consent to participate. Sensitivity gaining this consent was particularly important given the relationship between the researcher and the participants. For all of the students involved I am one of their University tutors and hence have a role in assessing their progress and completion of the course. I am aware of the potential stress that this observation might create and sought, both in written briefing documents and during interactions with the participants, to reassure them that the research has no effect on the outcome of their course and to remind them of their right to withdraw from the study. The timing of the observation and interview was intended to ensure that they were confident of the outcome of the course before being observed.

Prior to the lesson observation a briefing letter was given to all the pupils in the class explaining the purpose of the study. It was the intention to video-record the observed lessons, however, in all but one of the first observations one or more pupils asked for the video-recording not to take place. As a result of this the approach was changed to audio-recording of the teacher with field notes used to capture information that would have been provided by the video record.

The most significant aspect of research ethics in establishing credible findings in this study was in maintaining and developing the relationship between researcher and participant over the length of the study. There was a need for an ethical approach to the research, both to ensure credible findings and to minimise the research mortality level in the cohort. The significant duration and time commitment from the participants presented a threat in both respects. In addressing this the research attempted to minimise the possibility of ethical issues in a number of ways.

Careful briefing of the participants: all of the participants were selected from the group of trainee teachers for whom the researcher is a course tutor. It is hoped that this existing relationship enabled the potential participants to make informed decisions about their willingness to engage in a longitudinal study with the researcher. Both verbal and written briefing made the requested involvement and time commitment clear and emphasised the right to either decline to participate or withdraw from the study without any negative effect on the relationship between the participant and researcher outside the study. To this end it is reassuring that several participants chose to withdraw from the study suggesting that they felt confident to do so without harming this relationship.

Sensitive treatment of constraints on participation: contact with the participants during the study aimed to minimise any additional pressure on them during potentially stressful periods of their training and early career. The timing of interviews was designed to avoid likely periods of heavy workload in the school calendar and was negotiated with the participants at each stage. The location of the interview was either at the researcher's workplace or the participant's workplace or home according to the preference of the individual participant. Observation of lessons was undertaken wherever the participants were comfortable with the observation taking place and with the researcher obtaining consent from the teacher's school. If the lesson observation seemed likely to cause any stress or

discomfort on the part of the teacher the interview proceeded without observing any teaching.

The longitudinal nature of the study makes it likely that a number of the case studies would drop out before the end of the three year period. Indeed, of the original participants who agreed to undertake the study, two left the study before the initial interview, another suspended and eventually withdrew from their training year and another took a break between qualifying and taking up employment. A further two participants completed the first interview and then either withdrew from the study after leaving teaching in the first year or were unable to take part in subsequent interviews as a result of periods of maternity leave. The data collection therefore had to reach a compromise between the need to collect sufficient data to answer the research questions and over-burdening the case study participants leading to withdrawal from the study. Studies of teacher workload and levels of satisfaction by both Price Waterhouse Cooper (2001) and the School Teachers' Review Body (2002) describe the pressures of workload and the effect of this on teachers. Whatever the realities of the profession, the early stages of a career in teaching can be very demanding. It is for this reason that only two interviews each year were undertaken and either one or two lesson observations depending on the consent of the participants. As a result of various considerations, both pragmatic and affective, not all of the interviews were able to be supported by observations of the participants teaching.

3.5 The role of the researcher

An issue that is recognised in the design of this study is the embeddedness of the researcher. As one of the tutors on the Newman University science PGCE I was involved in delivering a number of the taught sessions on the teacher training course undertaken by the case study teachers. Some of these sessions include teaching with the explicit objective of developing the student teachers' understanding of classroom talk. I was also the supervising tutor on at least one of the school placements for all but one of the participants. Hence it is impossible to see the findings of the study as entirely detached from the influence of the researcher. I have therefore taken a phenomenological approach to the research within an interpretive research paradigm (Bassey, 1999; Hancock and Hancock, 2006; Gall et al., 2007). As Bassey (1999, p.43) describes "Interpretive Researchers recognise that by asking questions or by observing they may change the situation they are

studying". It is clear that the process of periodic conversations with a focus on classroom talk is not the 'normal' experience of teachers in their early career and the nature of this study will affect their perceptions of the nature and purpose of classroom talk. If the conclusions of Berry et al (2009) are accepted the findings of this study will need to be considered in the light of the opportunities that the study itself provides for reflection by the case study participants. I would not, however, suggest that the nature of knowledge transformations that come about as a result of the three years of the case study would be entirely the result of opportunity for reflection offered by the research process itself.

There also needed to be a degree of sensitivity in the handling of the interviews and lesson observations. Cohen et al. (2007, p.151) make the point that "The notion of power is significant in the interview situation, for the interview is not simply a data collection situation but a social and frequently a political situation." In this study the balance of perceived power, particularly at the start of the case study, lies with the interviewer. At the early stage the participants are engaged in training and the researcher also has a role in the assessment of the trainees' outcomes in completing the course. To minimise the effect of this power relationship the first interview was undertaken at the end of the training year immediately after the final assessment visit on school placement. At this point in their training the participants knew the outcome of the training year, thus the possibility of adding additional anxiety over completion of the course was minimised. It is important that the interviewees are encouraged to feel as comfortable as possible about the interview as a non-judgemental process. Subsequent interviews were arranged in consultation with the teachers in the study at approximately six month intervals but with flexibility to suit the situation of the individual with the intention of limiting any negative effects of undertaking the interview.

3.6 Data analysis

The central strand of data in this study is the periodic interviews with the case study teachers over the three year duration of the case studies. It is this interview data that provides the central narrative that seeks to explore the development and translation into practice of professional knowledge relating to the nature and purpose of classroom talk. Interviews with the case study participants explore and probe the personal meanings that each makes of their experiences and how these experiences become internalised in their schema of professional knowledge relating to classroom talk.

Analysis of the interviews focussed on the following themes:

Awareness of professional knowledge: exploring the extent to which the participant case study teachers are able to describe how they perceive their understanding of different modes of classroom talk and how these contribute to learning science.

Sources of professional knowledge: examining how different influences are perceived by the case study teachers as contributing to their professional knowledge about the nature and purpose of classroom talk and aspects of the case study teachers' early careers that influence their understanding of classroom talk.

Transformation of professional knowledge: eliciting the case study teachers' recognition of the barriers and facilitating factors that mediate the transformation of their understanding of different modes of talk into practice in the classroom.

The interview data was also used to identify where there are apparent threshold concepts that have the potential to influence the development of professional knowledge of classroom talk, or the extent to which developing understanding is transformed into changes in practice in the case study teachers' classrooms. Analysis of the data also looked for connections between, and awareness of, professional knowledge in relation to possible threshold concepts and perceptions of the developing classroom practice of the case study teachers.

All of the interviews were transcribed by the researcher and the transcripts collated in Nvivo. Nvivo was then used to make an initial coding of the themes that emerged from the interviews. Nvivo nodes were created and attached to each interview response that related to the characteristic of the node. Once all of the first three interviews had been coded, covering the range of questions used in the interview schedules, the existing codes were grouped and organised into node trees relating to grouped themes of nodes. The full coding structure is included in appendix C. The coding themes that were developed are listed in table 3.1:

Table 3.1 Coding themes

This table gives the names of the coding themes attached to extracts from the interview data. Descriptions of the themes are given in appendix C.

Types and purposes of classroom talk		
Modes of classroom talk	Purposes of classroom talk	Planning for classroom talk
Pupil-to-pupil talk	Emotional and social development	Activity led
Teacher-to-individual-pupil talk	Assessment of learning	Choosing the right words
Teacher-to-whole-class talk	Developing communication skills	Non-linear planning
Non-verbal dialogue	Developing science skills	Planned questions
Pupil to whole class talk	Learning ideas and concepts	Planning from objectives and outcomes
Pupil to teacher talk	Engaging pupil Interest	Planning time for teacher-pupil talk
Teacher questioning	Relationships with pupils	Planning variety
Teacher led class discussion	Classroom management	The spontaneous nature of talk Structuring whole class discussions

Table 3.1 continued

Influencing factors		
Classroom and pupil influencing factors	Individual teacher influencing factors	School influencing factors
Behaviour	Curriculum knowledge	Professional performance indicators
Ability difference	Confidence - subject knowledge	School inspection
Different topics suit different kinds of talk	Learning theories	The need to cover content
Gender differences	Teacher identity	Workload
Getting to know pupils as individuals	Delivering knowledge	Community of practice
Impact of practical work	Facilitator	Assessment regime
Pupil age	Inspiring pupils	
Pupil reluctance to talk	Becoming experienced	
Physical environment	Less teacher led lessons	

Table 3.1 continued

Sources of professional knowledge of classroom talk
Reflection on practice
Mentor feedback
Colleagues
Own experience as a learner
University tutor
Research and theory
Continuing professional development
This research project
Online teacher resources
University sessions
Observation of classrooms
Formal appraisal
Acting as a mentor
Reading

Coding of all the interview data collected from the case study teachers was coded using a combination of elements of template analysis (Brooks and King, 2012) and grounded theory (Charmaz, 2000). Beginning with the semi-structured interviews, the aim of the initial coding was to achieve a series of categories that relate to the research questions of the study. However, this did not preclude the coding structure from being informed and led by the nature of the responses within the data. Initial reading of the transcripts identified both grounded codes and their relationship to *a priori* themes (page 71). Whilst not following a rigorous grounded theory methodology (Glaser and Strauss, 1967), a grounded inductive element to the coding structure informed the development of coding themes that emerge from the transcripts, particularly in relation to research questions one and two. Initial codes were then organised hierarchically into a coding tree which organised emergent themes in the data in a manner similar to template analysis (Brooks and King, 2012). Analysis of the unstructured interviews with

teachers adopted a coding approach more closely related to grounded theory method (Charmaz, 2000) to allow for the emergence of themes that may not have been evident in the literature on professional knowledge discussed earlier. Hence, I hope not to be culpable of being a researcher who, as Dey (2007, p.176) cautions, “ploughs ahead along an established theoretical furrow regardless of the diversity and richness of the data, thereby diminishing its potential for stimulating theoretical innovation”. Any further themes that emerged over the course of the study were incorporated into the template structure of the initial coding. These additional codes that emerged from subsequent coding were used to recode the initial case study interview data in a second round of coding.

Analysis of the interview data at a coded level was not given a quantitative treatment beyond a summary of the frequency of coded responses. Even this level of summary presentation of the data required caution as the occurrence a coded theme in an interview transcript cannot be given a quantified value as the context of the statement and the nature of its iteration is more important than the matter of its reference by the participant. Thus there is no attempt to quantify the significance of any individual utterance in relation to the coding structure. The purpose of the coding framework was to relate the interview data to the research questions and to develop a coding template that is used to inform the reporting of the findings. For this reason it was not considered necessary to engage another researcher in assessing inter-rater reliability. It is the development of the coding structure here that is important rather than the reliability of relating codes to individual transcripts. Instead the meaning of the coding template itself was checked with another researcher. The attachment of codes to sections of interview transcript was subsequently used to extract and compare the transcripts across different interviews and between different participants.

In response to the card sort stimulus statements in the semi-structured interviews rankings given by case study participants of different kinds of classroom talk by frequency and effect on learning were recorded in interview notes and tracked across the duration of the case study for each participant.

Chapter 4

Case study overview and summary findings

In this chapter I present an overview of the case study teachers and outline their individual circumstances and experiences during the study. Seven teachers were followed through the three years of the study from one of two consecutive cohorts of pre-service postgraduate trainees with an additional two teachers participating in the first year of the study and then subsequently withdrawing from further participation due to personal circumstances. An overview of the themes that emerged from the interviews with the teachers is then presented that gives a summary of the similarities and differences between the individual teachers in the summary. These themes are then explored in depth in chapter 5. More detailed narrative vignettes are presented in chapter 6 to explore in more detail how key aspects of the findings present in the individual case studies followed during the longitudinal study.

4.1 Overview of the teachers in the study.

Adam

Adam is a biology specialist although his recently completed degree is in sport science. Adam was successful in both his placements during his training although subject knowledge was a challenge and he talked informally about making adjustments to the school environment in which he was placed that contrasted with his own education in the independent sector.

Following his last placement Adam went on to work in the same large Academy High School in a suburb of Birmingham with a very mixed catchment, both in socio-economic and ethnic mix. His NQT year and subsequent year were successful. As a relatively young teacher in a large department, in which he started as a trainee, he has sought to establish himself as an experienced member of the department. Adam was also a competitive swimming coach and the conflict between the time required for this role and his teaching is a frequent theme for him throughout the study.

David

David is a physics specialist having completed one year of a physics degree before switching to psychology and subsequently completing a subject knowledge enhancement course in physics prior to beginning the PGCE

course. Both teaching placements were successful and feedback from mentor and tutors was generally positive. David had a very thoughtful approach to his own professional development, embracing and implementing both ideas from University sessions and feedback from mentors in school.

David was successful in obtaining a first teaching position in his final placement school, a High School in a small town, despite reservations about the travelling time from his home to school. At the end of his first year David moved to a selective grammar school nearer to his home.

Jason

Jason is a physics specialist having entered teacher training after recently completing an Open University degree in science as a mature student. His undergraduate studies were completed part time whilst working in a secondary school in an administrative role. He completed a subject knowledge enhancement course in physics prior to the training year. Jason holds very clear aspirations in teaching with a stated ambition to take on a senior leadership role in school at the earliest opportunity. Jason had a successful training year although he found the process of planning lessons was problematic and found it challenging to develop his teaching to address assessment and differentiation of pupils' work.

Jason worked for the second two years of the study in an inner city comprehensive secondary school in the centre of Birmingham. At the start of the year immediately following the end of the study he moved to take up an assistant head of science post in a school in a suburb of the city and subsequently, a year later, a Head of Physics role in another school.

Joy

Joy is a chemistry specialist who completed her training successfully and then moved to a denominational high school in a suburb of a city in the West Midland conurbation. Whilst she remained employed in the school throughout the study, interruption to her teaching due to maternity leave prevented her from taking part in the study after her training year.

Luke

Luke is a chemistry specialist and a relatively recent graduate with some post graduate science employment experience in a laboratory environment. Luke had a successful training year in which he was able to find a role for his confident and individualistic self-identity in establishing effective

relationships with pupils. In lessons Luke appeared to enjoy interactions with pupils and elements of lessons that involved teacher exposition.

Luke followed Sophia on placement in the school in which Sophia subsequently worked and then took up a post in an academy high school in a large town. Following a successful NQT year he established a lead role in his subject within the department and was promoted to Head of Chemistry in the year following the end of the study.

Ruby

Ruby is a biology specialist and was a confident and very successful trainee. She engaged actively in University sessions and was vocal in her engagement with ideas about learning and established a particular interest in classroom talk, choosing to explore classroom talk as a focus of one of her masters level assignments in response to experiences on her first placement. Her second placement, in the school in which Sophia was then working as an NQT, was very successful resulting in the highest grade for her training. Ruby's manner in the classroom is confident and lively with a very individual style of presentation.

Ruby then took up a post in the same denominational and academically high achieving school as Joy. Ruby continued to work in the school throughout the study. The school has a strong ethos of academic achievement and behaviour from pupils and even prior to taking up the post Ruby identified potential conflict between her own self-identity as a teacher and her perception of the expectations of the school.

Sean

Sean entered teaching after recent post-doctoral research work in genetics. In university sessions he clearly enjoyed the chance to discuss and debate issues around science pedagogy, often remaining at the end of sessions to pick up points with the tutors. He was a very active oral participant in sessions and invariably engaged in discussion with both peers and tutors.

His lessons were characterised by lots of one-to-one interactions between teacher and pupils. Both Sean and the pupils seemed to get a lot of satisfaction from curiosity questions that were related to the context of the lesson but took a variety of semi-tangential avenues where pupils asked questions and Sean gave fairly discursive answers. It was evident in the interview and from discussions with Sean's tutor he has had some concerns in adjusting intellectually to a school environment, both in terms of a need to

be less didactic in his delivery and in adjusting the level of his explanations and answers to a suitable one for the pupils he is teaching.

Sean took up a post in a denominational high school in the outskirts of a large city. At the end of a difficult NQT year, his induction period was extended by a term and when at the end of this he was advised that this would be further extended he left his post. During the remainder of the last year of the study he undertook supply teaching work in two schools, including the school in which he completed his second training placement. In the year following the study he left teaching to undertake a clinical research training course.

Sophia

Sophia is a Biology specialist having come to teacher training from a degree in Sport Rehabilitation. After graduating she worked as a physiotherapy assistant with elderly patients in a hospital setting followed by a year travelling during which she secured a place on the PGCE course. During her training Sophia secured employment at the school where she undertook her first placement. She is currently employed in the same school following successful completion of her NQT induction period.

Sophia's lessons were characterised by a very quiet presence in the lesson. She tended to do relatively little whole class teacher led work and instead used a lot of group work and supported pupil talk in groups and pairs. She was an inventive student teacher and used a lot of her own resources and ideas or adapted ideas to teach very varied lessons. She was able to respond to coaching from mentors very effectively and rapidly progressed to teaching good and outstanding lessons, achieving the highest grade at the end of her second placement.

Sophia is a quiet and reflective individual. In university sessions she was a fairly infrequent oral participant, though willing to contribute when she felt she had a contribution to make, she was generally fairly reserved in whole class sections of work, becoming more confident and animated when involved in paired and group work.

Steve

Steve is a young graduate with a specialism in physics. He was a quiet participant in the training course but had a successful year completing the training course without problems. He took up a post in a secondary school in a small town but resigned his post after two months and withdrew from the study.

4.2 Overview of the themes identified in the interviews.

In this section a brief overview of the themes identified in the interviews is presented in relation to the frequency with which the case study teachers referred to particular themes. The purpose of this section is to present an overview of the similarities and differences between the case study teachers in relation to their responses in interview. The themes presented in this section are the modes and purposes of classroom talk referred to by the teachers in interview. Care should be taken in making direct comparisons of frequency as the number of interviews for some of the teachers is lower where they were unable to participate in some of the interim interviews. Nor is the frequency of coding reference intended to indicate the importance of the theme to the teacher, rather the intention is to provide a summary of the themes that are returned to on multiple occasions by the teachers. The intention here is to provide a characterisation of the interview narratives and emerging themes that are presented in detail in chapters five and six.

Table 4.1 Summary of frequency of coding of references to modes of classroom talk by the case study teachers in all the interviews.

This table shows the frequency of coded references to the structural modes of classroom talk referred to by the participant teachers in all the interviews.

	Adam	David	Jason	Luke	Ruby	Sean	Sophia
Teacher led class discussion	3	5	1	1	1	8	8
Teacher-to-individual-pupil talk	0	0	4	3	2	8	11
Teacher-to-whole-class talk	0	8	10	8	1	6	15
Teacher Questioning	4	15	5	1	6	11	14
Pupil-to-pupil talk	4	5	3	2	11	7	16
Pupil to teacher talk	0	3	2	2	0	2	5
Pupil to whole class talk	2	0	0	0	3	0	1
Non-verbal dialogue	0	0	0	0	3	1	6

Grouping the modes of talk into three sets, those relating to pupil talk, teacher talk and non-verbal dialogue, there appear to be differences in the orientation of individual teachers towards the different kinds of talk referred to in the interviews in discussion of their use of classroom talk in lessons. These differences are illustrated in the profiles of the teachers' references to the modes of talk in figure 4.1. The nature of these similarities and differences is explored more fully in the following chapter, however, the profiles do suggest that there are some similarities between some of the teachers when comparing the relative frequency with which they refer to different modes of talk. For example, Jason and Luke share an emphasis on teacher-to-whole class talk in the coding of their interviews and Sean and

Sophia show similar patterns of relative frequency in their reference to teacher to pupil and pupil-to-pupil talk.

The profiles of the case study teachers' frequency of reference to purposes of classroom talk also shows both variation between the teachers and some similarities of emphasis for some aspects of the purpose of talk between some of the teachers. Adam, Luke and Ruby have a similar focus on the role of talk in managing the relationships between teacher and pupils, though Ruby refers less to the classroom management purpose for talk. David, Sean and Sophia frequently refer to assessment as a purpose for classroom talk. The profiles also suggest some individual distinctions for the teacher, for example David has a very clear focus on assessment as the purpose of classroom talk, Jason is the only teacher not to refer to any relationship element in his discussion of the purposes of classroom talk and Sean and Sophia have the most diverse view of the purposes of talk with at least some reference to all but one of the identified purposes of talk in the interviews.

The coding analysis of the interview transcripts was used to develop emerging themes in relation to the teachers' views of their use of classroom talk rather than as a quantitative analytical tool. I would stress that these summaries of the frequency of coded references in the interviews is not intended to overstate the significance of coded references but it does provide an overview of the differences in the frequencies with which the case study participants referred to the types and purposes of classroom talk and presents an outline of the focus of different coding themes in the interviews in the different teachers' interviews. The intention of this chapter is to provide an overview of the case study teachers in the study rather than to make any significant claims in terms of findings. In the next chapter the teachers' views of the nature and purpose of classroom talk and the influences on the development of these views is explored. It is in analysis of the richness of the interviews that the key findings emerge.

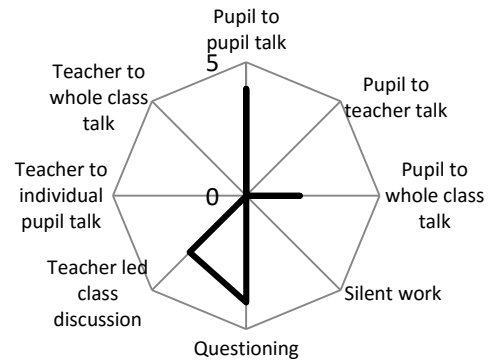
Table 4.2 Matrix coding of references to purposes of classroom talk by the case study teachers in all the interviews.

This table shows the frequency of coded references to the purposes of classroom talk referred to by the participant teachers in all the interviews.

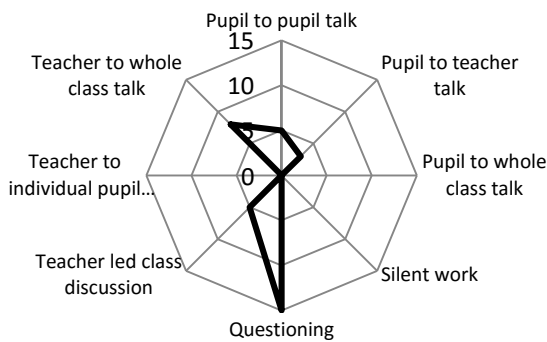
	Adam	David	Jason	Luke	Ruby	Sean	Sophia
Assessment of and for learning	4	7	7	2	8	7	6
Classroom management	7	0	7	5	1	0	5
Developing communication skills of pupils	4	0	1	0	2	1	5
Developing science skills	3	0	0	0	0	2	2
Emotional and social development	3	0	1	0	10	1	0
Engaging pupil Interest	7	1	3	3	15	6	5
Learning ideas and concepts	3	1	13	3	2	2	1
Relationships with pupils	6	0	2	6	5	1	2

Figure 4.1 Profiles of the focus of the case study teachers' interview responses about types of talk used in their teaching.

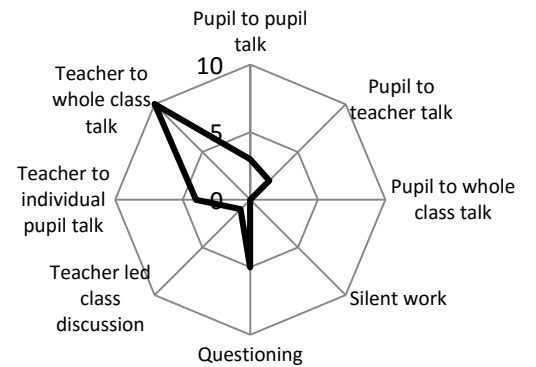
Adam



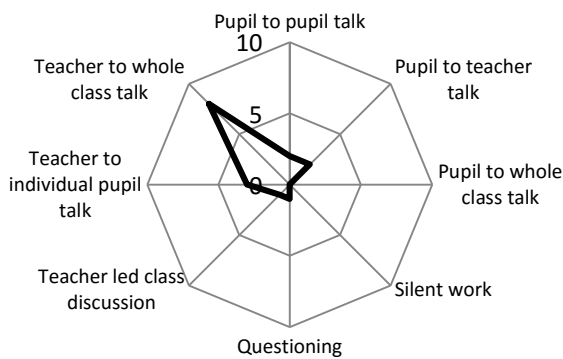
David



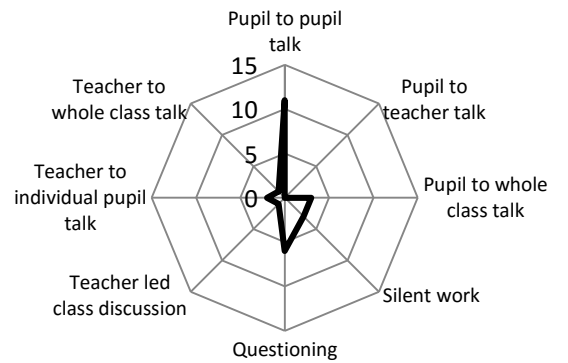
Jason



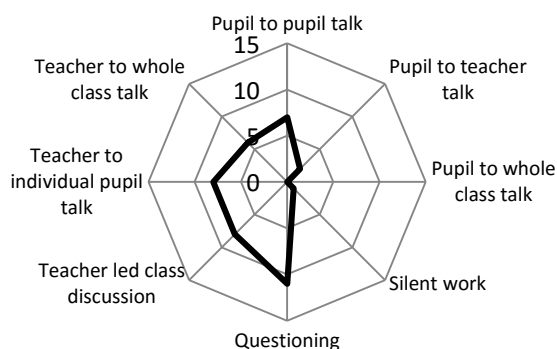
Luke



Ruby



Sean



Sophia

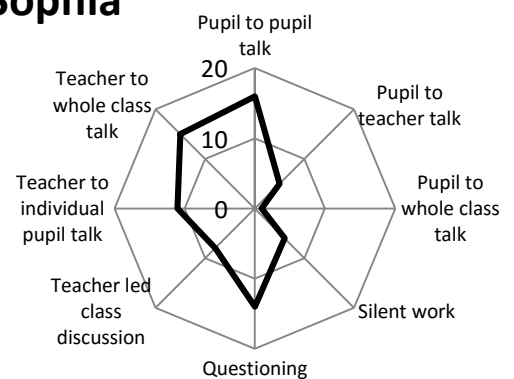
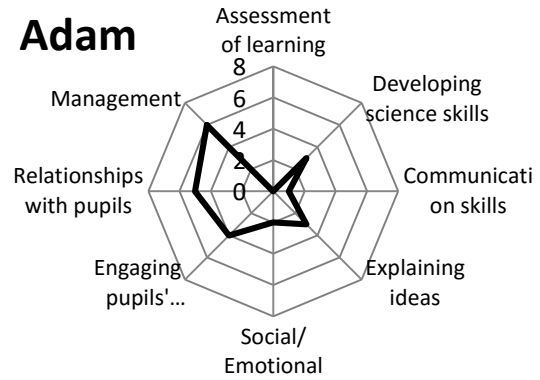
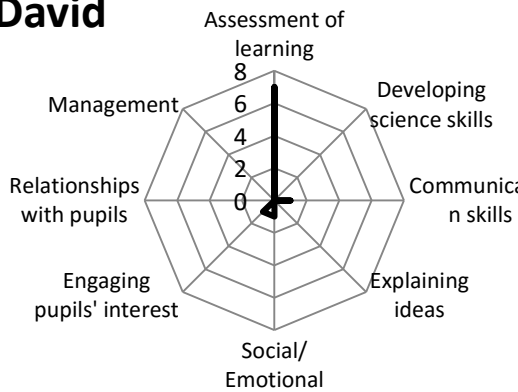


Figure 4.2 Profiles of the focus of the case study teachers' interview responses about the purposes of talk used in their teaching.

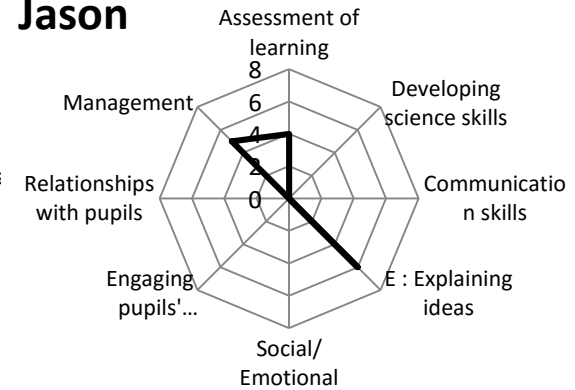
Adam



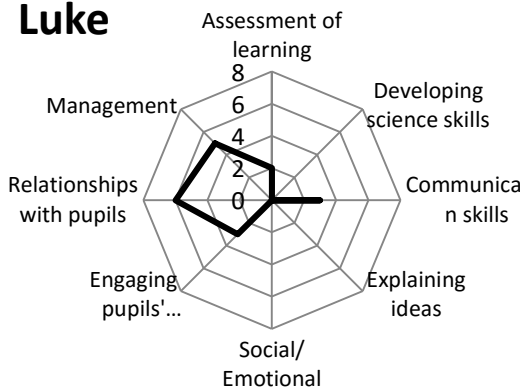
David



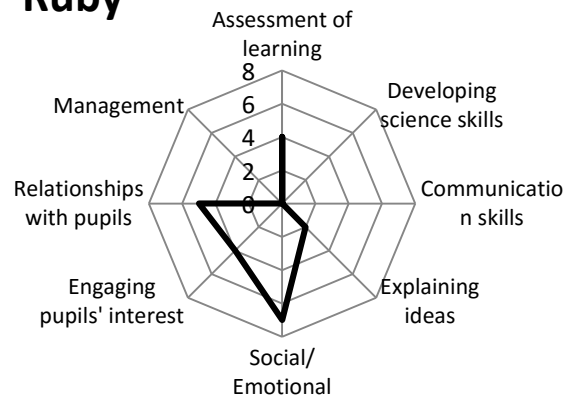
Jason



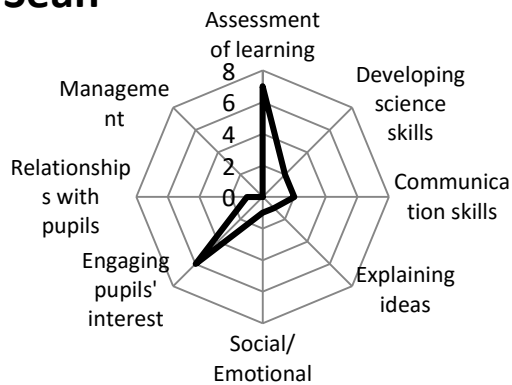
Luke



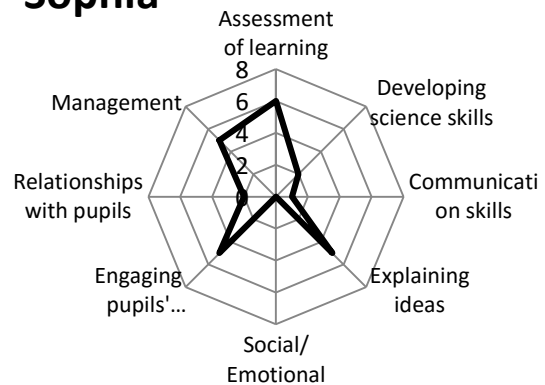
Ruby



Sean



Sophia



4.3 Overview of the perceived frequency of different kinds of classroom talk and changes over the length of the study.

In each of the end of year semi-structured interviews with the teachers a series of cards describing a form of talk was presented to the teachers and they were asked to rank the frequency with which they thought that they used that particular form of classroom talk. The card sort was undertaken after the open questions had been completed and was intended to give an overview of changes in the perceptions of the teachers about their use of classroom talk. Key features of the patterns in the teachers' perception of their use of different forms of interactions in their classroom are the variability between the different teachers in the study and, perhaps more surprisingly, the instability of the ranking of different types of interaction over the three years of the study. This suggests a fluidity of either classroom practice, or at least perceptions of practice, among all of the teachers over their initial years in teaching. The influences on these changes in perceived practice are explored in more detail through the interviews in chapter 5. In this section the intention is to present an overview of the patterns of change and difference between the seven teachers in the study.

4.3.1 Teacher - whole class interaction frequency

Figures 4.1 – 4.21 show the perceived extent of use with which each of the teachers used teacher-to-whole class interaction, teacher-to-individual-pupil interaction and pupil-to-pupil interaction in their lessons over the three years of the study. In each of the figures the perceived extent of use indicated in the interviews is scaled as follows: 1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely.

Adam

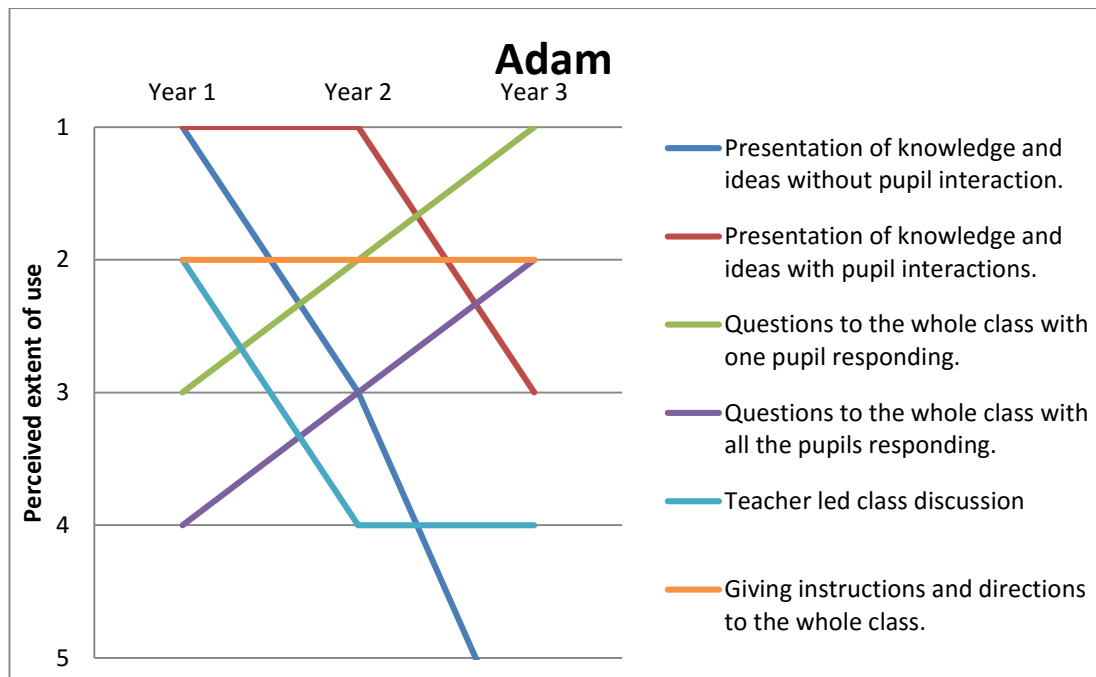


Figure 4.1 Perceived extent of use of teacher-to-whole-class interaction for Adam

1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

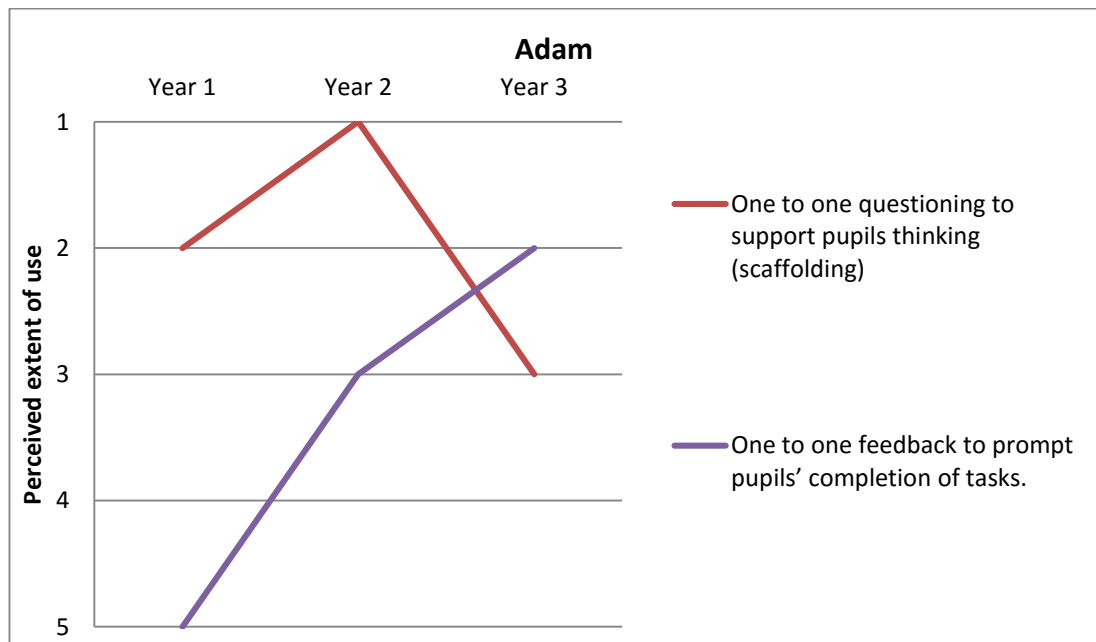


Figure 4.2 Perceived extent of use of teacher-to-individual-pupil interaction for Adam

1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

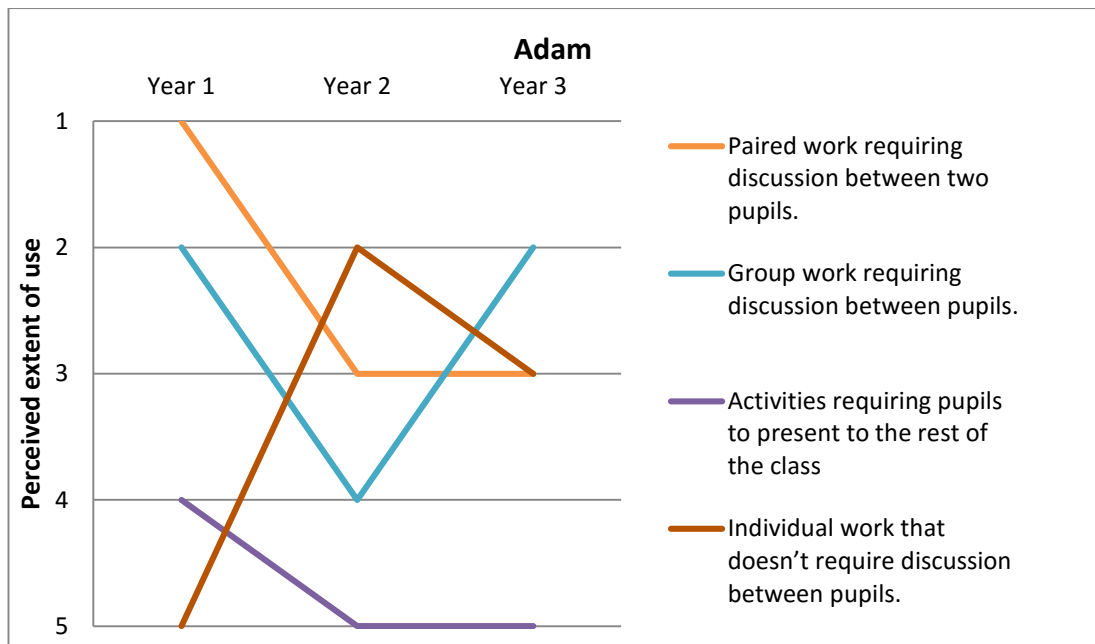


Figure 4.3 Perceived extent of use of pupil-to-pupil interaction for Adam

1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

A key feature of Adam's perceived use of classroom talk is a shift in teacher-to-whole-class interactions from presentation of knowledge, (particularly without interaction which become rare by the final interview) and teacher led discussion toward more use of questions in teacher-to-whole-class interactions. In teacher-to-individual-pupil interaction there is an increase in frequency of feedback to prompt completion of tasks whilst interactions to support thinking vary in frequency from most lessons to all lessons then to about half of lessons over the three years. In pupil-to-pupil interactions there is an increase in the use of individual work after the training year with paired work becoming less frequent. Group work is less used in the second year and then became more frequent again in year three. Overall there is a move toward a more balanced use of pair, group and individual work over the three years.

David

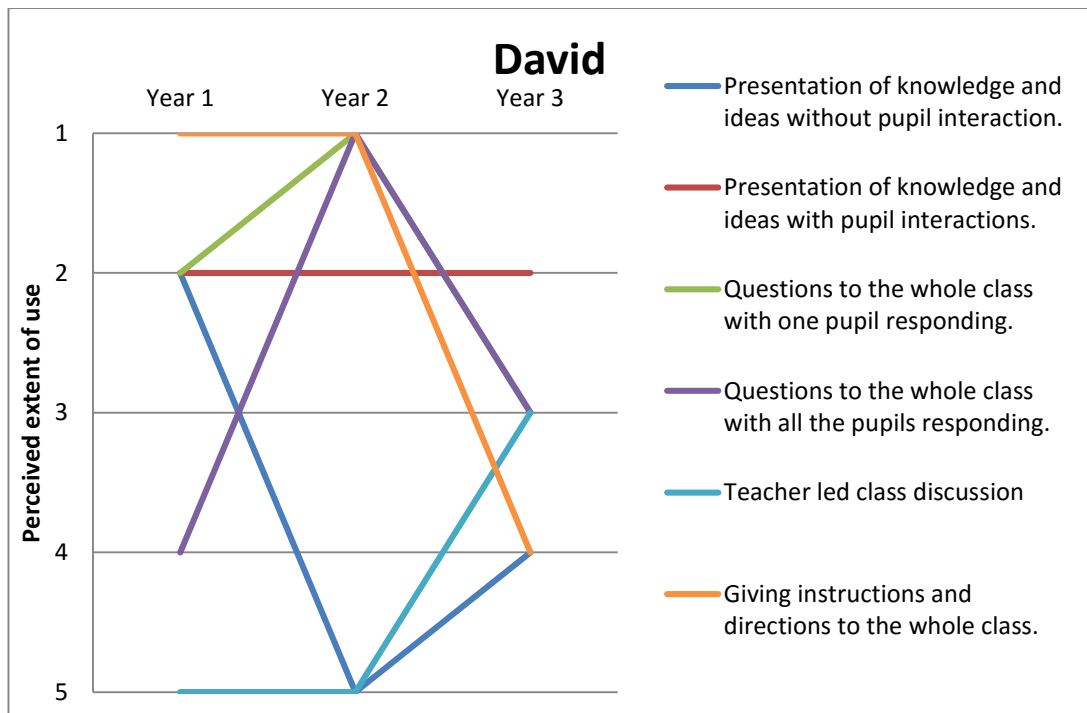


Figure 4.4 Perceived extent of use of teacher-to-whole-class interaction for David

1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

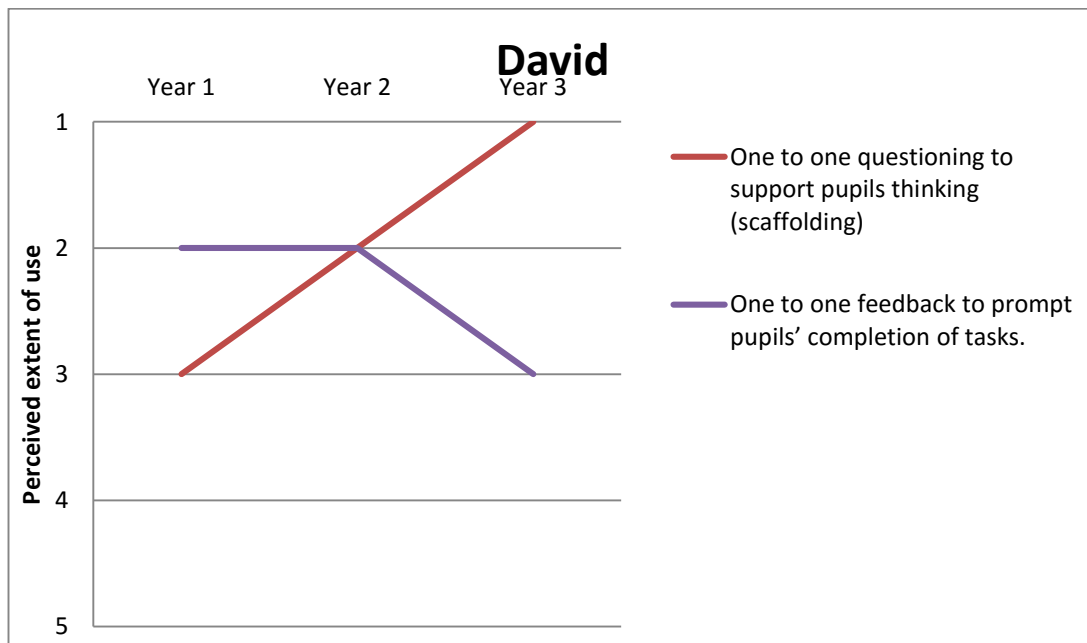


Figure 4.5 Perceived extent of use of teacher-to-individual-pupil interaction for David

1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

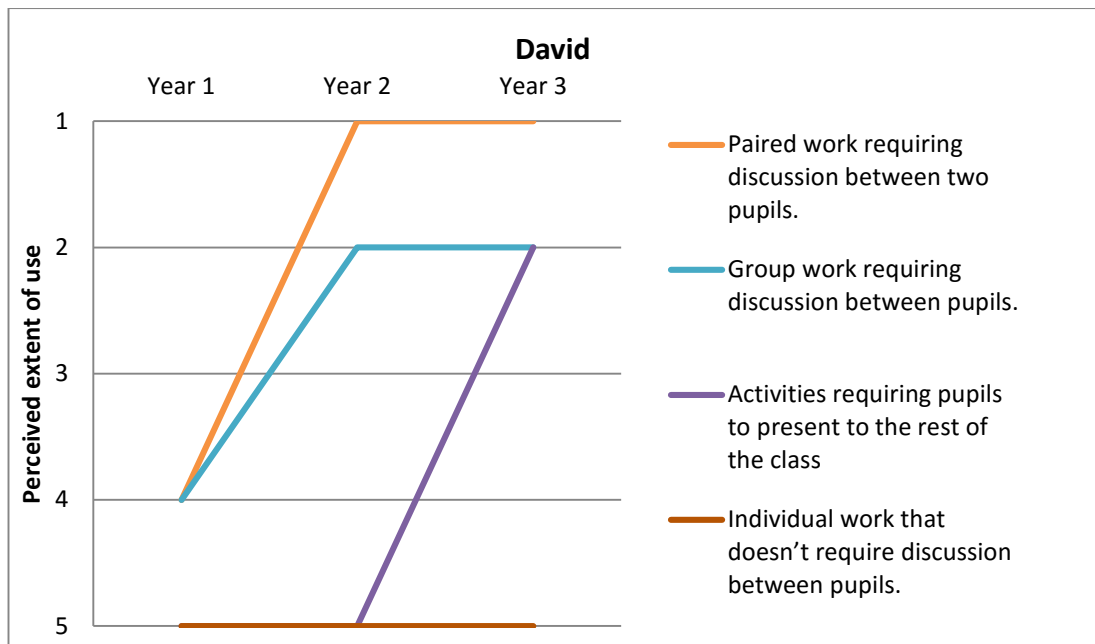


Figure 4.6 Perceived extent of use of pupil-to-pupil interaction for David

1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

The pattern of change in David's use of teacher-to-whole-class interaction shows a distinct change in year two that is to some extent reversed the following year, with increases in the use of questions to the whole class and a big reduction in the frequency of presentation of knowledge without interaction. In the third year these changes are partly reversed and this may reflect some significant influences in the context of David's move in year two of the study from a comprehensive upper school with predominantly white working class intake to a selective grammar school. At the same time there is an increase in the use of one-to-one questioning to support thinking and all forms of interaction between pupils. These seems to indicate a change in David's view of the role of the teacher in the classroom with less emphasis on teacher-to-whole-class interactions, though one consistently frequent form of interaction is the presentation of knowledge to the whole class with interactions.

Jason

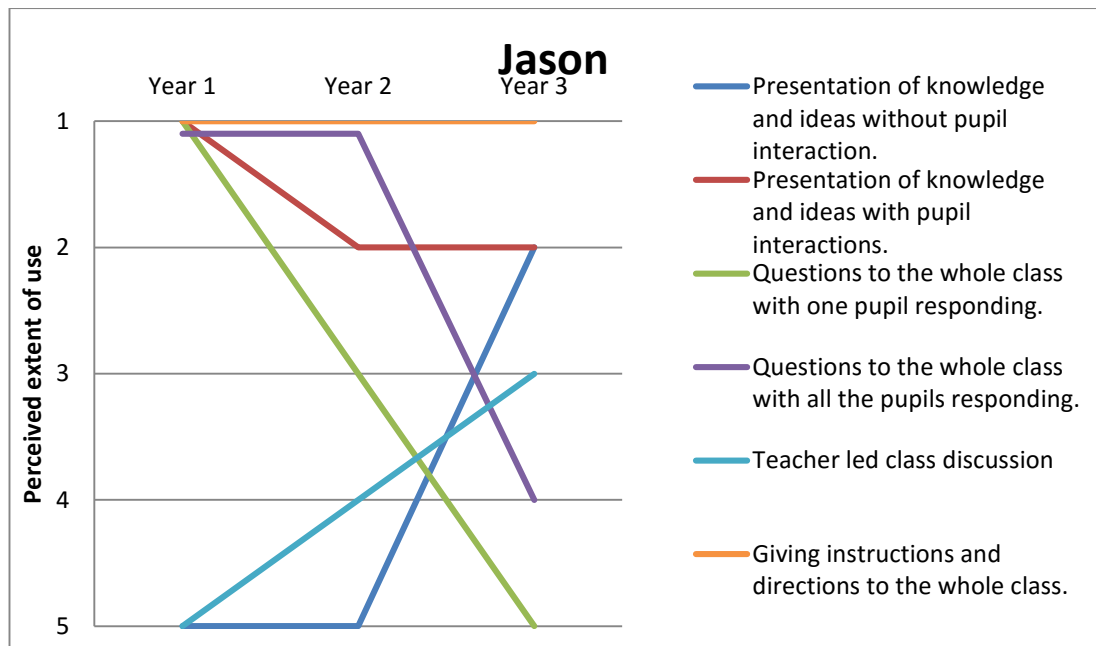


Figure 4.7 Perceived extent of use of teacher-to-whole-class interaction for Jason

1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

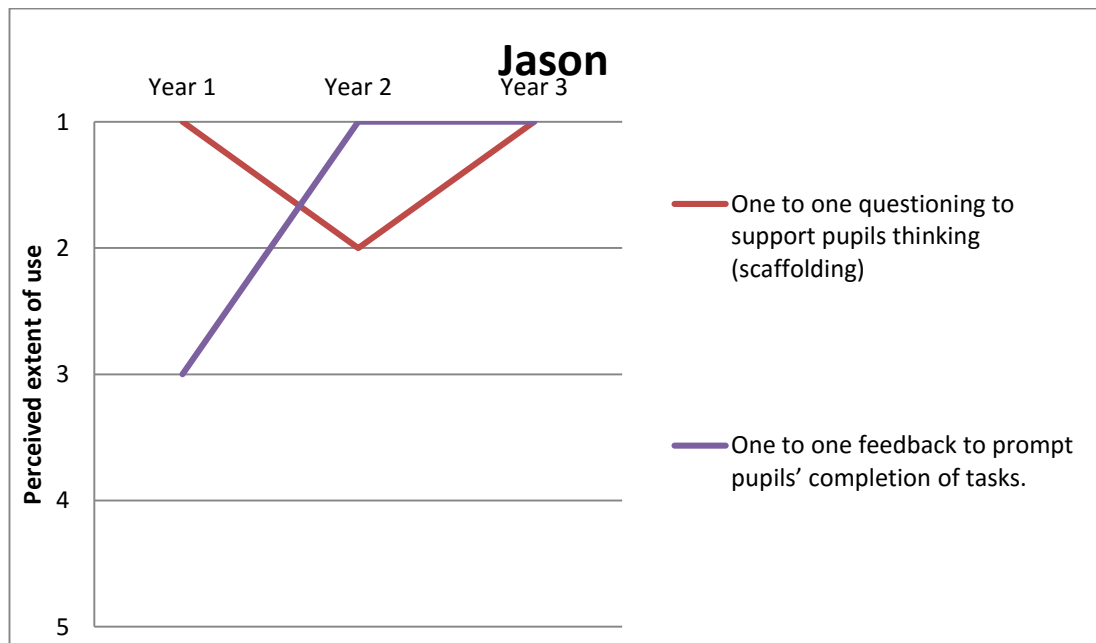


Figure 4.8 Perceived extent of use of teacher-to-individual-pupil interaction for Jason

1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

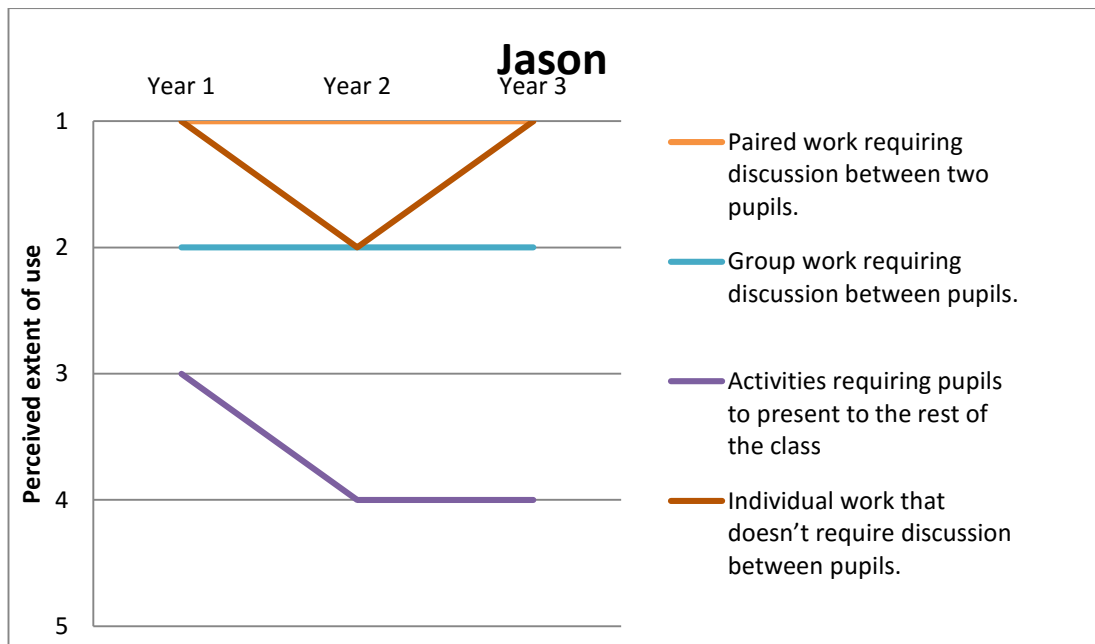


Figure 4.9 Perceived extent of use of pupil-to-pupil interaction for Jason

1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

Jason is one of the more stable teachers in terms of trajectory of change in the frequency of his use of different types of interaction with changes being largely in a consistent direction, either increasing or decreasing, over the duration of the study. Between year one and year three there appears to be a diversification in his teacher-to-whole-class interactions with those used every lesson (teacher to class Q and A type interactions) becoming less frequent and those used rarely becoming more frequent. In particular Jason is one of only two teachers in the study to adopt the presentation of knowledge and ideas without interaction as a frequently used mode of interaction with the whole class. There is also an increase in the frequency of interactions to prompt the completion of tasks and this may reflect the challenges of Jason's first post in an inner city school. Pupil-to-pupil interactions remain very stable over the three years and are seen as frequently used in lessons.

Luke

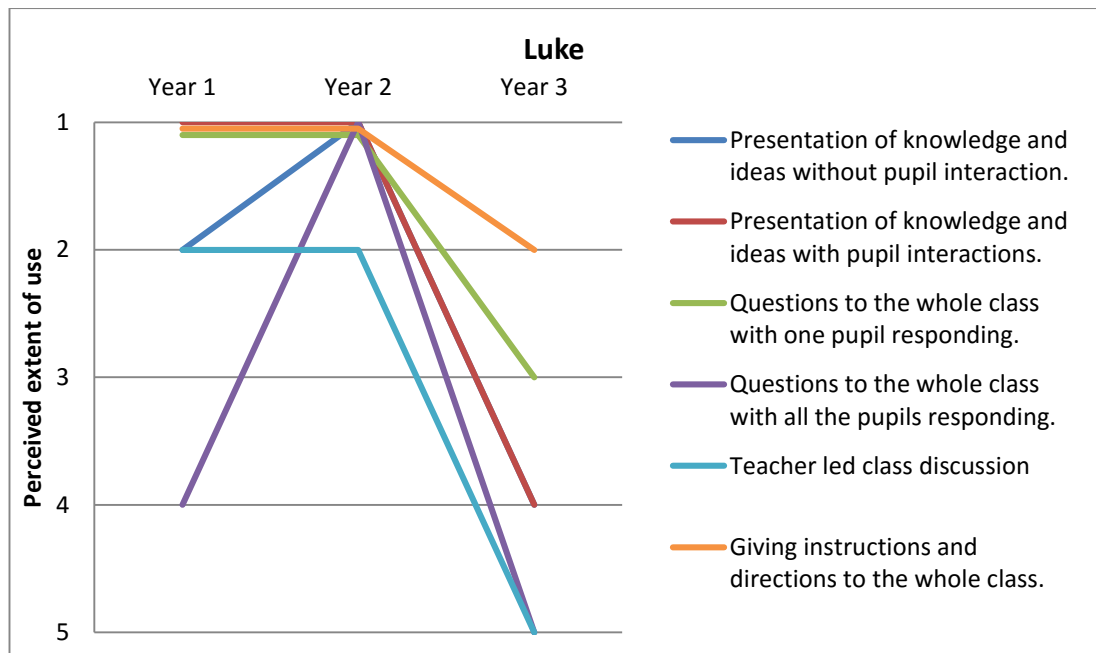


Figure 4.10 Perceived extent of use of teacher-to-whole-class interaction for Luke

1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

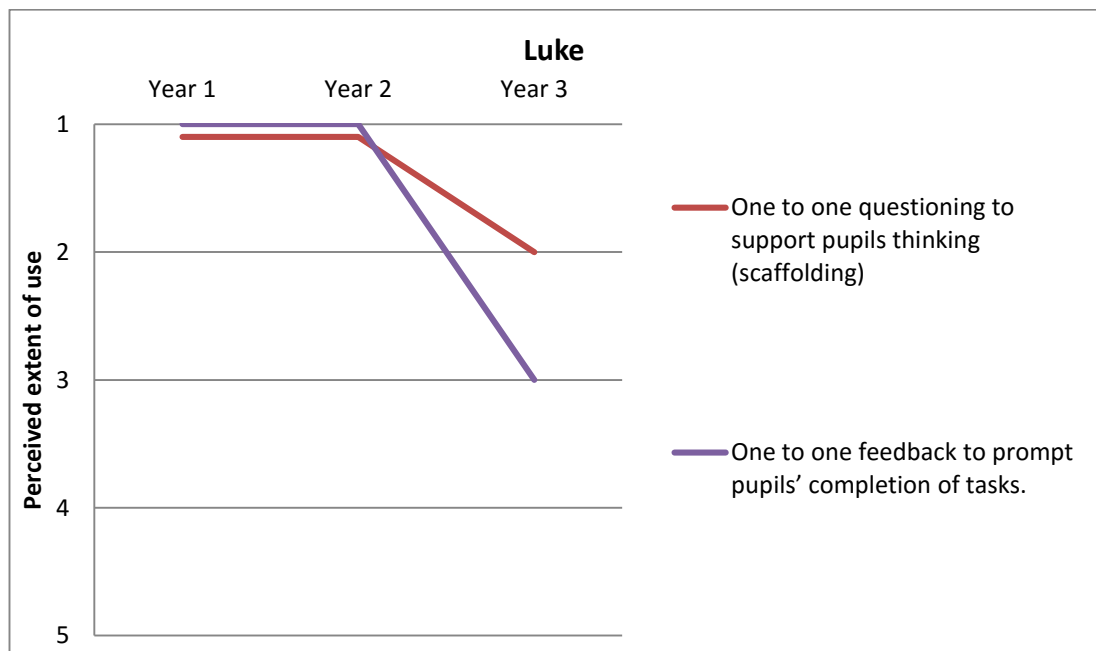


Figure 4.11 Perceived extent of use of teacher-to-individual-pupil interaction for Luke

1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

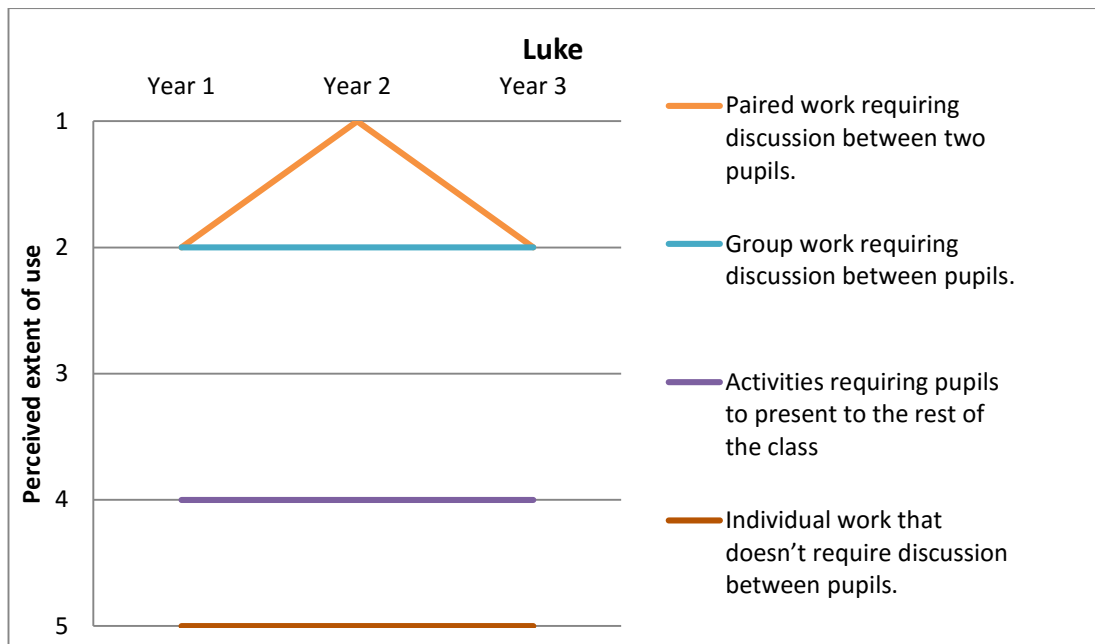


Figure 4.12 Perceived extent of use of pupil-to-pupil interaction for Luke

1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

Luke shows some big changes in the frequency of use of teacher-to-whole-class interactions in the second year of his first post with a decrease in the frequency of all forms of teacher-to-whole-class interaction. Presentation of knowledge, questions and instructions to the whole class and teacher led discussion in particular all become only occasionally or rarely used by Luke. Questions to the whole class with all pupils responding goes from occasional use to every lesson and then becomes rarely used over the course of the three years. There is clearly a shifting sense of the role of the teacher here, as with David, but in Luke's case it suggests a more stable move that occurs over the course of the year after he completes his NQT induction. At the same time one-to-one interactions with pupils also become less frequent whilst pupil-to-pupil interactions in paired and group-work remain frequent.

Ruby

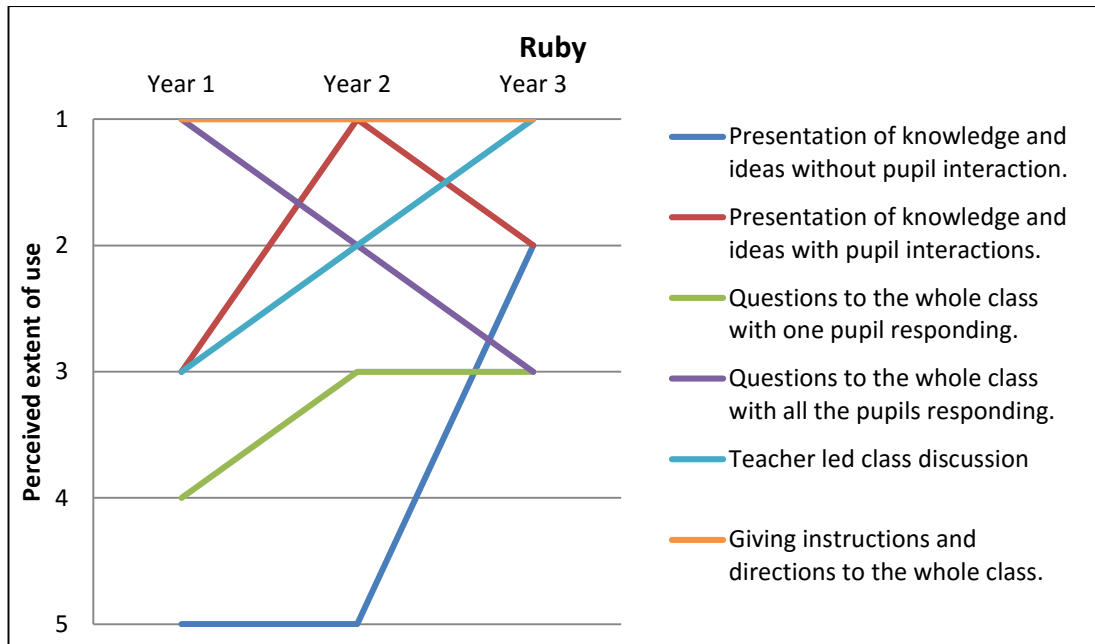


Figure 4.13 Perceived extent of use of teacher-to-whole-class interaction for Ruby

1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

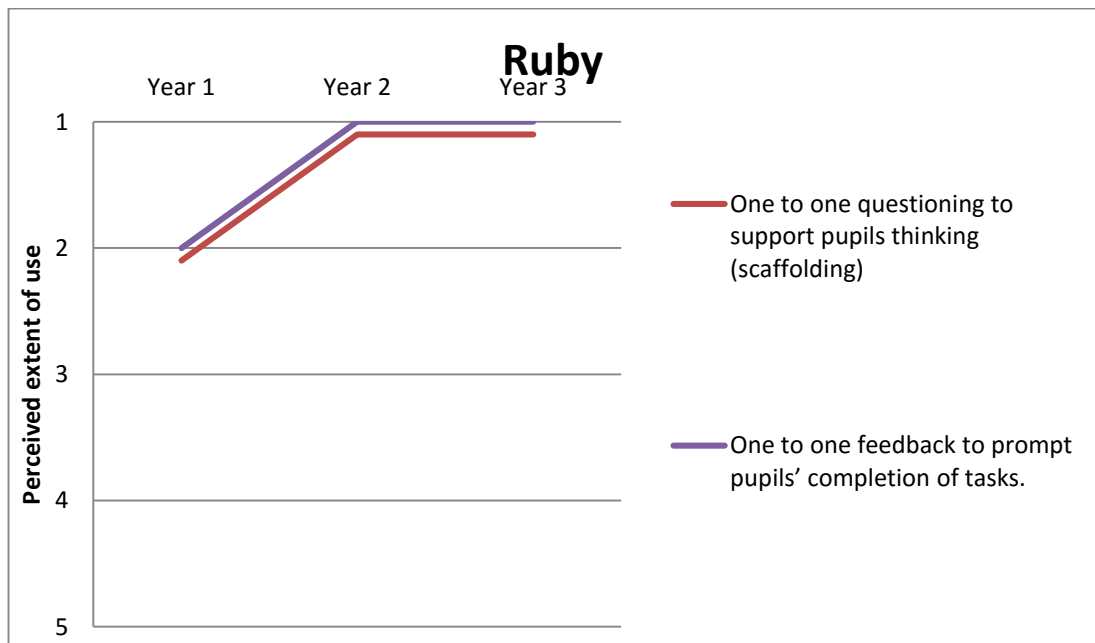


Figure 4.14 Perceived extent of use of teacher-to-individual-pupil interaction for Ruby

1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

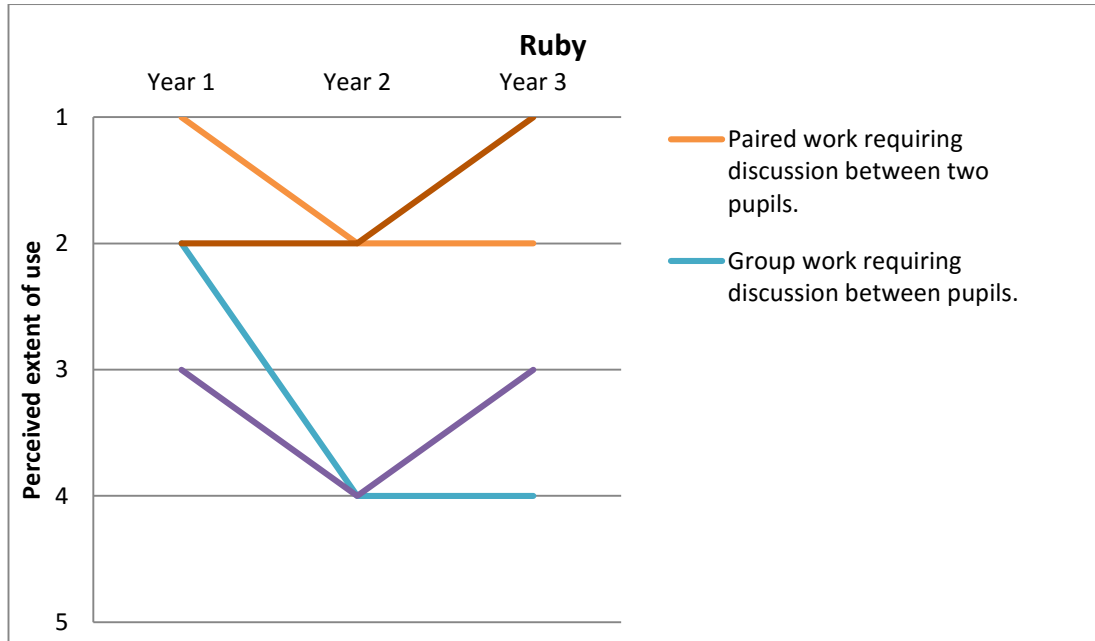


Figure 4.15 Perceived extent of use of pupil-to-pupil interaction for Ruby

1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

Ruby's perceived use of teacher-to-whole-class talk shows no particular overall shift in frequency with all the modes of teacher-to-whole-class interaction being seen as used in half or more of lessons at the end of the third year of the study. Changes within this are a big increase in the use of presentation of knowledge without interactions, something that she shares only with Jason, and a decrease in the use of questions with all the pupils responding. One-to-one interactions remain consistently frequent whilst the use of group work moves from most lessons to occasional use between the training year and the end of her first year in post. Unlike Jason, these changes seem to relate to the expectations of good practice in her employing school and these influences are discussed in her vignette in chapter six.

Sean

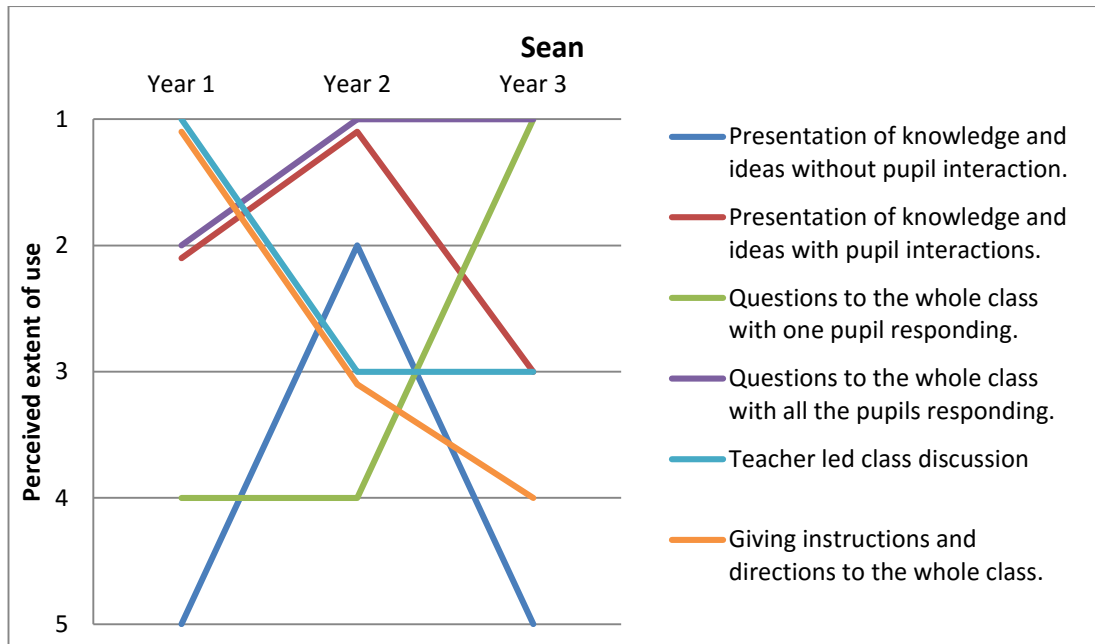


Figure 4.16 Perceived extent of use of teacher-to-whole-class interaction for Sean

1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

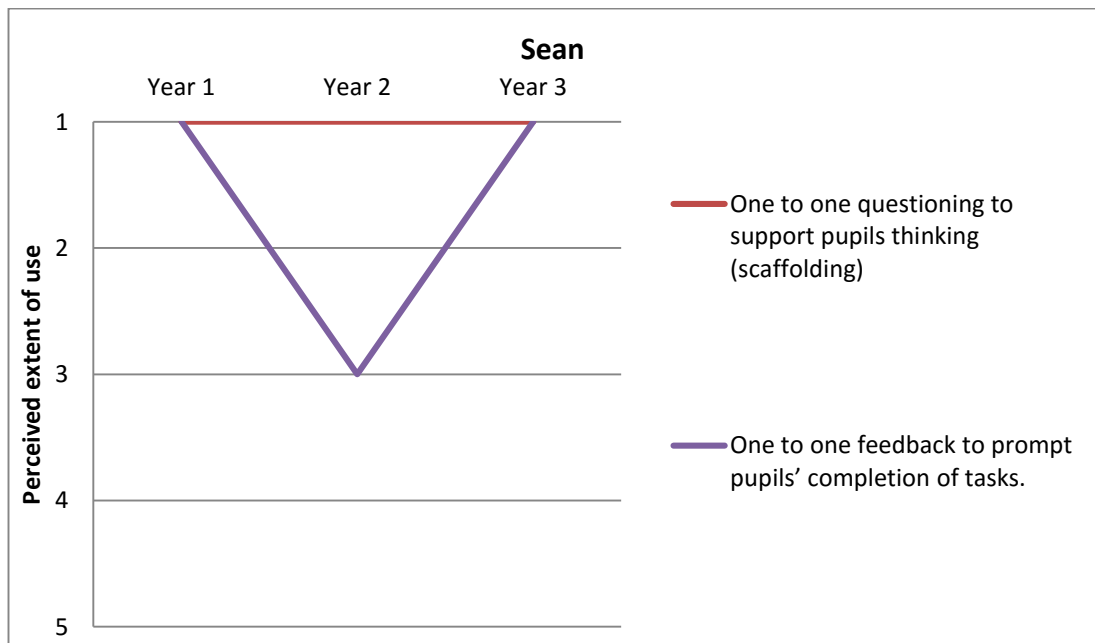


Figure 4.17 Perceived extent of use of teacher-to-individual-pupil interaction for Sean

1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

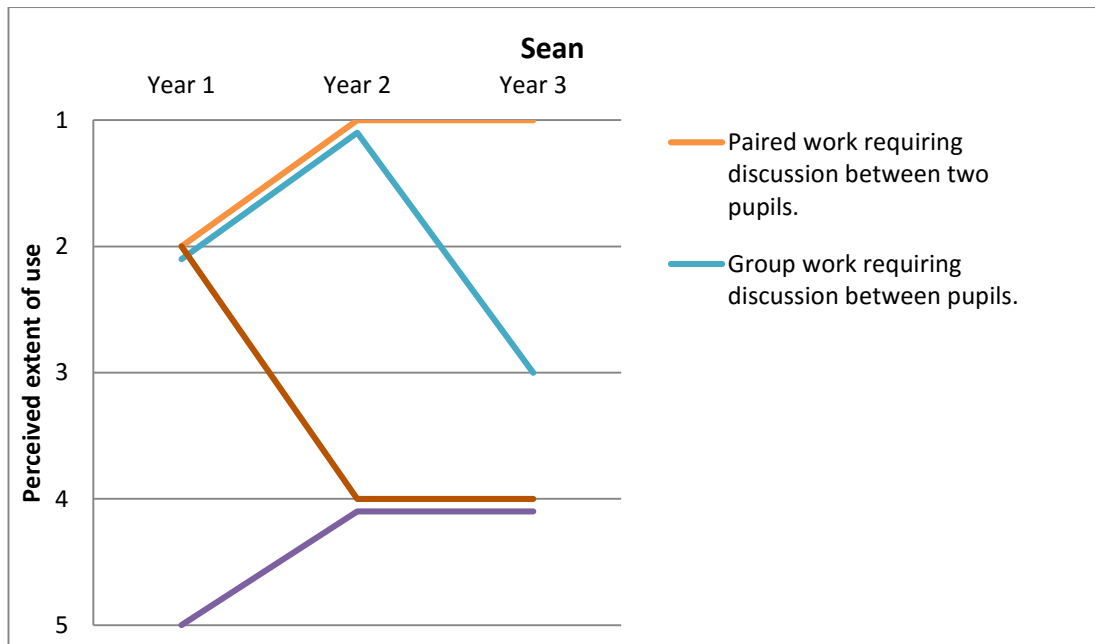


Figure 4.18 Perceived extent of use of pupil-to-pupil interaction for Sean
1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

Sean is another teacher who shows considerable instability and change in his perception of the frequency with which he uses different kinds of classroom talk. This is also reflected in his experiences in each year of the study and are examined in detail in his vignette in chapter six. Between the training and NQT year there is an increase in the frequency of his use of presentation of ideas without interaction and a decrease in the use of teacher led whole class discussions and instructions to the whole class. The former is reversed in the third year with presentation of knowledge without interactions returning from most lessons to rarely used as it was in the training year. These changes in Sean's view of teacher-to-whole-class interactions suggest a shift in perception of the role of the teacher but in a less clear way than for Luke and with less apparent stability in the direction of change. In interactions with individuals there is less change with only the prompting of completion of tasks showing any variation over the study, returning to the same perception as the training year at the end of the study. Sean's perception of pupil-to-pupil interaction is less stable than most of the teachers, with all the forms of interaction between pupils becoming more frequent and a decrease in individual work without talk between pupils. In the third year group work becomes less frequent again. In Sean's case this is in the context of a change from permanent employment in year two to short term contracts in different schools in the third year.

Sophia

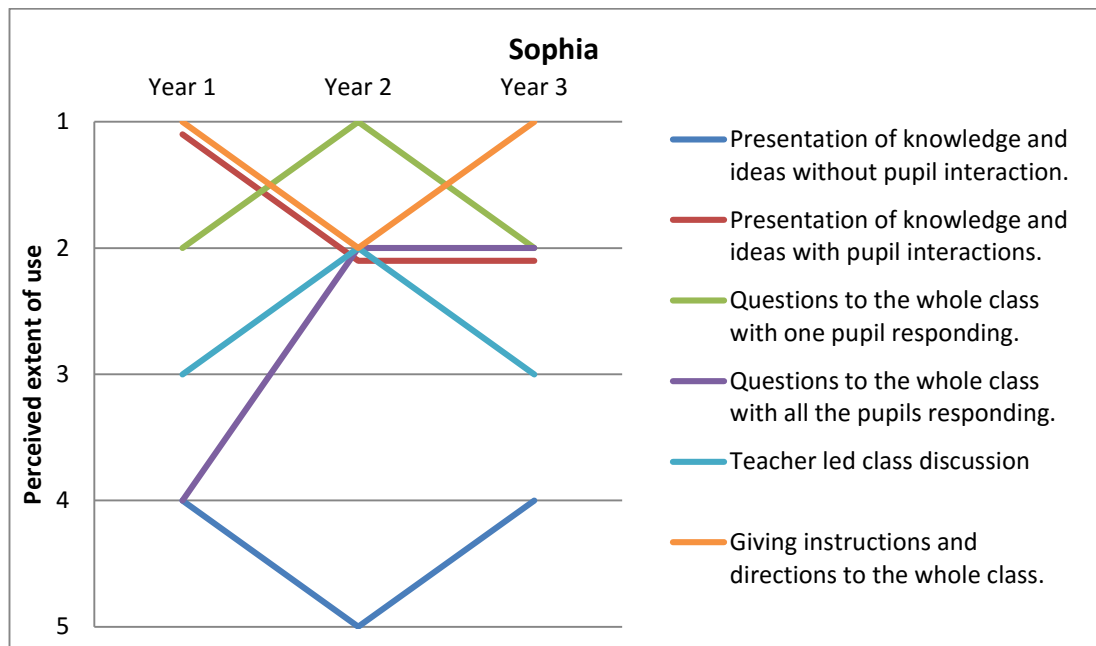


Figure 4.19 Perceived extent of use of teacher-to-whole-class interaction for Sophia

1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

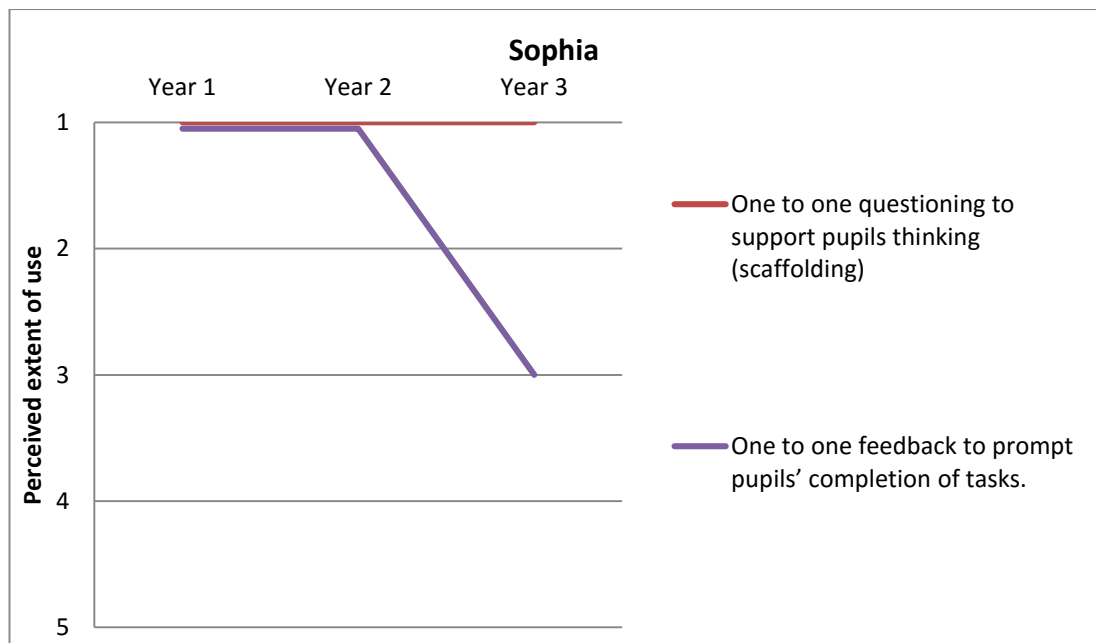


Figure 4.20 Perceived extent of use of teacher-to-individual-pupil interaction for Sophia

1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

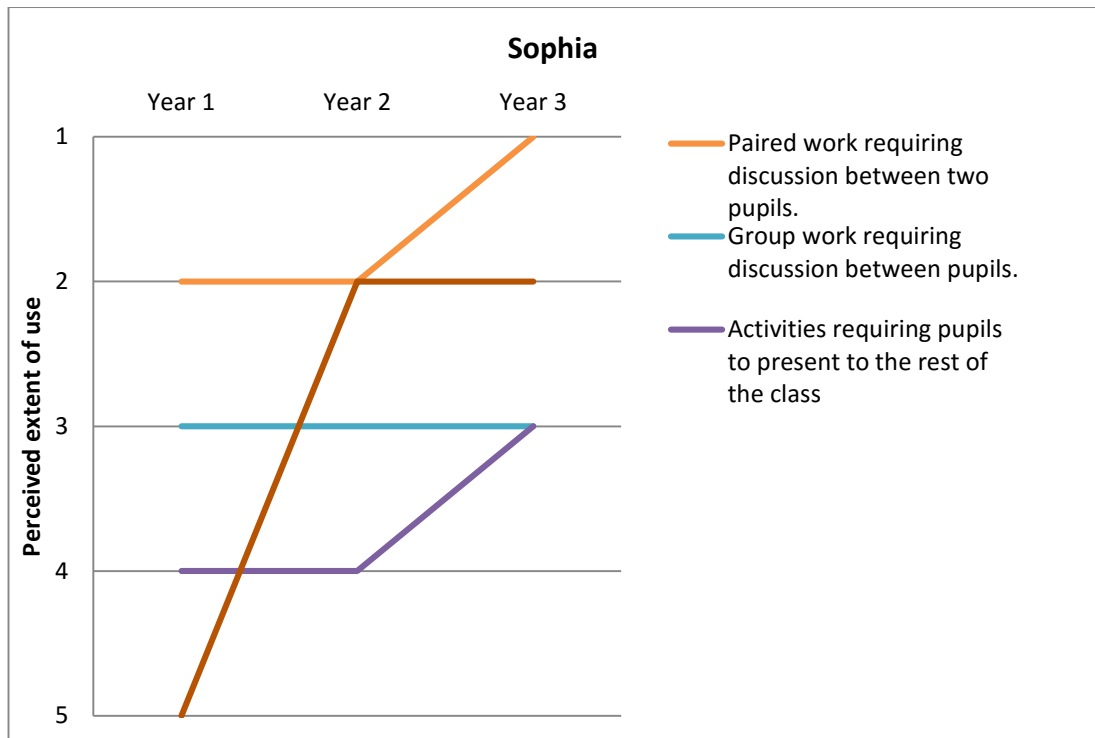


Figure 4.21 Perceived extent of use of pupil-to-pupil interaction for Sophia
1=every lesson, 2=most lessons, 3=about half of lessons, 4=occasional lessons, 5=rarely

The largest move in the frequency of teacher-to-whole-class interaction for Sophia is in the increase in the frequency of lessons involving questions to the whole class with all the pupils responding. Other than this there are only small changes in the use of different types of interaction that in most cases show a small increase or decrease that is reversed in the third year. There is a decrease in the frequency of one-to-one feedback to prompt completion of work in the third year and an increase in the use of individual work not requiring discussion between pupils between the first and second year. Other than these changes, Sophia is the most stable of the case study teachers and shows the least change in her perception of the frequency of the use of different kinds of interaction over the course of the study. This may reflect both her alignment with pupil talk early in her training and an apparent absence of tension between her approach to classroom talk and the expectations of good teaching within her employing school, again these are examined in the vignette in chapter six.

Chapter 5

Findings from the interviews

This chapter presents the findings from the case study participants' responses to the semi-structured interviews, exploring how the teachers seem to understand the nature and purpose of classroom talk. The analysis follows the coding template developed which identified four major themes in the interview data in relation to the research questions of this study. These themes are:

- Participant teachers' knowledge of modes of classroom talk;
- Participant teachers' understanding of purposes of classroom talk;
- Factors that influence participants' use of classroom talk;
- Sources of professional knowledge of classroom talk.

Each of these themes is analysed across all the interviews for all the teachers in the study. In the analysis of the interviews all the themes that emerged reveal the individual teachers' knowledge of classroom talk. In some responses particular forms of talk are referred to explicitly by the teacher, although usually in idiosyncratic ways. This is further illuminated by discussion of different purposes for using classroom talk and of factors that influence their use of classroom talk that gives further insight into their understanding of classroom talk. In this chapter common themes emerge from examining the interviews with all the teachers in the study. Particular narratives of change and development of understanding of the use of classroom talk are examined in more detail through case study vignettes of some of the teachers in subsequent chapters.

5.1 Ways in which the teachers describe their knowledge of classroom talk.

In the interviews it is clear that there is an absence of a common professional language for discussion of classroom talk. Each of the teachers in the study holds an individual conception of the kinds of talk employed in the classroom and the different purposes of classroom talk that reflect the individual identities and philosophies of teaching. Terminology that is developed in the literature about classroom talk such as dialogic teaching is not drawn upon by the participants. Instead their reference terms are the more pragmatic language of the classroom: questions, discussion etc. Indeed the term 'talk' itself seems to hold different meanings for different

teachers in the case study sample. A range of different modes of talk were identified in the interviews. Most of these related to descriptions of classroom talk in terms of the participants involved, the structure of the interactions and the intended outcomes of the talk. There was some consistency in the way most of the case study teachers seemed to relate to classroom talk across the three years of the study with a degree of stability in the orientation of individual talk. The most distinct typology of classroom talk that emerges in the interviews is between teacher-talk and pupil-talk. The interview questions opened up discussion of classroom talk without making this distinction and it is interesting that the extent to which classroom talk was viewed as the teacher talk or the pupil talk in interviews varied between the teachers. Sophia, Ruby, Adam and Jason referred to talk in terms of the pupils as participants in classroom talk in much of their responses, whereas for David, Sean and Luke there was a greater focus on the structures of their own talk. This underpinning alignment of the teachers' personal concept of classroom talk seems to relate to a sense of the individual's identity as a teacher and an orientation toward learning that leans toward either constructivism or didacticism. This difference is illustrated further in the individual vignettes presented in chapter six.

5.1.1 Pupil talk

The modes of classroom talk identified in the transcripts relating to pupil talk related to the participants of the talk, the classroom organisation and structure of the talk and the purpose of the talk. In the interviews all the participants discussed the importance of pupil talk in some way. In some instances this was descriptive of kinds of classroom talk that were seen as beneficial in some way, for example group work involving pupil talk or one-to-one interactions between the teacher and an individual pupil. In other cases the pupil talk was implied through the purpose of the talk, in most cases this was related to needing to either elicit pupils' ideas and thinking or assess their understanding. Nearly all the references to pupil talk were in the context of intended organisational structures planned and managed by the teacher within the lesson but for two of the participants the way in which pupil initiated questions were handled was a focus of development during the study. Sophia, Ruby, and Adam in particular, describe their view of the classroom talk that they employ in terms of the intended organisational structures of the classroom talk that emphasise the participation of pupils in the discourse.

Interviewer What different kinds of talk do you use in lessons and what are the purposes of those different types of talk?

Sophia Pupil-to-pupil talk, so they can develop their answers together. [...] One-to-one, [...] I try and see most people just a quick one-to-one talk. [...] I use a lot of classroom discussion and debates and also bit of consolidation for the class before we move on so that's quite a common feature. [...] I've started to use 'experts' to teach other people in the room so that's all pupil-to-pupil but I try to get them to help others and build mini teachers. [14p37]

Interviewer what's your perception of different kinds of talk you use in the classroom, what's your sense of it?

Ruby I suppose there's lots of different types. You can either use it in pair talk or groups on tables or like a circus of activities where you might start off in pairs and then you need to move round to other tables and add your ideas. [11p10]

Adam I do think pair share quite a lot, that's something that I do that does seem to work well and I think the pupils, the silent time to think allows them just that moment to think carefully and then they are sharing and building those ideas. [12p8]

And again in the final interview:

Interviewer So at this point what would you say are the different kinds of classroom talk that you use in your lessons?

Adam I suppose what's changed a lot is the activities that I set within the class, but I'm trying to [...] get them to do a lot more [...] now I'm doing activities where I am getting them to do the work and I am simply moving around the different groups, [15p6]

For Ruby, Sophia and Adam this sense of structuring the lesson to facilitate pupil talk is evident from the first interview, although the extent to which Sophia is explicit about the range of structures of talk she employs changes from the interview in her training year to her second year of teaching.

Sophia I try and do a bit of group work, a bit of independent work, [...] and a bit of class work, class discussion so we try get all points of view so they can learn about the same topic in those different styles of teaching [I1p15]

Sophia [...] I do think that talking between pupils from what I've seen is one of the most important ways that they learn just doing skills when they're doing practical is they talk to each other about how they should be doing it and I liked it a lot. [I1p22]

Sophia is motivated early in her career by a sense of satisfaction gained from listening to pupils talking. For both Jason and Ruby, in describing the purpose for pupil talk, the motivation is around creating a more positive experience for the pupil. Ruby sees a need for pupils to be able to talk in lessons as part of what engages them in their learning and expresses a dislike of a silent classroom.

Ruby I would say engagement, everybody being able to say something out loud [...], getting you to say it out loud and also it kills that horrible silence of everybody sits and write something (I2p40)

Similarly, Jason describes a dislike of an overly managed and quiet classroom environment. For Jason this influences his arrangement of the physical environment of the classroom to encourage interaction between pupils.

Jason When I first came in here last year it was all in rows, I hate that, they can't interact, there's no movement, there's no flow of anything happening but now with them being like this they can talk to people on the tables, they can have different things set up on different tables, there can be stuff that just going on so that there's movement and some sort of interest rather than just writing, I hate that. Even if it's loud and the behaviour is not as good as it could be if they're all sat in rows, I don't care. I'd rather have to shout at kids halfway through than have them all sat there, so yes. [I4p16]

Jason has, perhaps, the most holistic and clearly articulated personal view of the nature of classroom talk of all the teachers in the study. This is evident

from his first interview where he maps the forms of talk he uses in terms of both their structure and purposes of a range of types of talk.

Interviewer *What's your sense of, so I'm moving on to ask you about talk, what's your sense of different kinds of talk that you use in the classroom?*

Jason *There's the 'whole class look at me talk', erm, then there is the smaller group talk and then there is individual talk, and there is different kinds of each of those talks. There's the 'this is what you need to do talk', 'this is what you need to know talk' and 'this is what you need to stop doing talk'. So, and those are all inside all of the different levels so you've got the whole class, there's the three different types in groups and yeah.*

Interviewer *It's almost a mental picture?*

Jason *Yes very much so I split it all up into different, not quite different boxes but yes, pyramids. [11p16]*

This clarity of form and purpose of talk is less evident at the end of his first year of teaching and is more situated in pragmatic needs and problematic elements of managing specific groups of pupils. This has led to a greater emphasis on structuring interactions through the teacher to maintain on-task behaviour in the classroom.

Interviewer *[...] last year you said in the interview, thinking ahead, I'm going to try less of the standing at the front and talking and try to do more with particular individuals or small groups and that's changed? You've got a different route there?*

Jason *I have and I think that's a response to the actual classes I have. So the stronger classes or the more mature classes I do tend to do that a bit more; with the weaker and younger classes that just doesn't work because of... if I try and do that, if I try and concentrate on a small group then the rest have gone completely off task because of their behaviour issues, generally, and they just don't, without me being constantly there to go 'you need to be thinking about this', they can't cope. [13p14]*

Later in the same interview the sense of different purposes for different types of classroom talk emerges again with a change in terms of assessment for

learning and recognition of the need to establish some sense of pupils' understanding of the context and content of the learning.

Interviewer *What are the purposes of talk in the classroom, what are the reasons why you would engage in different kinds of talk?*

Jason *Explanation of the concept, explaining a task, behaviour obviously... Pushing further, pushing the kids to get a little bit further than they were... There something else but I'm not sure what, there's something else that sitting in my brain that is going, this, but I can't quite tell you what this is so...*

Interviewer *And pupil talk, is that the same purpose or, is it part of the same thing for you?*

Jason *The pupil talk is so that I can find out what they need to do and where they are but then some of the pupil talk is about them pushing themselves or each other further. Yeah... [I3p45]*

For Sophia, Ruby and Jason, there is further element of recognition of talk between pupils that does not involve the teacher as having an influence on learning that the teachers value.

Ruby *Some of the boys, who were really trying in a corner, had sort of listened to some of the girls who were really trying next to them and sort of cobbled together a few of their ideas with a few of the other person next to them and sort of come up with a fairly decent response to be honest. But at least they had been listening to each other perhaps not in the way I intended but they had all been talking. That was just really lovely to see. [I1p31]*

Sophia *I've started to use 'experts' to teach other people in the room so that's all pupil-to-pupil, but try to get them to help others and build 'mini teachers'. [I4p37]*

Jason *I can't think without talking so if I can't think without talking, there's a chance some of them can't think without talking [...] get them to think about and talk about, because if one of them got the wrong idea when they're talking to the other one hopefully it won't give them both the wrong idea hopefully they will go we are not sure, that is the idea behind it. [I3p41]*

Indeed, of all the teachers in the study, Jason has the most clearly articulated sense of the influence of talk on pupil learning and, as he often does in his interviews, describes his view of the role of pupil talk through a metaphor for learning as like processing dreams:

Jason I think they need to be able to talk about it to process it. I think of it kind of like when you dream to deal with the day, to process all the day, it was like that. They had all the stuff talked to them, they may have drifted in and out, so there is going to be a, need a time when they can think over it, talk about it, see that they didn't miss any bits of it, getting bits filled in. And I think it clarifies it in their own heads, from being able to actually talk around the ideas and go 'listen that doesn't make any sense because of this' and just by saying that I find that saying that will make it go 'oh but that's because of...' Sort of thing. [15p37]

Sophia describes how she arranges the seating of pupils to create a mix of ability in pairs or groups as a way of supporting pupil-to-pupil talk. Whilst not explicitly stated in the interview responses there seems to be an underlying sense in the way Sophia talks about her use of classroom talk that is focussed on creating opportunities for pupils to talk about their ideas, as she puts it to “develop their answers together”. There is also an indication that part of her motivation for using pupil-to-pupil talk relates to perceptions of pupil engagement:

Sophia I try not to spend too long on [classroom debates and discussion] because I think it can become a bit boring for the pupils that, the low ability pupils do get disengaged with classroom group talk. [14p37]

The use of mixed ability groupings supports a second aspect of pupil-to-pupil talk that Sophia refers to in her later interviews: the use of pupils as “*mini-teachers*”. Sophia describes having started to use a talk approach of getting pupils to take the role of “*expert*” and trying to get them to help other pupils in the class.

Teacher to pupil one-to-one talk is also regarded as important by Sophia who describes a dual purpose to this mode of talk, being both about “*getting [pupils] thinking more*” and for her to have a sense of knowing “*where [the pupils] are already*”.

Sophia One-to-one, that's probably helped my quality, because the tasks that I use now I try and allocate some time in the lesson where I go and have some one-to-one with at least, I can't see everyone, but I try and see most people, just a quick one-to-one talk. And not 'how are you are you getting on, okay?' because they go 'yeah I'm okay', this was something specific, like an answer to a question or an extended question about what they found that I think that gets them thinking a bit more. [14p37]

There is also a purpose for Sophia in developing relationships with pupils through talk with individuals and in encouraging them to participate in lessons:

Sophia Listening to the pupils is something that I've been trying to do a lot more of and also not just for them developing their answers but they trust you a lot more if you spend time listening to, even if it's got nothing to do with a topic that were doing today but if it's about some sort of science they are trying to build a rapport with you it helps so much in the following months with their participation. [14p10]

There is an indication here of an emerging recognition of a genuinely dialogic mode of teaching where the ideas of pupils are listened to carefully and recognised as an essential part of the learning process. However, here again there is blurring of the aim of the mode of talk between pupil learning in an immediate and direct way and outcomes relating to participation and engagement that are likely to have an indirect effect on learning.

5.1.2 Teacher talk

In contrast to Sophia and Ruby, Luke and David's responses in terms of the kinds of talk and purposes of talk used in their classroom were focussed on the talk by the teacher. Luke in particular refers almost entirely to his own talk, with an emphasis on the development of teacher talk during his training year.

Interviewer Do you think about kinds of talk that you use, are you are conscious of that in your planning [...]?

Luke Often it comes out naturally I think. I think things like questions, key questions I'll try and put down but a lot of the time I kind of just follow it through, I mean the way I talk to them, it's not just like I make it up on the spot, it's kind of like I've been trained to talk in a certain way to some extent. So when I first taught I just kind of say

'listen' and then 'listen' and hope they listen. Whereas now I use countdowns, perhaps too much because I've learnt it's kind of just like a teacher way of saying like 'right I want you to listen', 'I want you to be listening in three seconds' just gives you a warning that you are going to be listening. It's a lot more structured way of just saying 'okay guys we need to listen now' although I do try to say things, I do use the word 'guys' a lot. I try to kind of like talk to them like that but it's not... I don't plan to say those sorts of things. [I1p12]

This focus on the nature of his own talk is in the context of a shift during his training year to recognise the problematic nature of learning and Luke recognises an emergent understanding of the complexity of classrooms:

Luke Yeah. I did think it would be a lot more didactic, I thought it would be a lot more just kind of, it sounds stupid, but just like I put something on the board and they magically absorb it and it is nothing like that at all. I didn't really realize just how much effort, planning and preparing sheets and making the way for them to learn. [I1p2]

Luke's focus on his own talk re-emerges in the final interview after two years in teaching with a clear typology described that is entirely related to his own talk and its purposes. Development of his understanding of talk seems to be in terms of a development of his own language and mode of talk that is part of his sense of being a teacher, what he refers to in his first interview as switching on 'teacher mode'.

Interviewer how do you use [talk], and what different ways do you use it?

Luke Okay so you kind of got your introductory, [...] kind of friendly relationship building type thing when you're speaking to them and you're just asking them 'how was your weekend' and things like that [...] And then you've got your instructions so you got your 'right I need quiet' whatever your signal might be and then to give some instructions [...] and then I suppose explanations are slightly different than instructions really because if you're explaining something you try to do it as quickly as succinctly as possible in a way that is interesting, [...] so it's slightly different language. And then behaviour, so when you've got someone being a bit of a nuisance and you say 'right I've asked you to stop I've given you a warning, I need you to step outside, and using words like I need you to do this and thank you and things like that. [I5p2]

David's main focus in the open early part of his first interview was on the development of his own classroom language and the process of transforming subject knowledge into a form that would be understood by and accessible to pupils. Most of the emphasis in his interview is on the teacher's talk, both to the whole class and to individuals/groups of pupils. It seems that David is identifying an overlap between understanding of talk and subject-specific knowledge, the pedagogic content knowledge of science classroom talk.

David I want to get back possibly to more talking about actual what words I'm using and more what effect they have of moving from one to the other. I think that comes back to from I think comes back to the knowledge kind of thing when you've got the different bits of knowledge that you want to get across. [11p5]

David also presents a view of his own classroom talk as forming a narrative to link a series of activities in the lesson. He highlights a need to make his own talk engaging and maintain pupils' interest.

David I wanted my language to be intriguing enough for people to pay attention [...] I do see it as a narrative, as a story that you have to have the linking sections that there is something that holds one bit to another and then you follow it through [11p8]

In the first interview Sean is also focussed on the teacher talk in his discussion of how he uses classroom talk. He does, however, offer a personal view of talk that could be considered analogous to authoritative and dialogic modes of talk:

Sean I also actually think that teacher directed talk is where you are obviously telling them to do something or you are giving them a piece of information that they didn't have before but they need in order to access something. Whereas obviously the class discussions you're feeding back they're getting their ideas, you're taking their ideas and going right okay that's a good idea, how would that make a difference, so you are opening their way of thinking out to the rest of the group and helping it to basically take its own course within reasonable limits. [11p10]

There is an implicit recognition here of the need to work with pupils' ideas in the classroom and that part of the role of talk is to mediate the interplay between the science view and pupils' attempts to present their own

explanations and understanding through classroom talk. Along with the stated need to open up pupils' thinking to the rest of the group this viewpoint is very close to the definition given by Mortimer and Scott of the dialogic mode of interaction where "attention is given to more than one point of view [...] and there is an exploration or 'interanimation' of ideas" (Mortimer and Scott, 2003 page 33).

Sean It's almost starting a debate in a sense, I found that it's a great tool [...] to actually see how they are working things out and where they are coming from so, any misconceptions in that sort of environment get addressed. (I1p11)

Sean is recognising the importance of engaging with pupils' ideas and the likelihood of variance between pupils' ideas and the science ideas he is trying to present. He is using classroom talk to create discussion about ideas that enable some insight into different points of view where there is a recognition of the pupils' ideas. This suggests an implicit development of more dialogic interactions (Mortimer and Scott, 2003).

Sean also talks about the nature of his questions in terms of developing ideas about talk and of the move to a more interactive pattern of communication.

Sean To begin with I wouldn't have done questioning at the start and that's why it was more lecture-ish even after my very first lecture after that there wasn't as much questioning whereas now as a result of this placement particularly my higher order questioning has really pushed forward. [I1p15]

Sean refers to feedback from his mentor that provided very strong guidance to develop a more interactive pattern of communication, in part to maintain pupil engagement. It is clear in his response that the guidance was about patterns of teacher behaviour rather than providing a rationale for interactive communication patterns.

Sean He [the school based mentor] didn't say never to do again; he just said "that was a lecture." So I knew by the tone of his voice that that was the wrong thing to have done. [I1p5]

This lack of a framework from the mentor for reflecting on the purpose of different modes of communication suggests that for Sean there is a clear disjunction between theoretical frameworks presented on the PGCE course and feedback on emerging practice in school.

For some of the teachers it is evident that they are very strongly focussed on their own talk, either to the whole class or in interactions with pupils. Talk by pupils themselves is not often referred to explicitly in these interviews, though the structural elements of organising the classroom to encourage pupil-pupil talk in paired or group work is discussed. Each has a different experience of developing their talk in the classroom. Luke talks about changes in how he uses his own voice in terms of the physicality of his voice, tone and volume. He is explicit about moments during the course where he has had to adapt and develop the use of his voice:

Luke I had an incident with one of the lads in year ten where basically the feedback from that was that I sounded like I was being aggressive a little bit like I hadn't turned off teacher voice to one-to-one let's have a conversation because you've acted out a little voice. And they reacted negatively and I think I've tried to try a little bit more since it's just quite difficult to just remember right okay I'm not in front of the class and I have to bring the voice back down let's talk all calm. [11p25]

Similarly, Sofia, Jason and David are conscious of becoming more concerned with the content of what they are saying and of the need to develop teacher talk in terms of making use of appropriate language and word choice to explain ideas and give instructions with clarity:

David I want to get back possibly to more talking about actual what words I'm using and more what effect they have of moving from one to the other. I think that comes back [...] to the knowledge kind of thing when you've got the different bits of knowledge that you want to get across and you explain it... [11p5]

Sofia I think that was my talk I now realise that I have to be completely explicit about every minor detail even if I think that it won't matter, or they'll work it out somewhere along the line. I think now that I know I need to really reiterate and repeat specific things that are important in the lesson. [11p27]

Jason describes a similar change in the care with which he uses his own talk in terms of both his choice of words and the speed of his delivery.

Jason I have become very conscious of not going too fast, of being very, sort of knowing what I need to say and saying it clearly rather than just going at it and seeing what comes out of my mouth.

*[...] I'm trying to, when actually having to explain something, trying to be much more clear, much more useful in my explanation I guess.
[15p14]*

For Sean the two significant changes he discusses in the first interview are the use of silence to manage behaviour and the difficulty of calibrating the complexity of the subject matter presented to be accessible to the pupils he was teaching. This reflects both his placement in a very challenging school where low level behaviour problems were a significant issue for staff and his background in post-doctoral research:

*Sean During this placement [listening] has been the hardest thing to get in place. So it's keystones really of the teaching and that's what I found difficult. And of I've... I have improved greatly because I do now wait for quiet, I do now wait until they are paying attention. [...]
The other thing that has developed is my language is at the appropriate level now whereas to begin with it was, because I've just come from, there were some instances where I would completely lose the students based on the level I was pitching the information.
Whereas now I try and even when they are asking me a question, I'm thinking right away, how can I give them an answer if that's what required at their level? [11p3]*

For all three of these teachers, while the particular focus for each is different, the change they describe in their use of talk in the classroom relates to their own talk and to teacher-pupil interactions within the lesson. Though not surprising, it is clear that the understanding of the nature and purpose of classroom talk that is evident from the end of the initial training course is teacher-centric. The case study teachers' are reflecting on the changes in their own sense of themselves as teachers, their understanding of the role of the teacher and the changes in the way in which their actions as teachers are determined by their experiences and reflection on both what they feel was successful in the classroom and what was recognised by mentors as good practice. In the interviews there seems to be a complex interaction between experience, feedback from mentors and a sense of the teachers' own identify and belief what their role should be that will be explored further later.

That is not to say that this pattern of focus on the teacher talk is exclusive, rather that, for Luke and David in particular, their discussion of their use of

talk centres on the teacher talk in lessons. There is however some sense of this changing for Luke as he develops the confidence to respond to pupil initiated talk in lessons, adapting the lesson to respond to questions from pupils.

Luke I've had lessons with year seven where suddenly they just start asking questions and it just turns into like half an hour or forty-five minutes of the kids genuinely interested and asking questions back and forth, whereas a few years ago I probably would have cut it short and said 'we must move on with what we doing', because their year sevens we can't possibly have an intelligent conversation about something. So yes I suppose I'm much more willing to do this kind of, let things run their course. [15p6]

5.1.3 Non-verbal and unusual forms of talk

In interviews during the study Sophia, Ruby and Jason discuss classroom activities that do not, on the face of it, involve talk but where a form of non-verbal discourse is suggested. The teachers talk about either written tasks or silent tasks in terms of an internalised or silent 'dialogue' between teacher and pupil or between the pupils in the classroom.

Ruby even starting off without talk was quite interesting, doing silent mind maps where people had to add ideas on and then the final group would come up together, but then they were evaluating other people's ideas and forcing them to think outside of their own ideas and incorporate other people's. [...] I noticed that some of them were getting really frustrated because they never got picked to answer the question, because they couldn't sit still, so 'sit still and you can answer the question', which didn't work because then they just got more frustrated that they weren't being picked. Then when they were allowed their whiteboards it just was calm but I think it was that they all felt that they could contribute something. [11p10]

Sophia I think [writing is] a form of talk because it's what they are saying in their mind.

Interviewer So some of it could be internal?

Sophia That's the difficulty actually with talk, well vice versa with their talk, and their written skills, it depends on the character, the

pupil. Some pupils are really confident with talking and then they can't actually transfer that to paper. And then other pupils can write amazingly, I've got a few level six pupils in my year nine class and they write really intricately with loads of detail, that makes sense, in paragraphs. And then asked to read it out loud and they panic and they can't give their answer in the form of talk. [I3p14]

Interviewer [...] your marking, is that itself a form of talk do you think?

Jason Yes, I guess so, yes, [...] but one that I can't force them to pay attention to. So yes, in some ways... in some ways undervalued, certainly by the students. I mean we can try and make them pay attention to it but then you will mark it and say, 'so you need to do this now', and then when they do the 'this now' it is quite clear that they haven't actually read what you've told them, they see the word and written, and it's worse so yes. [I5p39]

It seems that, for these teachers, their understanding of classroom talk extends beyond a description of the modes of talk in terms of the participants or focus of the talk to see talk in terms of a learning dialogue within lessons where the 'talk' can be internalised or expressed in written form. This identification of non-verbal forms of discourse may relate to a focus in the schools where these teachers are working on a particular style of marking. By the middle of her second year in the school, Ruby is developing a degree of cynicism about her school's marking policy and the time consuming nature of this kind of written dialogue.

Ruby We've got a big thing on green pen and marking at the minute, it has to be in green pen, [...] if there isn't green pen in the book is not done so if there isn't green pen it has to be circled in green pen so that whoever is looking at it knows that you have green pen. It's become like this is a green pen moment, produce your green pens. Sometimes [...] it would have taken thirty minutes to write the answer so frankly we had a chat about it. I can give you the details of that conversation if you like but it's just that conversation that we are now forced to do in books but it never bothered me anyway because I was quite happy to do it, but it is extra, it is like triple marking sometimes, which is the only downside, I guess, of it. [I4p11]

Another unusual form of talk mentioned briefly by Sophia relates to Mortimer and Scott's non-interactive dialogic mode of discourse in that she uses her own voice to present the ideas of pupils in a dialogic manner:

Sophia I do a lot of post-its where they write their opinions and then I read them out and they will talk about 'does that make sense, it is, how would I rephrase that, using examples? [14p31]

For both these teachers the reflection on non-verbal elements of activity in lessons as representing a form of talk suggests a significant orientation towards dialogic teaching. For Sophia, Ruby and Jason there is an importance given to the internal construction of meaning by pupils and to their own role in opening these individual meanings to the social plane of the classroom with both the teacher and, significantly, with peers.

In the final interview, Jason talks about a change in his use of teacher talk to have a clearer distinction between teacher talk and pupil talk. He is the only teacher to identify a benefit to univocal modes of talk without any pupil interaction, what Mortimer and Scott (2003) would classify as a Non-interactive Authoritative mode of discourse.

Jason I try not to have too much in the way of interruption when I'm actually explaining because I find that it breaks my flow and I think it might break the flow of them understanding if I ask a sudden random question. Once it's done I sort of move around and talk to, and usually while they're working all sit there, right in the middle and then be able to sort of go to people who need or don't want me there. So yes... I sit in the middle like a spider.

Interviewer It is quite a clear distinction then...

Jason Yes.

Interviewer Is that different to how it used to be?

Jason I think so, I think it is to be more chaotic, I think it used to be more sort of I'm doing explanation, you've got a question brilliant what's the question, okay let's go off on a tangent. I think I've realised it needs to be a lot clearer, sharper, more focused and then we can deal with the other stuff because it might be that question is what I'm going to say next so why break the flow something that I'm just about to say, so yes. (15p23)

This clear distinction between univocal teacher talk and providing other times in the lesson for questions and interactions with pupils only appears in the final interview and seems to suggest a change in Jason's use of classroom talk at the end of his third year in the classroom. However, despite Mortimer and Scott's (2003) model of classroom discourse forming an explicit component of the training course it is not referred to by the teacher in the interviews.

5.2 Purposes of classroom talk.

In the interviews the teachers' views of classroom talk were also revealed through the different purposes that the teachers indicated for using different kinds of classroom talk. As discussed previously in the chapter, there is no clear common language drawn upon in relation to classroom talk, rather, individual teachers' views on both the use of classroom talk and the form the talk takes is revealed implicitly in their interviews. The different emphasis placed on the purpose of talk by the teachers says something about how each teacher is developing a view of classroom talk that is to a large extent integrated in their sense of themselves as a teacher. Two overall themes emerge in the teachers' discussion of the purposes of classroom talk: the effect of talk on learning, both in general ways and in science specifically, and a more affective purpose of improving the emotional and social development of the pupils and establishing effective relationships between the teacher and pupils. The extent to which the different teachers focus on these two themes differs between the individuals and changes over the period of the study.

5.2.1 Learning knowledge, ideas and concepts

Discussion of classroom talk seen as having a purpose in pupil learning by the teachers relates to either the presentation of knowledge by the teacher, dialogic elements of teaching where interactions with pupils are intended to support the development of understanding, or a role in the assessment of learning by the teacher. There is overlap between these themes for the teachers and there is a shifting focus for some of them during the study, but there is also a sense that emerges of a degree of individual identity in terms of their orientation towards the different purposes of talk: For some of the teachers the lens through which talk is viewed suggests a transmissive view of teaching with a focus on the teacher's role in presenting the authoritative science knowledge in the

classroom; for others there is a more dialogic view with a greater emphasis on pupil talk.

5.2.1.1 Presentation of knowledge

The perception by the teachers of the role of the teacher talk in presenting authoritative science views in the classroom is a conflicted one. For four of the teachers, including the two with the most teacher-centric views of classroom talk, Luke and David, as well as Jason and to a lesser extent Adam there is a sense during the study of a need to resolve the recognition of a role in teacher talk of explaining ideas, with a preference for interactions with pupils in lessons. Luke describes the difference between teacher talk with the purpose of giving instructions and explanation.

Interviewer You mentioned a difference between instructions and explaining, can you say a bit more about that, for you what's the difference?

Luke [...] An instruction you want them to hang on your every word 'you're doing this and then you're doing that' I do like saying 'this is what you're doing' and you're doing it as concise a way as possible so that you're not going around the subject. Whereas explanation, you can kind of have much more space for questioning, there is kind of like modelling, for you to do other things and for pupils to talk at the same time, because it's not just didactic. [...] I suppose explanations don't always involve you at the front talking they can be something that you're going around and then you are talking to someone and using hand gestures, you're making suggestions, you're using models, you're asking questions. So I suppose it's much more of a two-way process. (15p3)

So for Luke there is a clear difference in the mode of teacher talk depending on purpose. Managerial and instruction giving talk is 'concise' and less interactive whereas he sees talk intended to explain scientific ideas as needing to be interactive and incorporate pupil talk through questions.

Through David's interviews from the first to the third year there is a strand of discussion around what he calls the narrative of lessons. He describes a move to try and develop a coherent narrative to lessons whilst at the same time incorporating the pupils' talk into the lesson narrative and

creating a feeling for pupils of 'initiating' and 'exploring' the ideas within the lesson.

David I think that there is a flow between lessons, that there is may pick up the previous lesson or the lesson that's coming. [...] I would at the start of the topic go through it see how it interconnects, so you can see that start and end point each bit linking the activities and I think that, when I go by my lessons I see it as a narrative in terms of, [...] accumulation of knowledge or something like that, that you want to get to the end, therefore it has to link. [I2p12]

David I remember talking a lot last year about having a narrative of [...] lessons. I still feel very much that I want them to initiate the narrative more, so that they can start off their starting point and then hopefully we can get to somewhere else. [I2p23]

David I want the kids to be doing more in terms of the actual discovery and less, I think probably in terms of how that fits the language and questioning I think it would be, to have lessons that run themselves in terms of where the kids are doing them, [...] that there is an organic flow in terms of a voyage of discovery, but it's a definite structured thing. If I'm not contradicting myself, how it set up. [I5p7]

In his own slightly idiosyncratic categories of talk, Jason describes a similar inclination to limit the amount of authoritative teacher talk to the whole class.

Jason Obviously the, 'you should be doing this' one [...] The 'this is what you need to go and do', [...] too, the 'prodding them in the direction of letting them learn themselves' and the 'this is what you need to learn' is the bit that I'm trying to reduce as much as possible, so that, because that's the trying to stuff the knowledge in rather than letting them find it and that's the bit I try to keep to the least, obviously and the 'don't do this' bit as well. [I1p18]

At the end of the following year in school Jason is working through a feeling of not always meeting his own expectation of himself to make lessons interactive in the pressures and demands of his first year teaching.

Jason Yeah, when I'm feeling rubbish. When it's just like I need to explain this, I'm pretty sure they don't understand anything, I'm not

sure how to pull this out of them, I'm just get to explain it now and then asked them about it later.

Interviewer Something in your gestures there suggests that it somehow below...

Jason Yes it's not ideal because is not really sort of testing, assessing them as we're going along so not really knowing whether their understanding so I just gone here's the talking, I don't know if you understand any of that, we'll find out. (I3p13)

Of all the teachers in the study, Jason is the one who develops the most clearly articulated distinction between interactive and non-interactive modes of teacher discourse with a clear focus on the different purpose that each form is suited to:

Jason I try not to have too much in the way of interruption when I'm actually explaining because [...] I think it might break the flow of them understanding if I ask a sudden random question..." [I5p23]

The change in the teachers' view of what is appropriate or effective classroom talk, from a perception of talk relating to a transmissive mode of teaching to a more interactive and for most of the teachers a more dialogic approach to talk is examined in the next section on themes of change during the study.

5.2.1.2 Dialogic teaching for understanding

For all the teachers there is, at least implicitly, recognition of the significance of dialogic talk with pupils for learning. The teachers all recognise that interactive modes of communication in the classroom that recognise the pupils' ideas have the potential to have a positive effect on pupils' understanding of science ideas.

David [...] I want them to have some ownership of their definitions of things and if they're not quite right then they can be tweaked and stuff like that but at least have some initial some kind of exploration of their own understanding of where things are at the moment that kind of thing. [I2p26]

Sean I'll give them more questions rather than going 'yeah that's right' or finishing it off. I know I used to finish off things quite quickly just to try keep the pace of the lesson but now I try keep that

questioning going and just asking them questions back, or getting them to ask each other questions as well. [...] Because it allows me to see exactly how far their understanding in a particular part of the lesson goes. [12p9]

Luke Whereas explanation you can kind of have much more space for questioning, [...] because it's not just didactic, [...] So, I suppose it's much more of a two-way process. [15p3]

Sophia Sometimes [...] I'll ask a question and I'll think why did I ask that, I practically given them the answer? I could have rephrased that and got a really detailed response so I am kind of reflecting on myself as well. So yes, definitely, listening to the pupils is something that I've been trying to do a lot more of. [14p10]

Jason When it's just like I need to explain this, I'm pretty sure they don't understand anything, I'm not sure how to pull this out of them, I'm just get to explain it now and then asked them about it later. [...] it's not ideal because is not really sort of testing, assessing them as we're going along so not really knowing whether they're understanding. [13p13]

Adam I think sometimes if I had worksheets [...] doesn't show they know it, just be able to transfer the information from one thing to another, whereas now, because they are discussing a lot more, I feel that because they are talking about it a lot more [...] they are understanding it a lot better, sort of... [15p3]

So there is a common recognition, albeit with different levels of emphasis, for all the teachers that dialogic teaching of some form has a positive effect on pupil learning. This seems to be expressed in the sense of a deeper or more secure level of understanding by pupils, as Adam puts it 'a *lot deeper thinking*'. Jason explores his ideas about this deeper learning through an analogy:

Jason ... letting them get on with it and not interfering [...] because I think it lets the idea sort of set rather than pushing them before it's gone solid.

Interviewer Tell me a bit more about that phrase letting an idea set...

Jason Like jelly, the ideas are like jelly in their brains [...] but some, their brains aren't as cold as others so it takes longer for the jelly to set. If I start moving the jelly before it sets it could spill everywhere and then there's no jelly. [I3p26]

So, in his first year as a qualified teacher, Jason is trying to articulate a sense of the way in which his interactions and talk with pupils affect problematic areas of learning. There is recognition by some of the teachers that part of the role of the teacher in classroom discourse is listening to pupils. Whilst it is not explicitly stated, there is sense here of the teachers developing an understanding of the importance of dialogic interactions with pupils in the form of questions with an emphasis on responding to the pupils' answers. This seems to be more than the closed triads of question, response, evaluation that might be intended to make the presentation of science knowledge interactive. However, for some of the teachers this implicit sense of the potential effect on learning of dialogic teaching, there remains an underlying view that the effect of interactions and talk is as much in maintaining pupil engagement and concentration in the lesson as it is in the process of learning.

Steve I think, as well, if it's say, too much teacher led, a lot of the time they just get bored. So if you're there just standing at the front just talking to them constantly then after five minutes they're just gonna be gone. [I1p13]

Luke I think as I've kind of come along I've realized like you need a variation [...] like a little bit of chalk and talk, answer some questions [...] even if they don't engage with one part, they're going to engage with another part and they still come out with something at the end of it. [I1p23]

Joy In the sense that I'm more relaxed so I can give them more time, personally one-to-one. So when I've given them that time to do the task I can then walk around rather than consciously thinking, right stop them all now I need to get them all listening to me again and that's a struggle for some classes and then me going on and on and they're bored and not interested. [I1p48]

These references are all from the first interview. Both Joy and Steve withdrew from the study whereas Luke becomes less focussed on simply engaging pupils' attention as he develops confidence in his classroom

management. Luke's changes are explored more fully in his own case study in a later chapter.

5.2.1.3 Assessment of and for learning

All of the teachers in the study referred to a purpose in classroom talk of assessing learning. There is a strong overlap with the previous theme in terms of learning as in most cases the assessment purpose indicated is a formative one. However, it seems clear that, in the way that the teachers articulate their understanding of talk, there is a distinct focus on the role of talk in assessing pupil learning. In particular this emerges in later interviews which may reflect the influence of a school focus on assessment in the communities of practice in which the teachers are working.

David, Jason and Sophia describe using talk to make judgements about the direction of their lessons and informing decisions in lessons about the sequence and progression on the lesson.

Sophia I always start off with talk, most of my lessons, get ideas and from me to know where they are already. [I3p9]

Sean [the pupils] could understand it without talking to each other but how would I know because it's less reliant on what's in the books [...] so getting them to talk about stuff allows them to understand for themselves and I can just hear what they're saying as I go round them and if someone's gone clearly way off in their understanding I could then go up to them say right so you're saying that's the case where as if they're just sitting quietly you never find that out until it's too late.

Jason That's what the AfL is for, to find out which way you've gone so yes I just think it's helpful. [I5p5]

Jason goes further and suggests that this use of talk to assess pupils learning can reduce barriers to learning that develop when pupils develop personal versions of concepts. The implication here is of dialogic classroom talk giving the teacher an opportunity to address the individual conceptions that pupils form in the lesson. Jason seems to value the potential for interactions with pupils to prevent alternative versions of concepts becoming established in pupils' thinking.

Interviewer Is [talk] important to give you access the teacher to what they are thinking?

Jason That is very useful, yes, because without that they like have these misconceptions until... marking their book a couple of days later and go... Yes. [15p38]

And for David there is also a sense of the limited extent to which the pupils are able to retain knowledge from transmissive modes of teacher talk and hence the need to establish some sort of feedback on how much of his own talk has been understood and retained by the pupils in the lesson. Again, talk is seen by David as an integral part of formative assessment in his lessons.

David So there's a kind of overarching thing, the notion of you have to be informed of what your students know, that's quite a positive thing, but yes, you talked to them for the whole session but did they did it take any of it in? Invariably not I suspect, so having some kind of way of interrupting this, tell me what this is and that's going to inform what you do next. [14p18]

Sophia identifies a need to interact with pupils who would otherwise tend to avoid interaction with the teacher when the pupils do not understand an idea.

Sophia So now I like to [...] go around and challenge their [work] and say 'is that right' because [...] sometimes it can be because they don't understand and they haven't asked or put their hand up so like is going check because it saves me time with my marking and then I don't have to spend the next lesson reviewing anything that they didn't understand it just makes it flow a bit better if they if I know they're are all okay so I just go and check and ask them questions. [15p6]

Both Sophia and Ruby also talk about their interactions with pupils through the pupils' written work. Sophia explores the different roles of written and verbal assessment in terms of assessing understanding in the case of the former and a more affective role in engaging pupils in the latter.

Sophia I value the written communication a bit more because it shows their high level of analysing and evaluating and applying the skills that you discussed so it's hard really, which do I prefer written or verbal, I suppose when I'm checking their understanding, the written but when I'm trying to get them engaged, the verbal. [15p9]

Ruby holds an interesting sense of conflict around implementing school policies on written feedback and a non-verbal interaction with pupils through this which is explored more fully in her individual case study. Ruby does, though, recognise a role for her interactions with pupils in dialogue, either written or verbal, in assessing pupils learning.

Ruby It is because, a lot of feedback, so quite often rather than getting them to tell me, what they might do, a discussion, but it has to be in their book as well. So I suppose is more of a record of, as opposed to... A record of conversations or a class discussion or a record of what they think or feel. We do quite a lot of that so I guess if you interpreted in that way it is still being done. [15p50]

5.2.2 Affective purposes for talk

All of the teachers to some extent value classroom talk for the purpose of developing effective relationships with pupils as individuals. For some, such as Luke, this about developing a sense of positive relationships with pupils to create a rapport with pupils in his classroom and a purpose in managing classroom behaviour is stated by some; for others in the study there is more extrinsic purpose talked about in terms of learning objectives beyond the science curriculum. These wider objectives are around life skills for pupils such as verbal communication skills and personal self-confidence for pupils.

5.2.2.1 Establishing teacher-pupil relationships.

Luke talks at several points during the course of the study about the importance he attaches to the development of relationships with pupils and the use of talk to humanise the teacher-pupil relationship. During the course of his training he seems to wrestle with a tension implicit in his identity between being seen as a humorous and accessible teacher (“*they know you’re having a joke and you can take a joke as well*”) and the need to establish authority and control in the classroom. To some extent in the training year this is resolved through using classroom talk to establish relationships with pupils to meditate their inclination toward confrontational behaviour.

Luke As soon as you start to build a relationship with the kids it just becomes easier. At first it feels like you’re just herding cats, trying to get them to do what you want. Oh my God why aren’t they doing what I want? We are going out of control. And then suddenly it’s kind of... like one of the naughtiest girls in year eight coming up to me and

saying 'Sir was I good in the lesson today.' You know, she's usually an absolute pain and has massive anger management issues. I think it's just when you start to build up a bit of a relationship and have a bit of a joke. And even if you do something a little bit wrong, or say something a bit silly. They just don't mind as long as you've got a little bit of rapport with them so it goes hand in hand with the way you communicate. [11p30]

In the lesson observed immediately prior to this interview the teacher took the class outside and during the 5 minute periods on the way to and from the playing fields Luke spent the time engaging in conversations with various pupils about topics from outside school. It was clear that his identify as a teacher involved self-confidence in being able to build strong informal relationships with the pupils.

This recognition of the use of informal forms of classroom talk to develop effective behaviour management through positive relationships with pupils continues as a clear strand in Luke's first and second years in a teaching post.

Luke I can be that kind of happier teacher, talking to the kids and just being a lot more friendly and I think the year nines in particular I feel like I've got quite a good bond with them that I can joke to some extent, they do sometimes struggle to understand so I can't joke too much otherwise might not follow what they're supposed to be doing but I, it's a positive relationship and because I've got that bit really helps. [12p5]

Luke You've kind of got your introductory as their coming into the room kind of greeting, your kind of hello, your kind of friendly relationship building type thing when you're speaking to them and you're just asking them how was your weekend and things like that and just being friendly to just get them in the room and get them going and get them in the right mindset. [15p2]

A similar recognition of the way in which informal talk with individual pupils can improve behaviour management is evident in Sean's first year in teaching. This is a challenging year for him and there are clearly difficulties in establishing control with some classes. Again, Sean finds that being able to develop relationships with certain students through informal talk has benefits in managing behaviour.

Sean It used to be I would dread that class every lesson [...] but it's worked out better because I'm [...] a bit more laid back about them to be honest. Just through teaching them more regularly I've got to know them a bit better and there's a couple of things that the students are interested in and so for this particular student that has got his life set out for him, I'm saying to him right has your rugby at the weekend, and he says oh we got cuffed, and would have little two-minute conversation but that would give him enough to go actually he is interested and he would reciprocate and would do a lot more work [...]. I don't think I'll ever get it fully with him but I'm not going to stop trying and I think that's where I'd changed since last year. I found that sort of thing overwhelming last year I suppose because of my own educational background, I just don't, I didn't think at the time why would anyone not want to learn. [I2p4]

Sean seems less at ease with this aspect of talk than Luke and recognises a challenge for himself in learning to establish these kinds of conversations with pupils. Jason recognises a different purpose for talk that occurs in the entrance to the classroom as pupils arrive, a time and place for talk that has a purely behaviour management focus.

*Jason [...] I did go through a phase of being quite lazy and not talking to the students enough in a non-teaching way so I might not every lesson greet them at the door sort of let them come in then...
And that I found to be unhelpful, [...] it moved away from being my space to their space and a kind of change in the dynamic slightly moving too much to the corridors as a continuation of the classroom, there was a line, so that sort of talk I thought was rediscovered as being essential. [I5p9]*

Whilst using talk to develop relationships with pupils is less of a focus to Sophia's discussion of the purposes of talk, she too describes a personal challenge in learning to be more effective in informal interactions to develop relationships with pupils.

Sophia I know how to speak to certain pupils but I wouldn't speak to with other pupils depending on how like they were reserved or really loud, [...] It was especially in this area, and like this socio economic area [...] relationships; they rely on being quite jokey and friendly compared to when I was at school, it was a lot more formal. I don't if that's just with time teaching has changed that you could have

a chat with them and they're not just yes sir, no sir, I think they prefer that. I think it might be the generation of kids. Have you noticed that? [I2p6]

Throughout the interviews, Adam refers to a motivation to use talk to establish better relationships with pupils. However, his discussion of this puts it in more formal terms in that the classroom talk is focussed on the learning and is more teacherly in implied format but the motivation for engaging with pupils is to communicate a sense of his own commitment to their learning.

Adam Giving [pupils] that little bit of time each lesson, to make them feel like I value their work, to show that I value their work I should say. And to you know give them that confidence and try to motivate them and encourage them whilst I'm doing it. [...] I want to try and get to know the pupils and find out what they like [...] the style of activity that suits them in particular. [I1p6]

There is a shift during the study in Adam's view of the purpose of talk that reflects a move away from establishing and reinforcing expectations of behaviour. The purpose of interactions with pupils to convey a sense of valuing pupil's work in lessons is raised again in the second interview in the context of Adam's awareness of a change in the way he uses his own talk in the classroom.

Adam I think the way that I was doing it I came from four years of Uni and it was very lecture orientated where they just stand at the front to deliver. Whereas now it's actually going round and making the pupils, giving them that little bit of time each lesson, to make them feel like I value their work, to show that I value their work I should say and to give them that confidence and to encourage them, to motivate them to master it and do it. [I2p3]

And again in interviews during his first year in school, the use of teacher talk to develop positive relationships through interactions with individual pupils is described by Adam.

Adam I think a lot of my talk has gone on to try to form that strong teacher pupil relationship. And why did do in my second placement, it worked really well with one class so I ended up sort of doing something similar with all my classes [I2p6]

Adam I found something that comes from my sports coaching but motivation, I actually bring it into my lessons a lot now, after having spent a year in the school and establishing myself as a teacher I do a lot of motivational talk, not like a motivational speaker but I try and encourage them quite a lot, I will speak to them, I will maybe talk one-to-one with individuals and try and pick them up and boost their ego [...] so that they get the sense that I am working with them and want them to succeed whereas I'm not just a robot here to do a job and deliver information at them for them, I'm someone that they can talk to and discuss things with. [I3p7]

References to his role outside school as a swimming coach and how this influences his ideas about classroom talk are regularly made during the duration of the study and seem to form a key element of Adam's identity as a teacher that gives him a different perspective on talk from the other participants.

5.2.2.2 Learning life skills.

In her interviews Ruby speaks of a motivation for developing different modes of classroom talk by the pupils in terms of developing what she sees as life skills. For her, part of the reason for incorporating pupils' talk is to develop their verbal skills and self-confidence for adult life.

Ruby Wouldn't it be wonderful if they all were able to [...] discuss ideas and bounce off each other and not feel that they're wrong or that they're going to look silly. Because when they do have interviews or they have to defend their work or to have coursework at College or at Uni to talk about it, they would be able to without being defensive. [I1p21]

Ruby You need to succeed in the tests but you also need to come out of it as a human being who is capable of having conversations with other people and not taking offence if they don't agree with your point of view, that's ambitious but if everybody did it if that was the norm how good would that be. [I1p41]

Similarly, Sophia talks about her intention, through classroom talk, to develop communication skills. This recognition comes at the end of her first year of teaching and seems to sit more closely with explicit school curriculum aims around literacy skills. However, there is some sense of

tension for her in the perceived focus on written literacy skills that reduces the role of talk in the classroom.

Sophia I have actually, well I've started veering a little bit away from talk because a whole school approach is to use literacy, so I've started getting them to read a bit more. But then I use that with talk as well so I try and get people to read out loud, so that's another type of classroom talk which they don't, most pupils don't really like. The confident pupils do but I think it's a good skill to have. [I3p10]

Jason also briefly refers to a purpose in the development of communication skills in the penultimate interview. In this case it seems to encompass a long-term life-skill objective tied up with developing the ability of pupils to engage successfully with group work in the classroom environment.

Jason [...] it's about socialisation as well because if they're not having to work with other people and ideally not with people that they always work with them they're not going to learn to be to work with other people and you can see it in groups where, so there is a group that I have once every fortnight and you can really see that difference, they just can't work with each other. Whereas in my groups, they can generally work with anybody in the room, it's okay. [I4p18]

Whilst not specifically referring to the development of skills, in the middle of his first year in school, David describes a sense of tension between covering the science curriculum and his own values around a broader education for children.

David In my outlook on education I want to encourage kids to become well rounded human beings unfortunately there is this day-to-day pressure of when I know the exams looming and there is the medium-term plans are issued and reviewed by the Department I have to be up-to-date with those and I'm try to instil excitement at some parts, at least I started the approach as I say just on a day-to-day basis when I have got five lessons in a day literally trying to get the content, and I feel, this is why I'm a bit demoralised about the approach that I think I'm taking at the moment. [I2p15]

5.3 Factors that influence the teachers' use of classroom talk

In the interviews the teachers talked about a number of factors that influence decisions about the teaching approach adopted with different groups and subjects that in turn influence the type of classroom talk that is used in lessons. For some this is an awareness that these factors influence choices about classroom talk directly, for others it is more a case that these factors determine the classroom organisation and tasks and hence indirectly effect the opportunities for classroom talk. Some of these factors, e.g. the influence of practical work, the level of conceptual demand of different topics in science, pupil expectations of science lessons, have an influence over the teachers' use of different modes of classroom talk without being seen by the teachers as either facilitating or constraining classroom talk; whilst others are clearly seen as constraining factors e.g. pupil behaviour, workload management, school inspection frameworks. The coded responses are grouped into three themes of influencing factors: the influence of the science classroom environment and pupils; the influence of the school community of practice and the influence of the individual teacher's professional knowledge, identity and beliefs.

5.3.1 The influence of the science classroom environment and the pupils

5.3.1.1 The influence of pupil behaviour and behaviour management on classroom talk

There are some factors that are seen by all the teachers as constraining the range of types of talk they can use effectively and hence limiting the effectiveness of their teaching. The most commonly stated of these factors is behaviour management issues with some classes. This is particularly evident in discussion of differences in the use of talk with different groups of pupils and tends to be more often raised in early interviews during the training and induction years. There is a difference in tone however between the teachers, for David, Sean and Joy there is a sense of deficit for problematic classes, where they feel that they are limiting the range of types of talk, particularly pupil talk, in response to issues with managing the behaviour and interactions with some classes or to the expectations that pupils have of lessons and experience of negative reactions to trying certain kinds of activity.

Sean *[It was] suggested that now I don't give them the netbooks because they won't do anything with them and then I felt well I'm going to try anyway. And then I found out that yeah they're right and had that point and knowing that they don't really respond well to debates or whole class discussions, it seriously does limit, what you can do with them so with those particular classes I found that, I find it much harder to adapt to. [1p21]*

Joy *I will try to get [discussions] again and I think I'm saving it for maybe a better group [...] like when I'm tell them to be quiet they'll be quiet too, when I tell them to do it they will do it. I think a group like that I'd, I'd definitely if I have the chance to, set up a discussion. [1p30]*

David *[...] I think if I try the same lesson with my other year nine class which I had who are lower ability, they would have chatted about their Facebook account or something else for the amount of time and they... I don't think they would... they would have regurgitated the statements of for and against [...], but they wouldn't have taken it further in terms of their own background thoughts... [1p15]*

It seems in these comments that the issue is with managing on-task behaviour for more open-ended activities in larger groups that demand pupils engage in peer-to-peer talk about the content of the lesson. The teachers all perceive this as hard to manage and have an expectation of off-task behaviours in these situations. Ruby articulates this issue particularly clearly:

Ruby *I'd say with groups that you know are [...] more likely to be on task faster I'd say threes and fours no more. It's fine, they can cope with being in a group of three or four and actually talk about what they're supposed to be. Whereas there would be other groups who in a group of three or four I don't think that ever actually get round about talking about it until you actually went round and prompted them to, by which time the two minutes of talk ends up being 10 minutes. So in pairs and whispered if they are being particularly noisy, or in pairs normal talk if you want to gee them up a little bit [...] and if you want them to join up with other groups again you've got to be utterly sure that they are talking about what you want them to and that is constructive before you let them join up into a*

group of six or 7 to do a task otherwise you just end up with conversations about who's going out with who, you know just the sort of usual they don't use that talk in an educational academic way they just use as an excuse to have a chat. [I1p24]

In contrast to this Sofia is clear that an important part of managing classroom talk is to develop the expectations of what pupils are required to engage with effectively in terms of talk. Sofia has clearly made conscious classroom management decisions with the aim of avoiding the kind of limitations to what she can do with different groups on the basis of their behaviour.

Sophia Kind of with behaviour, I try and look at those individuals, again try mix their peer talk but try and put them with an appropriate person who may be is a higher ability or will encourage good behaviour with them. With more academic classes or with older year groups I tried just randomly selecting the groups, so they're a bit more mature. [I1p20]

Jason describes a sense of varying his approach in terms of talk depending on the specific context, both of the behaviour of a class as a whole and the particular occasion of the lesson. He describes varying the extent to which the teacher talk is 'focussed' or 'loose' and an intuitive decision making process in determining the nature of his talk with the purpose of encouraging cooperation and engagement from pupils:

Interviewer so those more problematic groups, is your talk different with those classes?

Jason Yes, a lot shorter. A lot more sort of focused I guess. No that's not even true, sometimes it's a lot more focused, sometimes it's a lot looser, depending on how they are. When they enter the room, how they come into the room changes how the talk is, whether it's sharp and clear and 'you will do this now' and that's what can happen or whether it's more loose. This is kind of like 'okay everyone, get yourself settled down', and then was slowly moved to 'this' and slowly slide you into 'this' and 'you won't even realise that you're working yet' sort of thing.

Interviewer are you conscious of on what basis you make that decision?

Jason *Mainly it's been intuitively, but I've been thinking about it a bit and [...] it's a very fine distinction between if they are in a really good sort of frame of mind when they come in and it can be really loose, if they're in really bad frame of mind it has to be really sharp and there is a continuum in between because if they are somewhere in the middle, that can go either way. The closer they are to really off, the sharper it has to be until it gets to a point, in that case it can't be and it has to be really loose and gently slide them around, because otherwise they just instantly rebel against doing it. [I4p36]*

For some of the teachers the use of talk that they would like to develop in their teaching has to overcome reluctance from pupils to engage in the talk in lessons. In some cases this seems to be related to a particular class dynamic, perhaps associated with the age of the pupils and in other cases a perception of a reluctance stemming from pupils' anxiety about speaking aloud. David and Luke describe experiences with classes where there is a general reluctance to engage with activities that involve teacher-to-pupil and pupil-to-pupil talk.

Luke *So I try doing all that sort of stuff and the year 11's didn't really buy into it and I think it's hard to explain why with year 11's. If I do with my year sevens and year eights brilliant no problems it worked really well with them. The year 11's I think are just kind of tired, they just want to get what they need to do and do it, they don't want anything else. [I2p2]*

David *I'm told by other teachers that it's quite an apathetic attitude of students that come to the school, as in they expect the work to be done for them almost and they have that approach to lessons. And I don't know if it is just the school, I don't know if it is just something that that is in the village where the school is at. But there is especially higher up the school, my year 11's across the board are incredibly lazy and it just is mind boggling that at this point where it counts so much. [I2p7]*

Sophia also identifies reluctance on the part of pupils to engage in some of the forms of talk that she expects in lessons. Sophia regards the cause as more to do with a perception of the anxiety created for pupils when there is an understanding that the response might be seen as incorrect by the teacher than lassitude on the part of pupils.

Sophia I don't know why they feel like that. I think you must be a social pressure. They don't like to be wrong, which is a natural human instinct, so just getting them to stand up or giving them a role like the scribe, researcher, I think it takes the pressure off them as well.

[12p28]

Adam identifies a potential constraining factor in classroom talk in the problems in inter-relationships between specific pupils and the need to organise groupings in the classroom to mitigate the effect on talk in the classroom from pupils who find it difficult to relate to each other.

Adam There are some kids who just don't get along and so they have to be, sometimes it's difficult because I think when I started off with the groups I just said forget all the problems that you had outside of the classroom, come in and sit down and you're going to work with that group, that's going to be your team and if you work together both will benefit from it but if you just sit there not talking then neither of you are going to learn from that experience, neither of you are going to benefit. There are still some relationships within the classroom which just don't seem to, which can't really be resolved easily so they have to be put into different groups. [15p11]

Overall, the behaviour of pupils in school is seen as a significant limiting factor by all of the teachers in the study that has a constraining effect on their choices about the forms of classroom talk that can be employed. Unsurprisingly, as they gain experience and confidence through the duration of the study this constraint becomes less frequently mentioned. David provides an interesting perspective on this as he moved at the end of his first year of teaching, from a school where he felt behaviour had a significant influence to one with a more positive atmosphere in terms of behaviour, "*a pleasant environment to work because of the behaviour and the respect that just exists within the place*". As a result of this David identifies a wider range of possible modes of talk in terms of interactions with the pupils.

David The challenge of having to explain things and people asking questions which... I very rarely got asked questions last year, it was very much providing information and trying to generate answers that this novelty of actually having people enquiring about 'do you mean this or do you mean that?' It's a lovely different challenge. [14p1]

There are opportunities afforded by more motivated pupils to engage in a wider range of kinds of learning and, by implication, a different focus to classroom talk.

David [it is] just nice to be able to say 'this is the task that I want you to do' [...] and there will be total focus on it which there wouldn't be the class like that at my previous school.

Interviewer So is there anything in terms of the kinds of talk you use that you do differently, to borrow for less of or do...

David It is more inquiry based here. Whereas there would be a response of 'what's the point sir' at the other school, 'how is this going to help me?' Which you can understand but it just didn't register on their radar of usefulness or anything, whereas because the type kids they are here, the backgrounds they come from, it's instilled in them that actually the world is quite exciting place to learn about so it is easier in that regard.[15p24]

Seeing behaviour as a constraining factor, unsurprisingly, emerges most strongly in the early interviews. In interviews in the second year of the study several of the teachers talk about the positive influence on their ability to use classroom talk to good effect, of getting to know pupils better as individuals within a class group. The exception to this is David whose experience of pupil behaviour as an influencing factor is strongly tied to the change in the atmosphere in his classroom after moving schools at the end of his first year of employment. For the other teachers, getting to know the individual pupils in their classes during their first year of teaching had a positive effect.

Sophia it's a lot better now, [...] I've got a better rapport with them. At the start as well a lot of it was behaviour with my year nines especially which are still a challenging group, we could have really good days and really bad days, but I think overall, with behaviour, my classes got better. They got used to me and I got used to them so yeah I'd say that it's a lot better than in September which the time just makes that rapport building just knowing how to save time in different areas I think. [12p1]

Sean Most of the time I'm more confident, with that class now particularly, it used to be I would dread that class every lesson and I only had them twice a fortnight, whereas I've now got them five times

a fortnight and initially I was going 'oh God I've got them for five lessons', but it's worked out better because [...], a bit more laid back about them to be honest. Just through teaching them more regularly I've got to know them a bit better. [I2p4]

The frequency with which the teachers mention the behaviour of pupils is not surprising, nor is it unexpected that this is more influential factor early in the study and recognised by several of the teachers as diminishing as a significant factor or as being an aspect of managing classroom talk that improves with time. A survey of the 'nature and impact of teachers' experiences of initial teacher training, induction and early professional development' (Hobson et al., 2005) identified behaviour management as the second most frequently mentioned deterrent to choosing a career in teaching.

An interesting sub-theme of pupil behaviour that emerges as an influencing factor in the teachers' use of talk is the experience of some pupils' reluctance to engage in talk in the classroom. This experience of reluctance from pupils to participate in classroom talk emerges in the responses of all the teachers in the study. The reluctance of pupils to talk and the influence this can have on the intended forms of classroom talk used seemed to be a surprise for several of the teachers in the study. This was best illustrated by Ruby who refers to an experience with a particular group during her training placement that had a significant influence on the way she saw herself as a practitioner in relation to classroom talk:

Ruby I had quite a 'head meets wall moment' with that year eight group,, that they just didn't talk. They sat quietly and they were that much in fear of the [regular] teacher that they did not speak, they only wrote out in their book. That was hard, to get them to talk, and then had to get them to stop. [I1p36]

She goes on to suggest that the reluctance to talk stemmed from the regular teacher's strategies for managing behaviour that were intended to minimise disruption from pupil talk.

Interviewer And that year eight group that you've talked about, who found it really difficult to engage with what you are trying to do, I seem to remember, that was an influence to you choosing to write about talk [in the University assignment]?

Ruby Yes. They sat in pairs. Looking back at it I think the layout of the classroom had a lot to do with it. They sat in individual paired desks so the only person they could speak to was the person next to them who wasn't necessarily somebody who was of similar ability to them it was usually to keep them quiet so the naughty one sat next to the person who was very able but then that able person didn't get a chance to talk because the person next to them couldn't care less, you know 'you're is a swot I'm not talking to you'. And so talking didn't really happen. [11p37]

Ruby's experience of her own orientation toward pupil talk being in tension with the practice and expectations of either her mentors or the school ethos is a strong theme in her personal experience of developing knowledge of classroom talk and is explored in more detail in a later case study chapter on Ruby's experience.

Sophia refers to similar experiences with pupils' reluctance to talk although in her case this comes from the pupils themselves and is not a result of another teacher's influence. In this case it is the context of group-work in the classroom and Sophia reasons that this reluctance comes from a social pressure and an unwillingness to be seen as getting it wrong in front of the teacher or peers.

Sohia I do a lot of group work now. [...] I think it helps because they really struggled with talking as well. I like to give them roles in groups and get them to be more active.

Interviewer Tell me more about the struggle they have.

Sophia I don't know why they feel like that. I think it must be a social pressure. They don't like to be wrong which is a natural human instinct, so just getting them to stand up or giving them a role like the scribe, researcher, I think it takes the pressure off them as well. So you're 'it's not all pressure on one person today, you're all going to contribute a little bit'. Some people like working in groups but I try and avoid one person doing all the work.

Interviewer Do you think there is a particular science issue for this business of not wanting to be wrong [...]?

Sophia Yes. I think that's only transcended by teachers saying "your exam you need to write this down" and because you're so

restrained by the curriculum in the time that you have to do that it offers less time to be a bit more free and have lessons when you are just debating or you are seeing if actually these theories are right can we evaluate them. There's not a lot of time to do that because there are, we need to know this and this is what you'll get a mark for in your GCSE. [I2p33]

Behaviour management as a factor influencing the development of the participant teachers' use of classroom talk is the most commonly occurring theme in terms of factors affecting the teachers, identified in responses in twenty nine of the thirty four interviews.

5.3.1.2 The influence of pupil ability on classroom talk

Most of the teachers refer to the influence of pupils' behaviour on the ways in which they use classroom talk. As with the influence of pupil behaviour the experience of talk in lessons with different ability pupils is individual, though more in terms of the response of the teachers to the experience than a diversity of experience. For Jason the influence of negative experiences is a self-reflective one and unsuccessful lessons with a particular class have led him to evaluate the level and starting point of his own explanations to the class.

Jason Better would be a clear explanation that the kids got and I think that for some of the time it works pretty well but I know that other parts of the time it really doesn't, I've got a really weak year eight set, [...] I find that I do what I think is a clear explanation but it really isn't, [...] So whether that is that I've misjudged where their starting point is or whether it's that I'm explaining it badly I'm not quite sure. I think is mainly that I'm misjudging the starting point. [I2p13]

Luke had also had negative experiences with academically less able pupils. In his situation he talks about experience with a BTEC diploma year 11 group with whom he had difficulties during his first year in post.

Luke When I did something wrong it was like that went wrong because I pitched it wrong, [...] after getting the 'good' it boosted my confidence and I was like 'right I'm not an awful teacher, I can do this', so I delivered an all singing all dancing lesson, the year 11 [lower ability group] hated it, it went awfully, so the next lesson I did a grumpy teacher stands at the front, copy off the board and they

actually asked me why did you bother with all that stuff you did last lesson Sir? [I2p1]

So Luke seems to draw the conclusion that some kinds of interactions with some groups of pupils will inevitably be less effective. Sophia recognises in her own teaching a difference in the way she structures talk in lessons depending on the ability of pupils. A notable difference here from Luke is the focus on individual pupils rather than a perceived group identity for a class.

Sophia With behaviour, I try and look at those individuals, again try mix their peer talk but try and put them with an appropriate person who may be is a higher ability or will encourage good behaviour with them. With more academic classes or with older year groups I tried just randomly select the groups so they're a bit more mature. [I1p20]

Both Sean and Sophia identify a specific advantage of using talk in lessons to support and develop the understanding of individual pupils who have limited literacy skills and have difficulty with written tasks.

Sophia The pupils that I found to reflect the best are at a high level, are usually better at English and constructing paragraphs and writing and justify their answers, but then that's not always, that's the majority but there are some pupils who can hardly write but can discuss their answers quite clearly. [I3p28]

Sean There's one particular student in my year sevens, if you see his writing, it's not writing it's just scratchings really, [...] I found that the only way to deal with it is just that asking questions because as long as I have some form of assessment for learning, yeah they might not have that much written down but I know they know it because I've asked them and I do that regularly with all the classes now and I think that's another major shift from my PGCE to NQT year. [I5p5]

It is not surprising to find that the experiences of the teachers of different ability ranges in the pupils they teach is seen as influencing the way in which they use talk but it is notable that the effect on the different teachers varies. In part this seems to be to do with the way in which they relate to the classes they teach as groups of pupils or individuals. In some of the interviews the influence of different age groups of pupils is discussed.

Adam With my year sevens have to be conscious of my, the language I use when talk to them and if I use a particular word I might have to explain it, I try and judge it by their expressions and their faces, or if they you know look at me with a questioning, puzzled look, [...] whereas when they get older it can become a quicker routine of giving them instructions, [...] I try and treat the [...] the older ages with that little bit more maturity [I1p15]

Luke I teach A-level as well, [...] and it's just so different. Like instantly with the A-level chemistry I was in and settled and I felt really confident, they just want me to do what I do. They're happy if I do it almost like a lecture, if I just sat there for an hour and talked at them and then gave them some exam questions they'd be perfectly happy with that. [I2p8]

In a subsequent interview a year later, Luke describes the influence of working with A-level pupils on his teaching lower down the school.

Luke I think that something that sixth form taught me is to speak to them more like adults and I think that's something that kids lower down actually quite like, [...] so it's kind of like casual language, casuals the wrong word but [...] with the sixth form it feels so much more relaxed and I can kind of just go on and give an explanation and kind of talk about it and it's very free-flowing and that's helped inform my teaching lower down. [I5p5]

In his second year of teaching, Adam describes how he has come to use Bloom's taxonomy as a tool for tailoring the nature of his questions in lessons and identifies a tendency to use more closed questions with less academically able groups of pupils:

Adam We sort of looked to Bloom's taxonomy [...] and I had a question about rollercoasters [...] and it was all about Bloom's taxonomy [...] I felt that they made quite a lot of progress with their understanding [...] so that was really nice. But on the flip side my [...] my year tens and elevens [...] it's been very much a closed question scenario, as in like 'we have taught you now all the information, we are going to test you on that information, do you know this do know that, do you know X do you know Y, what does Z mean' and so whilst I've been, whilst I've done my own thing with my year eights, with my year tens and elevens it's been quite closed. [I4p9]

There is often an overlap in discussion about pupil age and ability in terms of the influence on the range of kinds of classroom talk used, though for most of the teachers it seems that academic ability is the overriding feature that influences their use of talk.

As with the influence of experience on the extent to which pupil behaviour influences classroom talk, all of the teachers comment on the positive influence of getting to know individual pupils. The influence of knowing the pupils and the way in this develops from the experience of being a trainee teacher on placement to being established as a qualified teacher is most clearly articulated by Jason and Sean:

Interviewer *Something else that you mentioned in the last interview was about the longer placement having allowed you to get to know your groups a bit more. [...] is that still happening [...]*?

Jason *yes definitely, definitely, having a longer time with them is definitely a lot better just because [...], rather than it being with the first placement, no idea, with the second placement I kind of got an idea of what this group needs, now it's more like I know what these individuals need which means that I can tailor it a lot more. So for example [...] if I have one group then you need to think about this, or bring a particular point that this kid will need, [...] so yes it does and it's still changing even after having been with them for six months. [I2p42]*

Interviewer *you're talking quite a lot about how you have adapted to individual pupils students, is it a change?*

Sean *I'd say it is and without realising it to be honest [...] I see myself as naturally doing a form of differentiation, whereas before differentiation was almost [...] like a swear word in teaching, you must differentiate more, but I do and it has been a major shift. [...] I think a PGCE student will never [...] really appreciate that because I've only begun to appreciate that because I've taught the students from the start of the year [...] and it is that getting to know those individuals as individuals, not as a class, and I think that has had a major shift. [I2p7]*

Both Jason and Sean, looking back from the midway point of their first year as a teacher, see a significant influence that comes from having time to get

to know individual pupils and how this enables them to adapt their use of classroom talk in response to the needs of individual pupils.

5.3.1.3 The influence of pupil age on classroom talk

A theme that overlaps with pupil ability in the discussion of influencing factors by all of the teachers is the age group of the pupils. The teachers take a different approach to classroom talk with different age groups of pupils. This is partly to do with different levels of ability in terms of coping with potentially complex tasks involving discussion and argumentation by pupils of different ages. Several of the teachers indicate that ability is the over-riding factor here, with ability to cope with talk-based tasks not necessarily relating to the age of pupils but more strongly mediated by their perceived academic ability.

Sophia I give them open-ended questions all the time, but it's something that I believe you have to learn to do, reflecting and evaluating. It's a high end, high-level skill and as you get older, as your brain develops you learn more, I think it becomes easier. But then that is not always true because some of my year sevens can reflect and evaluate their thoughts and some of my year elevens can't so I think it just depends on how your brain works, what you understand or your ability possibly. But for me personally as I've got older I've become more reflective. [I3p25]

Another element relating to pupil age that influences the way in which some of the teachers use classroom talk relates to the level of the course that they are following. This overlaps with the influence of the assessment regime discussed in the next section but is clear in the way the use of talk is employed with different age groups. Sophia makes the distinction between the 11-14 year olds of key stage three in English schools and the exam oriented key stage four that follows this.

Sophia I think with key stage three I've become more a guide to them, to help them, and assisting with their learning. The key stage four, I think I've become more dictative, this is what we've got to do, this is what you've got to achieve, this is when we've got to do it by, let's knuckle down. Whereas you can be a bit more free and open with key stage three, spend more time on doing presentations and that sort of discussion today and let's feedback our ideas. [I3p34]

A different approach, particularly to teacher-to-pupil interactions in talk is identified by some of the teachers between compulsory and post-compulsory education. Several of the teachers talk about a different approach with A-level sixth form groups from that which they employ lower down the age range.

David Well, just terms of register, I think, I could be a lot more informal and conversational with higher up years. My sixth form I think I'm much more laid-back approach in terms of how I describe myself whereas I think I am probably more considered lower down the years. [15p15]

Luke describes the influence that working with post-16 pupils has had on the way he talks to younger pupils and the influence his teaching of older pupils has had on the way he approaches his own talk in the classroom, becoming less formal and being less teacherly in his language.

Luke I think I've started to find that I've tried to relax a little bit lower down the school, I think that something that sixth form taught me, is to speak to them more like adults and I think that's something that kids lower down actually quite like, that I'm quite laid-back and straightforward [...] which sometimes doesn't go great with the year sevens but I find that once they start getting part way through year nine they really connect with that and it's like 'actually he's speaking to me like an adult and he's not just treating me like a child' and that's something that sixth form taught me, so it's kind of like casual language, casuals the wrong word but yeah I'm not just being a teacher and talking to them. With the sixth form it feels so much more relaxed and I can kind of just go on and give an explanation and kind of talk about it and it's very free-flowing and that's helped inform my teaching lower down. [15p5]

There also appears to be an element here in which positive experience with older pupils has reinforced Luke's orientation toward a more dictative mode of teaching with teacher-to-whole-class talk being a part of his own practice that is validated by these positive experiences with the older pupils. In contrast Jason is more cynical about the apparent difference in the expectations that post-16 pupils have of the nature of teaching and the form of talk expected in A-level lessons.

Interviewer is it different with different age groups?

Jason ... Yes and no, I think in 7 to 11 different based on ability more than age group but then post-16 they feel like it should be more like a college, the atmosphere in the classroom, which is fine by me but they see a very definite break between 11 and 12, but very much it should be doing college type stuff.

Interviewer And what you think they think college type stuff is?

Jason That they can sit around and do nothing most of the time. That seems to be the overwhelming impression they give me as to what they believe college is like... [14p22]

For all the teachers there is some degree of recognition that the age range of their classes has an influence on the way that they use talk but how this manifests in the nature of the influence it has varies between teachers.

5.3.1.4 The influence of the physical environment on classroom talk

Jason and Ruby raise the potential constraint of the physical classroom environment on the way in which they are able to use talk in lessons. The extent to which the arrangement of seating and tables facilitates effective group work and talk between pupils is discussed by all three, the difference being that Ruby teaches in a science classroom with three fixed rows of lab benches facing a front projector screen, whereas Jason is able to, and makes a point of, arranging moveable seating to enable discussion between pupils in group tasks. Ruby first describes the influence of seating arrangements in drawing contrasts between the classrooms that she experienced during her training placements and the influence on the amount of interaction between pupils:

Ruby Looking back at it I think the layout of the classroom had a lot to do with it. They sat in individual paired desks so the only person they could speak to was the person next to them who wasn't necessarily somebody who was of similar ability to them it was usually to keep them quiet so the naughty one sat next to the person was very able but then that able person didn't get a chance to talk because the person next to them couldn't care less, you know 'you're is a swot I'm not talking to you'. And so talking didn't really happen [...] Whereas at [training placement school] they were in groups of four or five or the tables kind of came round in a horseshoe and you could at least kind of pull faces at the person on the other side and there was a bit more interaction. [11p37]

By the middle of her first year in teaching Ruby is struggling to manage this kind of interaction and pupil talk in group work in a room with fixed rows of seating but is finding strategies to maintain group work and pupil-pupil talk during activities.

Interviewer I got sense from talking to you last time that a lot of what you did was orientated around pupils working in groups, is this quite a difficult room to do that...

Ruby It's horrific.

Interviewer have you found strategies to get around that?

Ruby Half rows, I've also got groups, [...] and then there's all the stools, they have to drag their stool with the maximum amount of noise is just obligatory. So I find half rows good. [...] but yes it is a real challenge. [I2p13]

And Ruby continues to try and manage a conflict between her inclination to incorporate pupil talk in groups and the difficulties that her classroom presents throughout the subsequent two years of the study:

Ruby It's just awkward because then they got their backs to you and it drives me crackers. If I could take the [placement school] chairs and tables out [...] and put them here I would do that in a heartbeat. [...] I don't know I think maybe it's something to do with that normally may be something that they get in trouble for so that the ones who don't like turning round and talking would much rather sit and look at me and wait to be told the answer, whereas the ones who are quite happy to turn around and have a natter were on that five minutes ago and they're not necessarily talking about the thing that you wanted. [...] I think it's more behaviour management probably than anything else. [I4p7]

Ruby I still struggle with the layout of this room but try to do group work and discuss things in groups and feedback as a group. If they are particularly uncooperative they know that I'm going to pick on a person so they jolly well better talk to the person next to them or they are going to look like a complete lemon otherwise. [I5p6]

5.3.1.5 The influence of practical work in science lessons on classroom talk

Sean, Joy, Ruby, Luke and Adam all talk about the influence of practical work in lessons on their use of classroom talk, but with different perspectives: For Joy it is an issue of managing the balance of authoritative and dialogic modes of talk, though she doesn't use these terms, in deciding how to mediate what she sees as the balance between investigating and discovering ideas and presenting the information pupils need to know:

Joy That's one thing I think...I'm working on is what information do I need to tell them, what do they need to learn at what point. I think that's one thing...you know do I tell them as much information as I can before a practical, or do I let them find out for themselves, or do I tell them after the lessons? [11p13]

Here there appear to be competing priorities for Joy, the need to tell pupils the science or give them opportunities to make their own discoveries which might imply a degree of dialogic teaching. The issue here seems to be managing the timing of the authoritative account of the science in relation to the experience of practical work. Joy is trying to work out for herself whether to tell her class the science before they engage in practical investigation or after they have had an opportunity to explore the practical observations on the basis of their existing understanding. In either case there is a clear sense that Joy's role as teacher will be to tell them the science at some point. Her ideas are further elaborated in the context of an example from her experience:

Joy Say the topic insulation, do I tell them what insulation is beforehand or do I tell them later, you know that's one thing that I'm trying to deal with as I'm going along...do I tell them too much information before a practical or do I let them find out for themselves, and then assess it with them later, so I think that's something, I do try to....whatever topic it is, I do like them to know what the topic is or sort of have an idea or a definition of what it is, before they start any task or activity. But that's again, something I'm learning on when do I tell them certain things, when do I let them know for themselves or... [11p13]

David identifies a difference in the focus of talk during practical work with an emphasis on giving instructions and managing the task, rather than talk that is directed at learning science more directly.

Interviewer Is talk in your lessons different during practical work?

David Yes, much more directive, much more 'do this do that' I think. Invariably they will be instructions to follow that should be printed on the board for them but I think I'm much more 'this is it now, I need your attention, I'm telling you this'. (14p35)

In contrast to this, during both the second and third interviews, Sophia describes practical work as providing an opportunity for more questions and interactions with pupils:

Sophia I think I did a lot of talking in the year seven lesson with them when they were doing the practical which I always do in practicals, I go around and talk to them, question them. [...] If you go and talk to them one-to-one I think they get some sort of answers from you. So I think that sort of classroom discussion is easier to do in a practical. [13p1]

[...] now I like to, when they doing practical work, I like to go around and challenge their predictions, challenge their table and say 'is that right' because, partly it can be sometimes laziness, they just don't do it but sometimes it can be because they don't understand and they haven't asked or put their hand up so like is going check. [14p6]

Sophia also tries to articulate a sense that there is a particular role for pupil-to-pupil talk in providing an opportunity for pupils to understand more fully the nature of a particular practical activity in a science lesson by recognising the rationale for instructions in a way that enables them to make sense of the practical:

Sophia If we are doing methods or how to conduct an investigation then I think that for them to talk with a partner and to come up with a plan and sort of compose ideas, that I think is a valuable part of talk. Not just writing it down but actually knowing that this is a logical sequence, this can work and trusting their own ideas, yes that's another way that I use talk... I'm not sure, I'll come back to that one, can I think about it? [15p10]

In Ruby's case the importance of developing her use of practical work on her understanding of the role of talk in the classroom relates to less directed practical tasks which open up opportunities for more dialogic talk

where there is not an expectation by pupils of a clear authoritative answer.

Ruby It wasn't just writing a practical it was their practical that they did in their way. It wasn't right or wrong, so you know if it doesn't work it doesn't work, we'll figure out why didn't work, don't be scared of being wrong. [11p32]

For Sean the issue with practical work appears more pragmatic and in his discussion he is wrestling with problems he has himself in managing the time requirements of practical activities along with the competing demands from the perceived need to structure the lessons to include regular assessment of progress in the form of mini-plenaries for short activities. In managing the structure of his lessons and hence implicitly the opportunities for different forms of classroom talk there is a tension emerging in what he sees as a 'good' science lesson between extended practical work and short activities with regular progress checks:

Sean [...] Often you will have an hour or in the case of here in the afternoon you will have a 55 minute lesson, you will have to have [...] your starter, your plenary, or more likely a mini plenary, because you will have more than one activity. Fitting in practicals that are meaningful is much harder and so sometimes you are throwing in a practical that you haven't built on. [11p24]

5.3.2 Influencing factors stemming from the school community of practice

This group of influencing factors relate to perceived external influences on the teachers' use of classroom talk that are external to either their own knowledge and identity or the influence that the pupils and the classroom setting have on their use of talk. These factors appear to arise as a result of perceptions that the teachers have of the expectation that their school ethos and community of practice have on what is seen as effective forms of classroom talk.

5.3.2.1 The influence of workload on classroom talk

All of the teachers in the study described the influence of workload on their practice. Often this seemed to be a general sense of being a significant aspect of their experience of developing as a teacher rather than relating clearly and explicitly to classroom talk. Given the frequency of references to

workload in the context of open-ended questions about influences on their classroom talk it is worth considering how pressure from workload constrained the teachers' use of classroom talk. Jason typifies this general sense of the influence of workload on the quality of teaching.

Jason The other factors are things like the other stuff around the teaching work like the forms, stuff, the paperwork stuff, and the writing reports, the this that and the other. Levels of satisfaction with the job that impacted a great deal I found, when annoyed with the job in general, quality of teaching drops, when tired quality of teaching drops significantly, although I'm very tired at the moment and it's okay at the moment but I think that might just be, it's only two weeks so I can push through, you can do anything for two weeks it will be fine. So yes those are the other factors that I think have affected me most. [13p5]

Adam presents a particularly strong case of the workload being a central factor on his practice and he does relate this to some extent to classroom talk. Adam has a coaching role outside school and throughout the length of the study, the additional pressure this places on his time feature significantly in interviews with Adam. Half way through his second year he ceases this role and speaks extensively in the last two interviews about the influence this has on his classroom practice.

Adam I'm conscious, I think as my tiredness is increased, as I've got more tired, [...] it's that long term fatigue. [...] like if I've got the weekend to plan a good, Monday and Tuesday, Wednesdays is usually fine but it's just Thursdays and Fridays. I struggled with the back end of the week and again that's probably come from the fact that I coach Mondays and Tuesdays and some Wednesdays so that's taken away that planning time in the evening that I've required and you get to Thursday and Friday and I just annoyed myself with what I teach because it tends to be quite generic and I tend to fall back to certain ways of delivering information and I rely upon certain ways instead of expanding on try different things. [...] I can far too easily sometimes just fall back into them taking notes, answering questions, me delivering in a certain way and it's not really as engaging as it should be. [14p5]

In the final interview Adam is very positive about the additional time he has found for his school work and the influence this has had on the way he is

able to develop purposeful classroom talk and increase the level of interactivity in lessons.

Adam [...] looking back and reflecting, the start of term I would try and be all singing and dancing but the last two weeks before the next half term, before the holiday, I'd be flagging and it was just turning to me standing too much talking, questioning like I hadn't planned it out enough in order for me to make it really interactive lesson [...] it's only since I stopped coaching that I've suddenly, really been able to look back and evaluate and see, so yes I'm really happy, I'm really happy at the moment. [I5p3]

5.3.2.2 The influence of a perceived need to cover content

Sophia, Ruby and Jason all raise concerns over what they see as a constraint from expectations of the need to cover an over-loaded curriculum and their own desire to implement a more dialogic model of teaching. For these three teachers their emerging identity in relation to classroom talk is in tension with a transmission model of curriculum delivery. Sophia identifies the difficulty of managing a less structured and more dialogic mode of teaching in a crowded curriculum from her first experiences as a trainee teacher:

Sophia I can completely lose my lesson with one short period of classroom talk with the pupil that is quite interested and intrigued about science which is really brilliant sometimes you just don't have that time and it's unfair on them because you want them to be enthusiastic about science. [I1p43]

This theme re-surfaces in both interviews during the first year of teaching and begins to show how, for her, there is a developing tension between a motivation to develop pupil talk in lessons and a pressure to prepare pupils for examinations in a less dialogic fashion.

Sophia You're so restrained by the curriculum in the time that you have to do that, it offers less time to be a bit more free and have lessons when you are just debating or you are seeing if actually these theories are right can we evaluate them. There's not a lot of time to do that because there are, we need to know this and this is what you'll get a mark for your GCSE. [I2p25]

With key stage 4 I'm conscious that you need to keep classroom discussion to a minimum because of the content and if we get the content done within the lesson and we have opportunity to do at the end I'm more likely to do more open discussion at the end and spend more time on that. Because I know that I've embedded it and it's already there rather than getting to the end of the lesson and not actually have reached, because I spend too much time talking about just one outcome because I know the following lesson I'm going to be behind and then the following lesson, so I think that that does affect my classroom discussion, the amount of time that I have, which is really annoying. [13p2]

This is explored by the interviewer in the final interview with Sophia

Interviewer In that sense of the difference, is that to do with how focussed the talk is on the curriculum content rather than discussion or a change in the pattern of talk so say there is more teacher talk when there is pressure of time?

Sophia I suppose so yes, it is the pattern of, when it is in, there is more teacher talk when there is pressure, there is less teacher talk where there is less pressure. I suppose that is right but is a theme that I've noticed shouldn't happen but is, I don't think, I try to not let it happen because I'm aware that we shouldn't be so regimented and we should have moments of discussion but I suppose yes probably does to throughout.

Interviewer Why do you think that happens?

Sophia I think you know that you are responsible or accountable for that group you need to achieve a particular goal or set of goals and you know the time you got to do that and if you know the ability of the group, depending on their ability, I suppose if it's a higher ability you give them more freedom. You can get the content done and then you can have that time when you relax and discuss with lower ability, like a lower ability, lower than that year 10 group, which are all exactly the same curriculum but I can have more discussion with that group about abstract things and related to the topics but the other group I can't really because they take twice as long to cover a particular topic so that restrains you because you've got the pressure of, I know that you've got to get that group to achieve the same as this group

protects this group twice as long so you don't have the freedom and there is pressure on constrained on the amount of time we can spend on you having a pair discussion or a group discussion something is probably the reason why it happens. I hope it doesn't just happen to me. [15p17]

The attempt to resolve a tension between a motivation to find space in lessons for pupil talk and more dialogic modes of talk with a sense of the need to address all the areas of a full curriculum and the pressure this places in time available in teaching is most clearly articulated by Sophia but appears in the interviews with David, Ruby and Jason. A point of difference here is the way Jason rationalises the tension between his use of talk and perception of the challenge of covering the content of exam specifications in terms of the efficacy of pupils' learning in a more dialogic classroom.

Jason If I'm stood there talking at them they're not going to get it anyway so I'll have to go back at the end of the course and go 'so this is what we learnt', and they'd be 'when did you tell us that', so if they are just having it washed over them, there's no point in doing it anyway. So even if it feels like it's taking longer it's going to work better than doing it seven times. [11p64]

However, this is not typical of the teachers in the study who otherwise give the sense that they see pupil talk of a more open nature as time consuming and as interfering, at least in some sense, with what they repeatedly refer to as 'covering the content'.

5.3.2.3 The influence of perceptions of effective planning and structuring of lessons

The issue of lesson structure emerges more loosely in other interviews, and there are again implications for the way the teachers' actions will influence the range of types of classroom talk that they utilise in lessons. Similar to Sean's sense of the need to use short activities and progress checks, Luke talks about 'chunking his lessons:

Luke Like chunking is quite useful chunking up a lesson but with the year ten sometimes they can work better, because it takes them so long to get going because they are not particularly motivated, they are not the highest ability sometimes it can be a good idea to kind of

set them off with something, maybe have a short discussion beforehand which can be teacher-led. [11p15]

Here, though, Luke is able to see a way to use an explicit strategy involving pupil talk to support the use of shorter activities by engaging pupils with the ideas before a pupil activity. David also discusses issues he has had with this 'chunking' of lessons. For him the problem has been a sense of disarticulation between the sections of the lesson and how his own talk might be used to link the sections to create a coherent narrative throughout the lesson:

David Well in terms of the lesson just the... kind of segmented way in which it was planned in terms bring lots of different sections and... And breaking it up in different ways, in terms of development... in terms of my... well in terms of my teaching practice, it was very much... at the start it was all about getting the story right, getting kind of the thread of the lesson and that's still very true, but it's kind of moved away which I wanted to come back to, it moves... initially when, at the first school placement it was all about trying to get the right wording to be able to link the sections together, so you had little kind of just to be able to piece the bits on and I seem to have got away from that and just getting an overall arching theme and just seeing what happens between the different activities in terms of my language. [11p5]

There is also clearly an influence on both David and Joy of structuring a lesson with a starter, main (or mains) and a plenary. Both teachers talk about the influence of this dominant lesson structure on the way in which they engage with talk in the classroom. Joy defines her own classroom talk in these terms, seeing her talk as having a different purpose in each phase of the lesson, varying from a focus on the structure of the lesson at the start to the science content of the lesson in the main part of the lesson and then again at the end:

Joy The beginning talk is always...I mean I always...actually once they've come in to the initial talk, is obviously I always tend to explain the learning objective, I'll share those, and that's like my first talk with them. Explain the starter to them, let them get on with it, and then bring them together and then that's when I do the main talk about what the topic is. And sort of towards the end is, always again

sort of bringing them together and sort of summarising it. Yeah, I do talk a lot. [I1p16]

For David this starter/main/plenary lesson structure has to be built into his sense of story-telling and he reiterates the difficulty for him in terms of his talk of linking together these structured lesson parts to present a coherent narrative to pupils:

David I think it's how I plan, I look for little sections of areas that piece together, so you would have three or four, four or five within a lesson that's just how join them up within that.[...] Well it basically comes down to yeah, you've starters, you've you got things of introductions and I do see it as a narrative, as a story that you have to have the linking sections that there is something that holds one bit to another and then you follow it through. [I1p6]

Another structural element to the teachers' view of the modes of talk they employ is the assessment model with which they are working with some of their groups. Where the terminal assessment is largely coursework based and pupils are working throughout the course on a portfolio, this influences the modes of classroom talk that the teachers' plan to employ in lessons. In the following extract again Luke describes ways that he managed the expectations of pupils in building in the elements of talk that he sees as important, in this case pupil discussion, within the constraints of a portfolio based assessment model on a vocational qualification:

Luke I still try to encourage them to at least talk about things through a discussion but perhaps but maybe that's why I do so many presentations with them. If I want them to talk about something often if they do a presentation like [...] make a power-point, make a poster then present it. It's more of a controlled sort of they are talking about it but they've made some work to go with it and then that work goes in their folder so they can see a purpose to it so they are a bit more happy to do that. [I1p16]

In all these cases, whilst there are some tensions evident, the teachers see the factors as aspects of their practice and context that are at least recognised as valuable and each teacher is trying to navigate a confluence of their own beliefs about good teaching and the advice they are being given and are seeing around them about what constitutes good teaching. Ruby talks about an influential experience of taking over a class from an experienced teacher who used a very different approach in terms of

classroom talk to the one that Ruby was trying to adopt. It was reflecting on this class that led Ruby to choose dialogic teaching as a focus for one of her academic assignments:

Ruby [The class teacher] used to say “this is the way to do it, but I can do it because I’ve been here for ages”. Which, I smiled sweetly, and got on with it. [The class] were very able and all want to just do well. They could do well by sitting and writing out of the book that was one way, it did work. It might not have been particularly good for all of them but it does work. [...] They achieve marks in the tests. I think it’s sad to watch them do it, they don’t have particularly good social interactions [...] You need to succeed in the tests but you also need to come out of it as a human being who is capable of having conversations with other people and not taking offence if they don’t agree with your point of view, that’s ambitious but if everybody did it, if that was the norm how good would that be. [11p41]

Sofia also talks about a sense of conflict between what she is being asked to do in terms of performativity and her own belief in what a teacher should do:

Sophia I don’t want to focus on, well I know you have to focus on achievement and data and statistics and getting on with your department and being seen to be an outstanding teacher but I want to keep the fun and creativity and excitement and good rapport and make them enjoy science rather than thinking urgh its science today, I want to try and keep, as that’s how I feel about it and if I lose that passion then it will be transferred to pupils will it. [11p45]

This tension between the pressures of performativity and Sophia's own identity as a teacher are not directly articulated in terms of their influence on classroom talk but I would argue that there is an implied sense, for both her and Ruby, that the approaches to talk used in the classroom will be influenced by the teacher's sense of what makes a good teacher.

Perceptions of external expectations of what is judged to be good practice are also raised in the interviews as influencing factors on the teachers. During the study there is a sense of a change in the expectations of formal judgements of teachers by OFSTED inspections and the influence this has on what is seen as good practice in the schools in which they work. The way in which changes in the inspection framework relate to classroom talk and are mediated by established

cultures in school is described by Ruby in the light of continuing professional development training:

Ruby I've been to [training] on the new OFSTED framework in which they've said basically that you're not going to be penalised now for too much teacher talk or if there is no differentiation that is not to be penalised and [the assistant head responsible for teaching and learning] has said 'I don't care what OFSTED say I think the previous way was the best way and that's what I'm looking for'. [14p35]

It is clear from the interview with Sean and David that the significant influence of the external judgements of good teaching is experienced through the influence it has on the culture and ethos of the school. Both Sean and David have experience of working in more than one school and both draw clear contrasts between the ethos of different schools.

Sean Because [School A] were being pressurised by the local authority [...] because they were running the risk of going into capability measures and they were maybe just bombarding all the teachers with, 'right you have to do this so that we seem to be getting better', [...] it seemed to be drawing everything away from what was happening in the classroom and at [School B] they got this focus on the classroom, for classroom activities and for them to start to learn and to add things and to get ideas because that sticks in their mind more because they've come up with it rather than here's a task create this. And it's a better focus, so I think that's one of the pressures certainly that I had at [School A]. [14p1]

David I think it's probably a more prescribed notion of what was required for the OFSTED lesson, what they wanted to see in terms of I want to see progress, I want to see evidence of progress in it. And that's very much what the previous school had in terms of teach a bit, test a bit, demonstrate a bit move on a bit, use that to inform the next bit. [Referring to current school] when you shut your door you are allowed to get on and teach. So yes until this OFSTED inspection [...] I think very much the school expects teachers to get on with it in their own way. [14p16]

Both David and Sean have experienced the different expectations on their practice that develop as a result of the pressures on schools to conform to expectations of what Ofsted will judge as good practice and it

is the school culture and interpretation of this through judgements made by senior staff that have an influence rather than Ofsted itself.

5.3.3 Individual factors that influence classroom talk

Some influencing factors on the use of talk that arise in the interviews relate to the individual teacher's knowledge both in the domain of content knowledge and pedagogic knowledge. The areas of teacher knowledge discussed here are not explicitly knowledge of classroom talk but are areas of teacher knowledge that are described by the teachers as influential on their use of classroom talk, either as constraining or enhancing factors. Other factors might be described as relating to the teacher's self-identity as a teacher and a philosophical stance on learning and teaching.

5.3.3.1 Teacher knowledge: subject, curriculum and pedagogy

Several aspects of teacher knowledge appear in the interviews as influencing factors on classroom talk and these might be loosely grouped into content knowledge and pedagogic knowledge.

Content knowledge is mentioned by all but one of the teachers who suggest that confidence in the subject knowledge that they are teaching has an effect on the way they use classroom talk. Subject knowledge confidence is a particularly strong and recurring theme for David who talks about the influence of his own confidence in the subject matter as having an influence on how effective he feels he is in communicating ideas through teacher talk.

David I think as I know the content better, [...] just so that I'm more comfortable walking into a class and knowing that they can listen to me without any issues and that they know that's how it should be then I can embark on content that's interesting. I do believe that that will improve, very much so. [I2p35]

David I don't know if that's to do with subject knowledge again, just you know what the key bits are but then you can link it together easier or just the fact that you're just getting better describing it repeating it. [...] [I4p13]

David I'm probably a lot less secure going off-piste, say I think that I'd be much, in terms of preparation I have my PowerPoint which I know inside out and that's the content that I want to be covering and so just because of how it links to other parts of the course and what's coming up [...] so I probably am less enthusiastic about them

enquiring, questions in that regard just because I feel out of my depth. [14p43]

It is generally the more teacher-talk focused participants who see subject knowledge as a constraining issue or a concern in terms of developing their use of talk and it related to seeing the challenge of making clear explanations.

Sean [...] one of my fears in a sense is that, some of that content I can deliver but I'm not entirely confident in that delivery. I mean part of that will come with experience [...] but I think that's my main fear [...] for the next couple of years, making sure that the information is there and is accessible by the pupils and is correct and delivered well enough. [11p2]

The other aspect of subject knowledge that is seen as an issue in terms of a confidence in using teacher talk in lessons is knowledge of the curriculum and this is mentioned by several of the teachers as developing over the first year of employment as they take classes through a whole year of school.

Sophia I feel more comfortable I think because I'm not too stressed about the content because I'm fully aware of what goes into an ISA (Individual Skills Assignment), what goes into the specific exam boards, I'm not too stressed out about that. I think now it's just trying to keep it more, keep it interactive and try to get them to achieve their levels. It's massively it's just all about their levels of the moment and where they are and where they're going and how getting there. Which was there anyway but that's my priority at the moment. [14p1]

In terms of more general pedagogic knowledge there are a number of specific learning theories that are referred to by some, though not all, of the teachers as having an influence on their use of talk. In two interviews Adam makes reference to Vygotsky's 'more knowledgeable other' as a reason for his interaction with pupils.

Adam They don't have the confidence or there's something that, there's a barrier that they've got towards them doing that work, they might just need a erm knowledgeable adult to sort of guide them and say yes that's correct that's what I want you to do, so it's about the presence as well, going around, moving around the classroom and talking to the pupils.

Interviewer You mentioned earlier [...] a knowledgeable adult which sounded like a reference to a particular theoretical perspective on learning, is that the case or am I misreading what you meant?

Adam Yes that was more from Vygotsky, that was coming from Vygotsky's proximal zone of development, erm... [I1p6]

The most influential learning theory that is mentioned in relation to classroom talk is the cognitive domain of Bloom's taxonomy of learning. This learning theory seems to be the most strongly reinforced in schools following an introduction to it in the teacher training year. It is explicitly referred to by Adam, David, Sean and Sophia, usually in the context of influencing the kinds of questions asked in lessons.

Adam I have on my desk a Bloom's taxonomy. It is under a pile of books at the moment but it is there. [...] so I say right, red group I've got this question or I've got a question for you and base it upon Bloom's so have something like Link, discuss, evaluate, something from Bloom's that's to their level or if I'm asking a question I will have to actually pick up the Bloom's and I would be the sort of using it as I'm going. [I3p12]

Sean And one of the things, we did get this at [school name] [...] it was a grid and it had different key Bloom's words so you've got like what is the lowest, and how might, is the highest, so I was thinking right how could I get to these points [...] [I4p7]

The PGCE course included a session at University delivered by the researcher that covered classroom talk and addressed some theoretical approaches to understanding classroom talk. The influence of this on the teachers seems to be minimal and most of them do not refer to it during the study. The notable exception to this is Sophia who refers to the influence of the sessions in her first interview at the end of the training year:

Sophia [...] I feel like we've learnt a lot about talk but you can never know what the talk will be about in lessons or where it will go or what you could be asked and I think that's the most worrying thing, is the most exciting as well because you can really learn something about a particular pupil or something about yourself [...]. [I1p42]

Then in the final part of the last interview when asked if there is anything that the interview hasn't touched on Sophia returns to the university session on talk that included Mortimer and Scott's modes of classroom discourse and describes how this has given her a framework, albeit in somewhat misremembered fashion, with which to reflect on her use of talk.

Sophia I suppose what style of teaching that I would be associated with because in my mind I remember, do you remember we had this [...] at University and it was like a scale and I can't remember the actual labels on the scales but it was like, [...] dictative, interactive and like a scale where you were on that, do you know the one? And when I'm teaching now I think about where I am on that grid, because it had facilitator, active facilitator so I try to be an active facilitator but I know I have moments when I'm completely dictative and I get annoyed with myself about getting into that position so the next lesson of try being more facilitative, [...] And it's like I try and think about where I am on that grid all the time and I know I probably move around all the time but I'd like to be sort of on one particular area where I'm comfortable all the time rather than changeable [...] [I5p37]

A more typical comment on the influence of theory on practice as becoming completely embedded in ways of working to the point that it is difficult to recall comes from Jason who describes his sense of the influence of the University session on talk:

Jason Perhaps it was at too high a level for me when it was being done. So is just like I don't get this. And so it passed me by. Or it might be that it was the wrong thing for me, the wrong bit about it. Because I'm sure there was talk about talk and I'm sure that some of it was useful because there are bits that were useful but I don't think it prepared me for just how important it was. So I do remember there being talk about pouring things into the empty vessels or something but at the time it either wasn't the right time for it to be hearing that so I was just what, what? [...] But no because I've remembered that so obviously so it was something that was useful... [I1p45]

5.4 Sources of knowledge on classroom talk

In addition to the emerging themes that the teachers identified as influencing their classroom talk the participants were asked to rank a series of sources of professional knowledge in relation to classroom talk that were identified in pilot interviews. Seven sources were ranked at the end of each year plus a further five in the second and third year interviews. The mean ranking given for the importance of each source of knowledge by the teachers over the three years is shown in figure 5.1.

For all the case study teachers the most influential aspect of their training was the school placement. Indeed it was stated without much elaboration or consideration by all the teachers as the most influential source of their knowledge of classroom talk.

Sean [Classroom experience] has the most impact... because there's nothing like doing it. [11p26]

David I think fundamentally it's doing it, I think fundamentally. I'm pretty sure on some level there's kind of a base thing of whether things are successful and how well they go on what you've been through. [11p24]

Joy Okay. Class experience first. [11p39]

Jason also recognises the significance of classroom experience but with the caveat of the need to take time away from the dailiness of the teaching placement to reflect on emerging aspects of practice and to consider links between experience and professional knowledge:

Jason You're too in it, too in the middle of it happening. It's like, it's like when you're playing rugby and you're in the middle of the scrum. It is happening, there is no 'you know what if I do this...' You're being punched in the head, there's no thinking time so took the stepping out of the 'got to do, got to do, got to do', to be able to think about it, and for it to work itself out. [11p23]

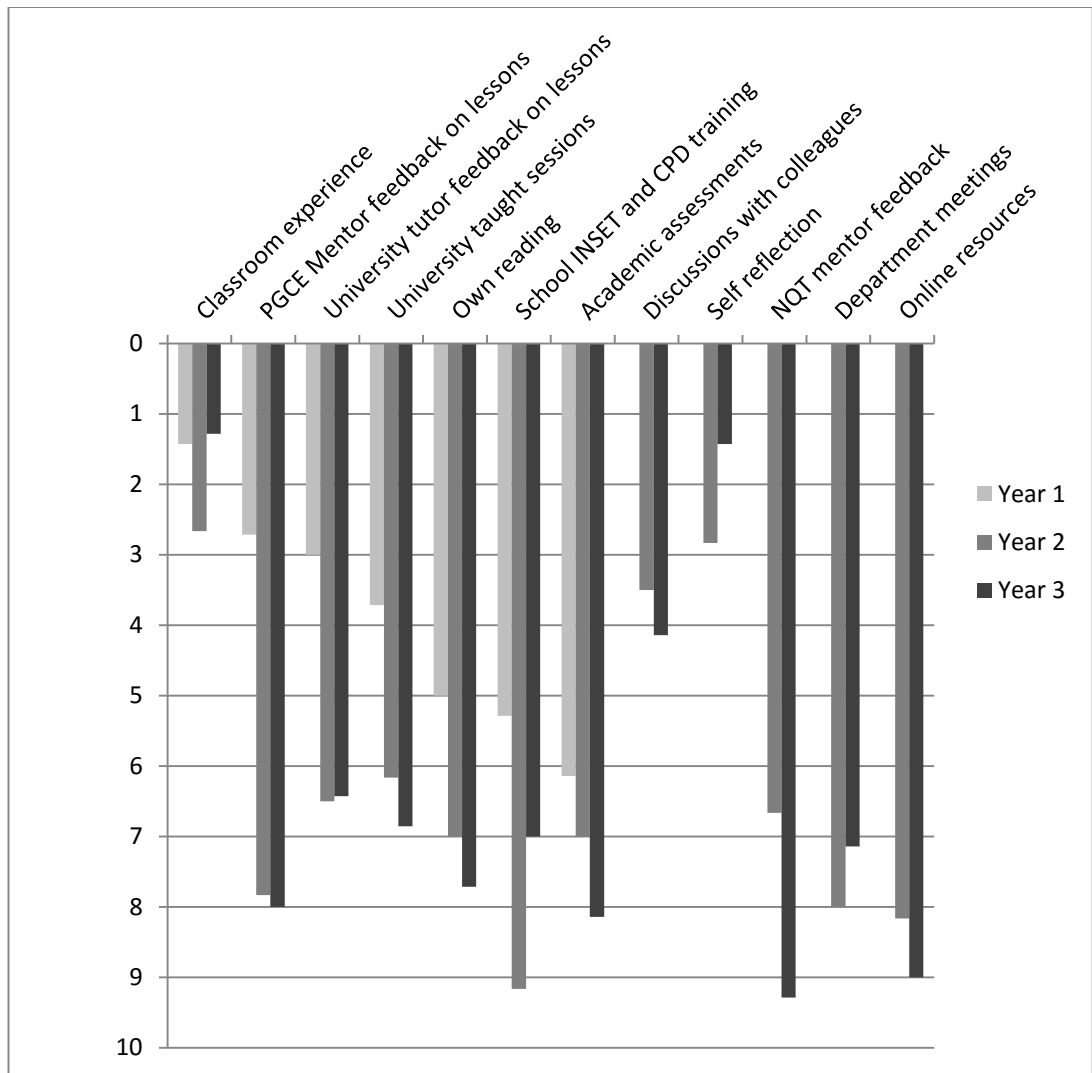


Figure 5.1 Changes in the relative influences of sources of knowledge about classroom talk over the duration of the study by mean rank from most to least important.

There was also commonality to the ranking of feedback on observations during placement as the next most important source of knowledge. However the teachers differed as to whether, in relation to classroom talk, it was the mentor or university tutor that had the most influence:

Sean I then say both of them [mentor and tutor feedback], obviously the reason I put the mentor first is because daily contact. [11p26]

Sofia [Mentor feedback] was frequent but it was [...] not actually based on classroom talk, it was more concerned with pupil progression, pupil progression, statistics, their levels. It was all about data. [11p32]

For all the teachers there was a sense that they needed the feedback on their practice to support them in identifying the aspects of their use of classroom talk that needed development. For some of them, whilst they saw the experience in the classroom as the most important they found it hard to recognise the connection between different kinds of classroom talk and the successfulness or otherwise of pupil learning. Sean describes a particular moment where he felt under pressure to change his approach in order to make the progress in his teaching practice that was required by his mentor, with a threat of formal action in the background:

Sean As a result of this placement particularly my higher order questioning has really pushed forward and it was one of the things that my mentor has said to me, 'You need to need to nail this in this lesson' and this was an observed lesson 'otherwise there is going to be cause for concern' [formal process of documenting insufficient progress on practice] and I just, something in my mind just clicked whether it was because there was pressure of what it meant or whether that lesson just lended [sic] itself to a particular, it was with some year seven and I knew at that moment I thought oh yeah, why haven't I been doing that before because she [school based mentor] said 'once you know it, and you do it, you'll know you've done it and you'll know how effective it has been' and I thought, I can do that. [11p15]

Taught sessions in the university were also seen as having had an effect on the teachers' knowledge of classroom talk but none of the teachers articulated how these sessions had influenced them in terms of their classroom practice. It may be that they were being generous to my ego in recognising the university sessions as a significant part of my involvement with their training but Sofia raised an interesting point in suggesting the problematic link between formal instruction in the university and the unplanned and spontaneous nature of the way she viewed classroom talk:

Sophia Generally with classroom talk I think we had loads of support, but you can never tell people how to deal with that. [11p44]

The view of classroom talk as being spontaneous and difficult to plan for and yet influenced by training and experience is reinforced in Luke's discussion of his planning:

Luke Often it comes out naturally I think. I think things like questions, key questions I'll try and put down but a lot of the time I

kind of just follow it through I mean the way I talk to them it's not just like I make it up on the spot it's kind of like I've been trained to talk in a certain way to some extent. [i1p12]

David also describes a sense that some of the ways in which he handles unplanned talk in lessons is first of all down to the problem of finding the time to plan in advance how talk will be managed but also that handling interactions as they arise is becoming more skilled with experience:

David I think mainly again because of time pressures that you're doing four lessons a day then you haven't got time to... to think of that particular question that's going to maximize that thing there. I know I've been very bad that allowing students the time to ponder on questions or to, to actually think on what I'm saying before I want to move on to the next bit again because of the pace but... I think probably it's becoming more instinctive and more just natural in terms of allowing one section to fall to another and knowing how to pin it [I1p12]

Ruby has one of the most integrated views of the sources of her knowledge relating to classroom talk, seeing it as a connection between experience on placement, taught sessions and her own reading for academic assessments:

Ruby I did that essay on dialogic practices and it came alive a bit more. It's just using activities and then having discussions about them, using everyday language to elicit understanding. It's not quite having a chat but it's sort of having the scientific chat to dispel the myths around it, make it memorable. [...] I think I'd like to read more about it. I tend to like practical tips, practical things to do. I understand where I wanted take me, where I want them to go it's just engaging them encouraging them to talk constructively. [...] school placements is where you do it the most but I would have never had such an interesting... if had I not had a couple of University sessions and then started doing my own reading but then again in some ways if it wasn't for the first placement I would have never started looking at it. [I1p26]

Drawing together the points raised in these interviews the teachers all show a struggle to reconcile the various components of their training in relation to talk. There seems to be an issue in the way their early beliefs about the role of a teacher, formal instruction and experience in the classroom combine in the problematic area of knowledge relating to classroom talk. Shulman's (1986) case based concept of teacher knowledge comprises precedents,

prototypes and parables. In these interviews there is evidence of a complex interaction of these forms of case knowledge. The teachers refer to changes in their ideas from early, precedent, notions of the role of the teacher as disseminator of knowledge. These precedents form a core sense of belief in the role of the teacher and what constitutes good practice in the classroom. For Luke there was a sense in which his own experience of learning as a student formed part of his view of teaching, even though he acknowledged that his own sense of how he learns is not typical. These precedents then interact with input during training in the form of prototypes from formal instruction and guidance. The training included input on the types of questions used by teachers and modes of interaction based on the work of Mortimer and Scott (2003). I would suggest that these formed prototypes that influence the teachers' view of classroom talk. The interviews suggest that, in the initial year at least, the teachers find it problematic to connect this prototypical knowledge with their remembered experiences in the classroom, which would provide them with parable case knowledge.

5.5 Changes in knowledge over the duration of the study

Over the course of the study there were changes in the way the teachers described their use of classroom talk. The training year was particularly significant in some of the changes in the way the use of classroom talk related to the teachers' view of their role in the classroom. In this section the emerging themes of change for the cohort as a whole are discussed. In chapter six the individual narrative vignettes of some of the teachers are presented with the purpose of further elaborating on the nature of change for individual teachers.

A strong theme emerging from discussion of the influence of their initial training on the teachers was the change in approach to both planning and delivering lessons. For most of the teachers there was a move away from a teacher led delivery of factual material to lessons that were more active for pupils. The first question in the interview at the end of the initial training year asked in general terms how the respondents had changed their view of what teaching involved during the year without explicitly asking them about classroom talk. It is clear from responses that underlying the teachers' views of the nature and purpose of talk was a shift in understanding of the role of the teacher and for some a significant change in their personal view of the nature of learning. This change was from a generally unproblematised didactic model of the transmission of canonical knowledge to a constructivist

model that recognises the need to support pupils as they make sense and personal meaning from their experiences and instruction. This transformation from didacticism to constructivism and from an unproblematised view to a recognition of the problematic nature of learning is a strong theme in the first year of the study. Joy describes early changes in her lesson structure that show a move away from teacher led instruction in the way she has come to limit the didactic elements of the lesson. Jason also talks about shifting his view of his role in the classroom from a passive transmission role to one of structuring and facilitating learning opportunities and of supporting pupils' learning. For Jason this change is interesting given his previous experience as a non-teaching member of staff in a secondary school and hence having had significant experience in a contemporary school environment prior to teaching. Adam is able to identify the trigger in terms of a critical incident in his own reflection for a change in his identify from the teacher that "*stood at the front of the classroom a lot*" and "*got through the amount I wanted to in the lesson, [...] just sort of delivering it.*" (interview 1) He describes the reflections on his emerging practice early in the course and feedback from a tutor that lead him to a shift in his view of his role in the classroom:

Adam I remember a lecturer describing it as like a castle, you stand behind your desk and that's where you feel safe, and I did try and move away from that and try, but I always stayed at the front [...] Whereas now [...] it's about the presence as well, going around, moving around the classroom and talking to the pupils..." [I1p4]

Here Adam appears to be identifying a shift in identity that needed a confluence of both feedback from observation of his practice and a personal realisation of the problematic nature of learning: A recognition that the failure of pupils to transfer the subject content presented in the lesson to their own work was not due to unwillingness on their part but the need for support from the teacher.

In all eight case studies it is clear that any change in their view of the nature and purpose of classroom talk is underpinned by a developing sense of what the role and expectations of a teacher are in a contemporary classroom. For some there is even a recognition that this is a contemporary view of teaching that they had little experience of when they themselves were are school. Underlying this may be a shift in the teachers' identity. Sean describes a moment in his experience where he reflected on a change in his sense of the role of the teacher in response to negative experiences in the classroom.

Sean So, the whole of the chemistry unit we did each set of double lessons as a single lesson. And so cramming information in and it just didn't work at all because there was too much talk from myself and not enough for them to even be remotely interested. [I1p6]

For others, change in their identity is implicit in some of the language that they use about teaching. Phrases such as 'facilitating learning' are used to describe their role in the classroom. For all of the teachers it is notable that the way they talk about their practice makes it clear that there has been a change in their identity, and they are able to articulate the lost identity with which they started the course. There is much less clarity about the nature of their new identity and it seems that this emerging hybrid identity (Hanrahan, 2006) is not one that the case study teachers are yet able to articulate clearly. The case study teachers' identity for all the case studies has shifted from a view of the teacher as technical expert and presenter of knowledge with a passive view of the relationship between teacher, student and science knowledge toward what Hanrahan describes as:

A hybrid identity, with different facets becoming visible (...) friendly community member, (gently) controlling teacher and classroom manager, motivating communicator (including amusing storyteller), learning facilitator, and goal-oriented task manager. (Hanrahan, 2006, p.28)

A second significant and related theme to emerge from the open discussion about the changes they have experienced during the first year is an emergent sense of the complexity and difficulty of teaching. For some of the teachers the early realisation of the complexity of their role stemmed from holding a fairly limited view of the role and identity of the teacher which was challenged by the expectations placed on them in the early stages of their training. Luke, Sean and Adam talk about holding fairly naïve views of the complexity of the teacher's role which were shifted by their early experiences and the expectations that were made of them in the first placement in school:

Luke ...it sounds stupid, but just like I put something on the board and they magically absorb it and it is nothing like that at all. [I1p4]

Adam ...when I started teaching it was about delivery of material and I was very caught up with just making sure that I got the information to the students and that I got through the amount I wanted to in the lesson... [I1p3]

For Ruby this early experience of the complexity of teaching was less to do with a need to re-structure a personal identity. In her case personal identity was congruent with the expectations of her mentors. Instead there is a realisation of the complexity of translating her identity as a “*guide*” into professional actions and competencies. This seems in part to relate to a mismatch between her emerging identity as a teacher and her experience as a learner which was limited to more passive roles within the classroom.

For several of the teachers the language with which they talk about the change in their view of the complexity of the role of the teacher suggest a shift in their identity from actions and interactions which connect the teacher with the class as a whole, where pupils have no individual identity, to a recognition that teaching is a transaction between the teacher and individual pupils. This is apparent in the focus on differentiating lessons for different abilities and learning styles in the teachers’ talk about developing an understanding of the complexity of teaching. Sean and Jason both used analogies for teaching that indicate the realisation of the complexity of the role and the difficulty of realising this without directly engaging in the role oneself:

Sean It’s like you’re a juggler, that can juggle three or four balls and then all over sudden you’ve got fifty to try and juggle all at once and you just have to try and do it. [11p4]

Jason ...it’s like the Swan analogy where it’s happening but you can’t see what’s happening to make it happen... [11p5]

In the shift from teacher as disseminator to facilitator and the problematisation of the teacher’s role, the case study teachers have come to understand better the nature of learning in the classroom and have begun to problematise learning as less than straightforward. This relates in some respects to one of the threshold concepts identified in Cove et al.’s study (2008 p 5): Teaching is about learning, both the particular achievements of individual children (often those who have initially presented ‘problems’ for the beginning teacher) and also the progress made by the class as a whole. This is, perhaps, the strongest evidence of the existence of threshold concepts in this study, a finding that I return to in chapter 7.

In the interview the participants were also asked about how elements of classroom talk are incorporated into their planning process. Lesson planning is a significant part of the input they have in their training and tends to relate to the structural elements of lessons. There appears to be an emerging

tension for the teachers between the value that is placed on planning during the training and a sense that dialogue and discourse in the classroom is spontaneous and difficult to plan for. In Viiri and Saari's (2006) case study of the development of dialogic teaching by a student teacher, it was similarly problematic for their case study participant to plan in advance the talk patterns intended for the lesson. In Viiri and Saari's study an intervention engaged the student teacher with aspects of Mortimer and Scott's (2003) model of interaction patterns, and yet the student teacher still talks about the problematic nature of changing one's own way of talking. It seems that there is a very close link between a teacher's identity and the development of talk as a consciously employed pedagogic tool. In this respect Sophia seems to have the most dialogic identity in the way she talks about the importance of interaction with pupils:

Sophia ... it's the most important part of teaching isn't it, having that rapport and discussion with pupils because if you don't have that then you're talking to a wall, you're not listening to them. But you don't really think of it at the time you don't think how important it is". [I1p6]

At the end of the interviews Jason has perhaps the most developed sense of the dialogic-authoritative and interactive-non interactive dimensions and is the only one of the teachers to recognise the potential purpose of non-interactive authoritative talk whilst still holding a clear view of the importance of talk for learning.

In exploring the literature on professional knowledge development, the construct of threshold concepts in the acquisition of knowledge seemed to offer a potentially useful framework for exploring the problematic nature of knowledge about classroom talk. Land et al.'s (2008) work on defining troublesome knowledge within undergraduate learning domains has been used to examine the significant changes in professional identity during initial teacher training (Cove et al., 2008). To explore the extent to which threshold concepts are evident in the domain of professional knowledge the final interview schedule asked the teachers to respond to statement that described the characteristics of threshold concepts as argued by Davies (2006) (See appendix B). It was evident from the varied responses of the participants that in terms of their own perception of the changes in their practice it is hard to argue that the changes represent threshold concepts. The teachers in this study did not recognise many of the features of threshold concepts in their view of changes in their knowledge. There was some recognition of the complexity of the changes but this varied between

teachers and the irreversibility and bounded nature of threshold concepts was not recognised. This leaves a question as to whether threshold concepts exist in the domain of professional knowledge which is addressed in chapter 7.

Chapter 6

Case study vignettes

In the previous chapter the overall themes that emerge from the cohort of teachers in the study were examined in relation to both the research questions of the study and findings that came out of analysis of the interviews. In this chapter the complex individual stories of some of the teachers are presented. These individual narratives that emerge over the course of the three years of the study highlight the complex interaction between the emerging teacher self-identity in relation to classroom talk and the community of practice in which the teachers finds themselves. In each of the individual cases the interplay between the teacher's belief and how that influences their view of classroom talk and external influences from perceptions of what is expected of effective teachers creates tensions. As the teachers attempt to reconcile conflict between their views of the role and purpose of classroom talk and the demands, both explicit and implicit, made on them by the community of practice in which they work, there are influences on their professional development. Where they are able to sustain a sense of self-efficacy there is, at least to some extent, a successful navigation of these conflicts. The four case study vignettes presented in this chapter explore in more detail how the experiences of the individual teachers and their personal beliefs and views about teaching are played out in the way their ideas about classroom talk develop. These four teachers are presented here as they each have a particular story that presents the complexity of these sometimes conflicting influences. For one of the teachers, the failure to successfully reconcile these conflicts ultimately contributes to their decision to leave teaching. For the other three, different personal teacher-talk identities and different communities of practice lead to different degrees of conflict and different ways in which tensions become resolved.

Sophia presents a pupil-talk centric teacher identity that is, to some extent, aligned with the cultures of the community of practice in which she works. Sophia experiences little challenge to her sense of self-efficacy and is able to develop a teacher-talk identity that is aligned with, at least, the internal expectations of her department, if not her perception of external expectations from the school inspection framework within which the school is operating.

Ruby also has a pupil-talk centric teacher identity but unlike Sophia she moves, quite knowingly, from her pre-service training to a school which she

recognises as having a culture and community of practice that she expects, justifiably as it turns out, which will be in some tension with her own identity. Ruby is successful enough in her first post in establishing a sense of self-efficacy so that she is able to develop a kind of hybrid identity that holds some degree of contradiction but allows her to reconcile implicit tensions between her own views of classroom talk and the expectations of the school leadership, subject team and pupils.

In contrast, Sean experiences a degree of conflict between his more teacher-talk oriented identity and the expectations of the community of practice that emerge through formal appraisal of his teaching during the probationary period of his first post. Although he continues to develop his ideas about classroom talk during the duration of the study, Sean is unable to find a way to reconcile his perception of what is expected of teachers with his own belief about effective practice, including the role and purpose of classroom talk.

Jason develops a particularly personal identity in relation to classroom talk and over the course of the study forms a particularly coherent and rational understanding of his own about the influence of classroom talk on learning that straddles the pupil-talk centric and teacher-talk centric identities of the other teachers in the study. Feelings of self-efficacy are strong and in the year following the study Jason took up his first leadership role in a different school.

This chapter presents the findings of the study in relation to the individual case studies of four of the participants that illustrate the complex inter-relationship between teacher identity, belief, views about learning, feelings of self-efficacy and the communities of practice in which they train and work. How these individual stories highlight aspects of professional knowledge in relation to theoretical perspectives such as communities of practice, self-efficacy and identity are discussed in the following chapter.

6.1 Sophia: a pupil-talk centred teacher identity

By the middle of the third year Sophia articulates her view of the types of talk she uses in the classroom largely in terms of the participants in the talk, seeing the modes of classroom talk in reference to those involved in the interactions (pupil-to-pupil, teacher to pupil or teacher to class) She describes the purpose of these modes of talk as follows:

Pupil-to-pupil talk: Sophia describes how she arranges the seating of pupils to create a mix of ability in pairs or groups as a way of supporting pupil-to-pupil talk. Whilst not explicitly stated in the interview responses there seems to be an underlying sense in the way Sophia talks about her use of classroom talk that is focussed on creating opportunities for pupils to talk about their ideas, as she puts it to “*develop their answers together*”. There is also an indication that part of her motivation for using pupil-to-pupil talk relates to perceptions of pupil engagement:

I try not to spend too long on [classroom debates and discussion] because I think it can become a bit boring for the pupils that, the low ability pupils do get disengaged with classroom group talk.

The use of mixed ability groupings supports a second aspect of pupil-to-pupil talk that Sophia refers to in her later interviews: the use of pupils as “*mini-teachers*”. Sophia describes having started to use a talk approach of getting pupils to take the role of “*expert*” and trying to get them to help other pupils in the class.

Teacher - pupil one-to-one talk: Sophia describes a dual purpose to this mode of talk, being both about “*getting [pupils] thinking more*” and for her to have a sense of knowing “*where [the pupils] are already*”. There is also a purpose for Sophia in developing relationships with pupils through talk with individuals and in encouraging them to participate in lessons:

listening to the pupils is something that I've been trying to do a lot more of and also not just for them developing their answers but they trust you a lot more if you spend time listening to, even if it's got nothing to do with a topic that we're doing today but if it's about some sort of science they are trying to build a rapport with you it helps so much in the following months with their participation.

There is an indication here of an emerging recognition of a genuinely dialogic mode of teaching where the ideas of pupils are listened to carefully and recognised as an essential part of the learning process. However, here again there is blurring of the aim of the mode of talk between pupil learning in an immediate and direct way and outcomes relating to participation and engagement that are likely to have an indirect influence on learning.

Teacher - whole class talk: This is a mode of talk that Sophia recognises as having a key role to play in her classroom. Teacher-to-whole-class talk is a mode that she uses frequently in the form of discussion and debate and to a lesser extent to manage activities and in particular to manage safe

practical work. Sophia's perception of this form of classroom talk is that it can be hard to limit ("*It's hard to hold yourself back, the teacher led [talk]*") but that she tries "*not to spend too long on that*". Where there is a sense of Sophia presenting a more authoritative voice in the classroom there is a strong sense that she values the pupil voice in creating the authoritative science narrative in the lesson and recognises a more dialogic aspect to the talk through holding up pupils' ideas in the classroom as part of the authoritative narrative of the lesson:

I'll get them to show their ideas and then I will say something like 'well that's a really interesting idea', [...] I try not to say that 'this is actually what you should have said'. I normally go 'well this is someone's idea on the board, you might want to jot down that idea because it may come up in your exam'... 'Your idea is wrong and your idea is wrong to', I don't say that because I want them to contribute their ideas.

This aspect of Sophia's use of talk shows the subtle shifts that can exist on an authoritative – dialogic axis. Here the pupils' ideas are valued but in a way that incorporates them in the science narrative of the lesson. Sophia also talks about a feedback purpose to teacher-to-whole-class talk on a periodic cycle around the end of sequences of lessons. This seems to relate to a school focus around communicating pupils' working levels against target data relating to national curriculum performance levels.

And levels, I talk a lot about what level you've achieved today. So: 'you've got this level, we should be getting to this level'. But usually at the end of the topic where I have concerns. I don't do it every lesson. [...] but at the end of each topic I am talking to them probably for five to ten minutes about; if it's not good enough or if it's a brilliant, a bit of praise and a bit of... Because I think they lose interest if you don't keep praising them throughout.

Changes in Sophia's views of classroom talk: Throughout the later interviews there is a much clearer articulation of both the different types of talk Sophia uses and the range of purposes of the talk compared with the first interview at the end of the training year. However, the recognition of classroom talk as being something that pupils do and that this may not involve the teacher is evident from the first interview with Sophia:

Generally most lessons there's some sort of talk and I start to try, depending on behaviour in the group, mixed peer talk between the pupils.

So it seems that the foundations of the articulation of the nature and purpose of classroom talk that are expressed by Sophia at the end of the case study are present in her early practice and view of her classroom even though she is not able to explain her use of talk as clearly and systematically as at the end of the study.

In her first interview Sophia talks about what she sees as significant changes to how she views the role of the teacher which focused on a shift from a transmissive view of teaching to acting as the facilitator of more independent learning. Sophia describes this shift as moving from *“initially I thought that I would teach them a bit of information they would take it in and that would be it”* to stating that in *“the last few weeks I’ve realised that, I was just, what’s the word? Facilitating [...] they need to take their own responsibility for learning so I would provide something for them but [...] they’d have to do the work and use me where necessary”*. This shift in her description of what she sees as the role of the teacher is supported by her reflections on the reasons for improved feedback on her teaching by her mentor: *“it’s all about making them do the work and doing well you’d do the preparation but then just monitored throughout the lesson that I think, I got better feedback for those types of lessons because they were less teacher led and more actually learning for themselves, learning from others not only from me.”*

In Sophia’s changing view of her role there is sense of a tension between her developing a sense of authority and control within the classroom and her developing view of the effectiveness of less controlled discourse in developing the level of cognition of pupils. She describes the move to more independent and less teacher led lessons in terms of her own worries and an increased element of risk:

Interviewer: Did that feel like letting go, was that difficult?

Yeah, it was worrying. Well practicals; it’s a bit scary, [...] I think it is a confidence thing because you need to know where it could go, be confident in your knowledge if they ask you for advice or you need to know the curriculum I suppose so that you can direct them on to what they should be learning. But it is risky...

This view resonates with the focus in Chen et al’s (2016) study on developing teacher questioning to incorporate multiple teacher roles that move the ownership of ideas and activities to the students. Chen et al also make the suggestion that limitations in the extent to which their case study

teachers manage this move relate to teacher confidence and subject knowledge.

For Sophia this sense of risk is mentioned in relation to topics in physics which suggests that this lack of confidence relates to subject knowledge and concerns about being able to answer pupils' questions in parts of the curriculum that are not related to Sophia's specialism in Biology. Her post 16 education in science was narrow and specialised in Human Biology both at A-level and as part of a vocationally orientated degree course. For Sophia the driver that seems to be leading to a move away from less risky, teacher led approaches to lessons comes from both feedback from her mentor from observation of lessons and from a feeling of personal satisfaction gleaned from seeing the quality of interactions between pupils. In response to being asked about her use of classroom talk Sophia focusses on developments that she perceives in her use of questions, both in making them more open and in challenging pupils' answers to encourage them to think more about their responses.

I've noticed it when I did my PGCE with you and I do it a lot now, it was to challenge them and say like 'Is that right? Are you sure? Make them doubt themselves and then they come up with more complex responses, so I do that a lot now and I'm always thinking about how can I would this question to make it quite challenging for them so I can get a really detailed response.

This recurring mention of a particular approach to questioning pupils is unique to Sophia and clearly forms a strongly held mode of classroom talk that stems from the latter part of her initial training and has remained a part of her practice throughout the case study. In the fourth interview it crops up as something that has been reinforced by the experience of observing and feeding back to a trainee teacher whom Sophia is involved in mentoring.

6.1.2 Tension between a pupil-talk centric identity and a culture of performativity

There is a conflict apparent in Sophia's experience between the expectations of a school's management culture and the teacher's own judgements about effective practice. This tension is clearly evident in the experiences Sophia has as she moves into her first teaching post. Indeed, it is something that she has already become aware of by the end of her training. When she talks about possible challenges in her first year of teaching Sophia raises concerns about maintaining what she sees as

important in her classroom practice in terms of the overall 'feel' of her lessons:

I don't want to focus on, well I know you have to focus on achievement and data and statistics and getting on with your department and being seen to be an outstanding teacher but I want to keep the fun and creativity and excitement and good rapport and make them enjoy science rather than thinking 'urgh' its science today, I want to try and keep, as that's how I feel about it and if I lose that passion then it will be transferred to pupils will it.

Exploring this further Sophia is clear that there is a potential conflict between what she is coming to see as the expectations of school leadership teams in their observations and judgements of lessons and what she believes are the most effective ways to use talk in the classroom. It seems significant that there is a "but" between Sophia's description of the performativity measures in school, "Being seen to be an outstanding teacher" and her desire to "keep the fun and creativity". There is already for Sophia a conflict between what she sees as the criteria for being judged by inspection and school leaders and her own belief in what constitutes good practice in terms of classroom talk:

As I was saying earlier about classroom talk I find that the best conversations I have are when they are just off-the-cuff or when I just think of a question, so if you are so rigid in planning a lesson like when I have an observation you're so worried about having an observation you're so structured and that can almost make it a bad lesson and not make it what it should be in criteria [...] it makes it more constrained and that's what a lot of teachers abide to so they can achieve their outstanding status, constrain themselves so they stick to the criteria. Is that a bad opinion?

A 'values schizophrenia' (Ball, 2006) is apparent here as Sophia asks the rhetorical question to the interviewer: "is that a bad opinion?" Even before beginning her first post there is an emerging conflict between personal belief and experience and the culture of good practice imposed in schools through the expectations made in observation and feedback to teachers. In the interview eighteen months later in Sophia's second year in post the interview revisits this concern about the conflict between her view of good practice and the pressure to conform to the expectations of a performance culture. Sophia talks about her reconciliation of the two elements. The tension is still

apparent in the way she talks about elements of what is looked for in lesson observations in the context of assessment of pupils' learning:

In terms of like after so many minutes you need to do an AfL [assessment for learning task], I do do that sort of thing whereas in a lesson I might do it in the first minute or it depends on the activity but don't have that time to do it in an observed lesson because it's so regimented I find that they're looking for this, they're looking for that.

At this point in her career Sophia sees less difference between her 'daily' practice and the way she works under observation:

So the main body of the observed lesson I do in every lesson it's just the finer details I suppose. So I don't think I've changed that much but I do agree with you but I did say I don't want to go along with the routines that you have to do don't you, you have to sort of fit in with what's goes on in the school...

In the same response she offers a rationalisation of her shift towards the expectations of the school in terms of recognition of the need of the school to measure and manage performance:

...because it's all about consistency and you don't have consistency, you don't have anything to compare to do you, it's like anything. So I understand is necessary and it is important.

There is a suggestion in Sophia's discussion of a training course attended by her and a colleague that the source of what she sees as the expectations of good practice in lessons that has become part of her employing school's performativity culture is not the external inspection from Ofsted directly but indirect mediation of perceptions of Ofsted expectations by the school's leadership.

When you're observed you want your learning objectives but [...] I know with OFSTED because me and Tom (pseudonym) went on the course, that's not what they want to see because they find it's so boring monotonous and even the kids are like oh we got to put the learning objectives again so I don't often use them in my lessons until they're necessary, until it's like would done this will be achieved and what level what you, until it's absolutely necessary. Because otherwise we're not really doing it for a purpose, why am I writing down the learning objectives, but saying that I do use them in my observed lessons because that's our whole school policy.

It seems here that Sophia is now navigating a three way conflict of expectations of practice between her own judgements, those of the school that are communicated within the school and the external messages coming from training intended to share the expectations of external Ofsted inspection of practice in school. The influence of cultures of performativity in schools on the teachers' development of ideas about classroom talk is discussed further in the next chapter.

There is an apparent conflict between Sophia's views of the kinds of classroom talk that are likely to enrich and enhance pupils learning in science and the need to limit this to allow time for pupils "to know this and this is what you'll get a mark for your GCSE" and to "get the stuff in our books". This tension clearly creates a sense of frustration and constraint for Sophia during her first year of teaching that arises from the need to reconcile the pressure that she feels from the expectation to address the entire exam specification and for pupils to have a written record of the topics covered in lessons.

It does annoy me because [...] I could give them more of a chance to think about it for a little bit longer and maybe do a bit of research, but sometimes I just don't have time for that, I have to tell them. But then I do sometimes. It works both ways, not all my lessons I just tell them, drill them. I think I'm still quite creative giving them things to like look at and discuss, but it does frustrate me that I can't spend time talking or listening to them talk.

However, it is still evident that underlying Sophia's anxieties about 'covering the content' she continues to recognise the importance of dialogue, at least to provide some feedback about the extent to which pupils are making their own sense of the content of lessons:

Most of my tasks I do put time into them to discuss in pairs and also time to feedback to the class and get different perspectives. I don't just go this is what will learning this is the answer, which would save time sometimes. But yes I think I do, but in the back of my mind I'm aware that the restraints that I have on time.

To some extent the resolution to this conflict between covering the content and employing a preferred range of classroom talk comes with experience. In her second year in post Sophia looks back at the level of pressure that she felt during her NQT year both in terms of unfamiliarity with long term

planning against a specification and her anxiety about a sense of personal responsibility for the outcomes of pupils in their examinations:

I feel more comfortable I think because I'm not too stressed about the content because I'm fully aware of what goes into an ISA (Individual Skills Assignment) what goes into the specific exam boards, I'm not too stressed out about that.

I don't feel as much pressure on myself to perform miracles. I think last year I was so worried about year 11 not getting their GCSEs it would be my fault, [...]because they're my responsibility whereas now; yes I am accountable but there's only so much I can do. [...] now, I am worried obviously about year 11 in the summer, but I'm not thinking oh my God, I'm not panicking. So I can just relax a bit more and spend time on the quality of each lesson that we do.

There is also an indication in Sophia's view of the way this increase in confidence from experience has enabled her to see the potential gain in terms of pupil outcomes. This she believes will result from more open ended discussion, In particular the ideas of debating issues and of creating space in lessons for different kinds of talk by moving some coverage of the specification ("short bits of information") into homework completed outside the lesson.

I've been setting a lot of homework for different short pieces of information that actually making a lesson on it would be pretty pointless, just simple questions. Which has opened up more time for classroom discussion on things that are ethical issues like learning and which means that I'm having a lot more of a debate with the kids but I think it was actually aiding their written work because they can construct sentences, and then state their opinion and justify it.

It seems that the experience of moving from a view of the role of the teacher, held at the start of the training year, as a disseminator of knowledge to a recognition of the potential influence on learning of a more dialogic mode of interaction with pupils has occurred within the context of challenges that placed constraints on this shift in practice. However, the underlying change in belief about the role of the teacher in classroom talk has remained. Sophia has been able to resolve some of the tensions that she felt around the pressure of performativity in her classroom over the course of the first 18 months in her first post. As this conflict is worked through over that period in Sophia's responses in interviews it seems that the strength of this opinion

about the value of more dialogic modes of classroom talk becomes a clear part of Sophia's identity as a teacher that enables the change she recognises during her training to survive the pressures of her first term as a teacher. This aspect of classroom talk is referred to by Sophia in terms of openness, freedom and creativity:

There are occasions when you can be more open and free and do creative things which I do try and do a lot still", "[the curriculum] offers less time to be a bit more free and have lessons when you are just debating", "leaving it quite open ended to classroom discussion" and "I know it's really good to have open rich questions.

In summary, Sophia presents an experience of successfully aligning her own teacher identity with the expectations of the various communities of practice in which she participates. There is an alignment of her personal beliefs and values with what is seen as effective practice in both her training placements and her employing school. This experience differs from some of the other teachers whose vignettes are presented here.

6.2 Ruby: successfully navigating tensions between the teacher self and community of practice.

Ruby's experiences over the three years of the study demonstrate an interesting tension between her own beliefs and identity as a teacher and the community of practice in which she finds herself working. This vignette explores Ruby's experience and how this affects her views of classroom talk in her teaching. The interviews with Ruby suggest an experience of developing an identity in relation to classroom talk that involves a sense of tension between her emergent self as a teacher and beliefs about the value of classroom talk in her teaching with the need for validation of her effectiveness as a teacher from peers and managers and the constraints of curriculum and assessment regimes. In this sense there is a complex and conflicting relationship in the development of Ruby's identity in the interplay between her internal self and the identity formation of the localised teaching community within which she trains and works. There are similarities with the way in which Sophia's teacher identity in relation to classroom talk emerges but there is a much stronger sense of tension with aspects of the community of practice in which Ruby is a participant.

6.2.1 Ruby's early development of a classroom talk identity.

In the initial interview Ruby attempts to give a narrative overview of her own experience of becoming a teacher in the context of discussing her views of classroom talk. She professes to bring very limited experiences on which to draw prior to the pre-service training, referring only to the influence of her own teachers and some brief observation of classrooms.

My experience really [...] was from my own school because I haven't had experience of a secondary school before I came to do the PGCE [...] I only had days here and there. I think what I'd seen had been quite formulaic [...], maybe that's because I sat in on lessons when they weren't expecting me [...]. I knew I was a guide, I needed to be, how to put it, to lead them like you've always said through the journey of it. But I hadn't got a clue how on earth I was going to do that when I started. I think I had all the right ideas of things people told me that it was but absolutely no clue how to do them because what I experienced was you do a topic you do a test, topic, test, so yeah. What I do now I don't think I could have imagined it in September.

Ruby's reference to a metaphor for the teacher as a guide perhaps indicates to some extent an emerging sense of self and already she seems to see this as somewhat at odds with her experiences of other teachers. Ruby appears to be beginning to have a sense of her own teacher identity as different from that of more experienced colleagues even before the start of her training.

Sometimes you think you're not seeing good teaching but you don't feel like you're in a position to make a judgement on anybody else before you start but you can't help watching it thinking [...] that I wish, I hope I find a better way of doing it.

Ruby's view of classroom talk at the end of her pre-service training focusses on the structural kinds of pupil talk that she has developed in her lessons that reflect the range of different strategies for building pupil talk into lessons. She also talks about non-verbal activities that involve pupils expressing their ideas as a form of talk, suggesting that Ruby is developing an orientation toward dialogic forms of teaching as central to her approach in her training.

Well I suppose there's lots of different types. You can either use it in pair-talk or groups on tables or like a circus of activities where you might start off in pairs and then you need to move round to other

tables and add your ideas. Or even starting off without talk was quite interesting, doing silent mind maps where people had to add ideas on and then the final group would come up together, but then they were evaluating other people's ideas and forcing them to think outside of their own ideas and incorporate other people's [...] But there's definitely something in them being able to talk to each other and then they might write one thing as opposed to sitting and saying 'I don't know' or drawing you a smiley face [...]

There is a sense in this first interview that Ruby has clearly recognised the potential for pupil talk in the classroom to have an effect on learning in science lessons. For Ruby the reasoning for this is affective, in that the pupil-to-pupil discourse encourages confidence in articulating their thinking, something that she holds in common with Sophia.

It's giving them the confidence to share an idea that they might otherwise not have said because they think it's silly or it might be wrong, heaven forbid you might be wrong, and they don't like to, there are some students who are very wary. [...] It's bouncing ideas off each other getting some confidence to come up with something, if it's not right it doesn't matter, cross it out, I'll never tell.

Ruby describes becoming more effective at encouraging more dialogic interactions in the classroom during her training. She describes observations of one particular colleague that influenced her to work on creating an atmosphere in lessons that encouraged pupils to talk about their ideas.

I think I became better at listening to what they were saying to me and saying 'okay yeah I get what you're saying, I get you, so you're talking about XYZ what about if...' or 'how about if...' or 'what would happen, why do you say...', and being able to mould it more into their conversation is more of a dialogue.

University based elements of Ruby's training have clearly had an influence on her views about classroom talk and she chose to focus on dialogic teaching in one of her academic assignments. This seems to have had an effect on her views of classroom talk.

I didn't really understand what it was or how it could be used at all, never really seen it in action. And then I did that essay on dialogic practices and it came alive a bit more. It's just using activities and then having discussions about them, using everyday language to elicit

understanding. It's not quite having a chat but it's sort of having the scientific chat to dispel the myths around it, make it memorable. You remember more of what you sit and chat about rather than copy out of textbooks. It seems a bit obvious, but then there's techniques to it and they were the bits that were interesting to learn, I think, to try... and fail... occasionally.

There is a sense of a purpose in encouraging pupil talk in engaging and motivating them, making lessons more memorable. Implicit in Ruby's reasoning is also a constructivist teaching identity that borrows some of the constructivist language such as 'eliciting' understanding and 'dispelling myths' that has a resonance with constructivist approaches to handling misconceptions in science. As with all the other teachers, however, the language of constructivist or socio-constructivist theories of learning remain largely absent or seem to be appropriated in a modified form as part of more everyday forms of speech in talking about practice in the classroom. So there are occasional phrases in the responses that stem from constructivist approaches such as '*elicit understanding*' and reference to the intention to '*dispel myths*' that suggest the language of constructivist science teaching and the significance of pupils ideas or 'misconceptions'. It is harder in the context of Ruby's responses to locate the sources of these fragments of language that suggest the development of more theoretical understandings of learning but there are regular references in her responses to influence from the University based elements of her training and her own study.

I think one of the first in terms of practices, I saw Phil Scott, he did a webinar, it was like beating gravity, they have the beam and they hang from the beam and beat gravity. And I was watching that and I was reading the accompanying paper and sort of thought I see what he's doing, trying to, you know their ideas weren't wrong, you weren't right or wrong, he just kept building on it, or what you think now, what do you think now?

There is a clear sense from the interviews that Ruby's pre-service training had a significant influence on her views of the purposes of classroom talk and resulted in an identity that could be described as oriented toward socio-constructivist and dialogic approaches to teaching. It is, however, striking to contrast Ruby's inclination to develop dialogic teaching approaches that is indicated by her choice to explore this aspect of teaching in her extended academic assignment and the lack of an explicit language to talk about her use of classroom talk.

There is a particular experience for Ruby on her first teaching placement that seems to sow the seeds of a tension in her identity that develops during her first two years in employment: she describes working with an experienced teacher who had a very different approach to classroom talk, preferring to minimise pupil talk. The conflict between observation of her approach and the success she had with outcomes for her class and Ruby's emerging teacher identity in valuing pupil talk in which the University led training was influential is picked up by Ruby in her initial interview.

Looking back at it I think the layout of the classroom had a lot to do with it, they sat in individual paired desks so the only person they could speak to was the person next to them who wasn't necessarily somebody who was of similar ability to them. It was usually to keep them quiet so the naughty one sat next to the person who was very able but then that able person didn't get a chance to talk because the person next to them couldn't care less, you know 'you're a swot I'm not talking to you'. And so talking didn't really happen. [...] I think it was just fear and they were very able and all wanted to just do well. They could do well by sitting and writing out of the book that was one way, it did work. It might not have been particularly good for all of them but it does work.

There seems to be an attempt to reconcile her pupil-talk oriented identity with her experience of observing a teacher who minimises pupil talk in lessons yet is seen as successful in terms of pupil outcomes by identifying a wider teaching objective than learning science in developing pupils' social skills in lessons.

[Pupils] need to succeed in the tests but you also need to come out of it as a human being who is capable of having conversations with other people and not taking offence if they don't agree with your point of view. That's ambitious but if everybody did it, if that was the norm, how good would that be.

It is clear that Ruby is developing a clear teacher identity that is orientated towards pupil talk in her classroom. There is an emerging constructivist identity and one which values wider social goals beyond measurable learning outcomes in the subject. What is distinct for Ruby is the way in which this teacher identity sits in tension with the community of practice and cultures of her employing school.

6.2.2 A tension between classroom talk identity and the community of practice successfully navigated.

In the final interview with Ruby at the end of her second year of full time teaching in the same school there remains a sense of conflict between the expectations of the school that are implicit in the practices and planning structures within which Ruby works that create time constraints in lessons. So there is a tension between Ruby's desire to encourage pupil talk and a need to 'get through stuff'.

I just do not have time to have every single person's question. So I get them to write them down. But then that takes another twenty minutes the next time to go through the 'wall' and it's lovely that they are so enthusiastic but I feel like I curb them sometimes, just because I need to get through stuff. That's the disappointing reality I guess. [...] We have been so constricted by deadlines this year that is the everything on a very, very, tight rota and you've got to have coursework done and you find yourself with ever decreasing amounts of time to fit things in and it's got to be done before the end of the year.

'Getting through the stuff', or 'covering the content', is a common tension for the teachers in the study and raises an interesting question about how they view the linear nature of their teaching. There is an apparent tension in the way Ruby talks between the enacted lessons that pupils experience and the underlying learning that takes place.

If I have the time to do it and I know I've got plenty of time we can do lots of activities [...] but if time is of the essence, no I do, I say this is the correct terminology or yes you got it right or no that's the thing that you would need to say, I do, I hate saying I do but I do. [...] Because they don't learn it, they remember it for three lessons and then it's not the thing that they are really excited in.

Ruby is trying to articulate a resolution to an apparent conflict between her belief that learning is deeper and more secure where pupils have the opportunity to talk, a socio-constructivist orientation, and the view of effective teaching that is emerging from the community of practice in which she works. There seems to be a need to develop a self-identity that encompasses both potentially conflicting views of good teaching in a way that maintains a self-belief as an effective practitioner.

They sat and talked to me for 10 minutes, they shared, they were brilliant but you've got to document it. Otherwise it doesn't count. And then that takes twice as long, so do you talk about it beforehand or do you just do a quick check. I'm being very, very, honest, it depends how much time you've got. You have to cherry pick which bits you can use and when but you can't use it consistently.

Interviewer Does it frustrate you?

It does and it doesn't. It frustrates me sometimes when I think there's a brilliant opportunity to do something and it could be so great and I think they would really remember that and that frustrates me. But then on the other hand you think that they are getting through, they are all their targets, when I plug their numbers into the sheet and they go green and you say brilliant they are on target and you think that's my measure, and I'm doing it so yes and no.

Where Ruby talks about her pupils' interactions with her as 'not counting' there is a conflict evident between Ruby's view of the value of classroom talk in supporting learning and a perception that only recorded written assessment feedback is valued by the school leadership. Yet she seems to present her own resolution within the following point when she suggests an acceptance of the measured outcomes in pupil progress. There is also an apparent conflict between Ruby's stated belief that opportunities for talk increase pupil engagement and her experience with some groups of pupils in this particular school. For older pupils in the school either the pressure or motivation to achieve good exam grades or a recognition that the teacher is under pressure to cover the curriculum creates a reluctance to engage in classroom talk

I think that they get less [...] enthusiastic the older they get, for sharing stuff. I think it is probably embarrassment more than anything else and [...] I don't think they're worried about what I think. I honestly think it's just teenage, I think sometimes it's just that they can't be bothered and 'if I sit here long enough she will probably tell us' and I have been the last few months.

And of a post sixteen A level group:

[The students] will just sit there rather than talk. [...] they don't want to look stupid and the able ones in the sixth form [...] they don't want to work with anybody else because that might drag their grades down

and they are not interested in having conversations with somebody who has got a C grade target because that's not where they want to be.

Pressures from students, the leadership team in school and the structures and planning of the science department create a feeling of constraint for Ruby in implementing the kinds of classroom talk that she has come to be convinced can have a positive effect on learning. There are times when she expresses an explicit sense of frustration at the implementation of school-wide approaches to teaching that conflict with her sense of the kinds of talk that ought to be taking place in her classroom. And yet it also seems that Ruby is finding a way to hold a positive self-image as a teacher by creating a multiple teacher identity that holds simultaneously to beliefs about effective teaching that are in conflict. So Ruby talks about 'covering the stuff' as a normal part of being a teacher at the same time as expressing scepticism about the depth and durability of learning that takes place whilst covering the curriculum at the pace dictated by departmental planning. Whether the divided sense of identity expressed here is what Hanrahan (2006) describes as a 'hybrid' identity or represents simultaneously held multiple identities is a question that is explored further in the discussion chapter.

6.3 Sean: a tension between the teacher-self and community of practice that remained unresolved.

Sean presents a distinct narrative case study over the three years in that the tension that emerges between his own views around classroom talk and the pressures of expectations of practice from his first employing school becomes part of Sean's account in the interviews of his decision to discontinue his induction period, leaving his post, and ultimately after a period of reflection, leaving teaching entirely. Sean was a mature entrant to the profession with a very strong academic background and experience in post-doctoral science research. An articulate and knowledgeable trainee, very keen to learn about teaching and respond to advice and guidance, he was unable to reconcile his own sense of a teacher identity with the expectations of classroom practice that were communicated through formal appraisal of his induction period.

6.3.1 A teacher-centric perspective on classroom talk

Sean is one of two teachers in the study who focus on their own talk in the classroom in response to open questions in the interviews about their

understanding of classroom talk. In his first interview, at the end of his pre-service training, Sean identifies the most significant changes in his understanding of the nature of classroom talk in terms of changes in his own talk in lessons; both in reducing the amount of it and adjusting the level of his spoken language.

When I started [...] my first day, my first lesson was to a group of year nines and it was a lecture and my mentor was shocked that they managed to sit completely still paying attention to me for an hour. [...] The other thing that has developed is my language is at the appropriate level now whereas to begin with it was, because I've just come from, there were some instances where I would completely lose the students based on the level I was pitching the information.

At the end of his pre-service training Sean's concept of classroom talk had moved from a focus on teacher instruction in a largely transmissive mode of non-interactive authoritative discourse and instruction setting to incorporate a sense of the role for both teacher talk and a kind of discussion with groups and individuals that recognised the need to hear pupil's ideas. This is reflected in the way he articulates a general sense of the types of talk in his classroom.

Well there's two things that immediately spring to mind, there's discussions with the class or the class in their little groups and there are also sort of teacher of directed talk which obviously, in my mind, I think of them as distinct, maybe not fully distinct but there will be a certain level of cross over

At the end of the pre-service training year Sean also talks about questioning in his sense of how he has changed his use of classroom talk over the year with a recognition of the increased use of questions and of a change in the kind of questions he uses with an implied improvement in the quality of questioning used in his teaching relating to higher order questions.

It's something that has, I'm by no means good at yet but there are elements where I think in the back in my mind yeah that was the right question to ask right them, I've nailed that particular point because the students have realized oh yeah and if to begin with I wouldn't have done questioning at the start and that's why it was more lecture-ish even after my very first lecture after that there wasn't as much questioning whereas now as a result of this placement particularly my

higher order questioning has really pushed forward and it was one of the things that my mentor has said to me.

This feedback on 'talking too much' from his mentor appears to have been a significant influence on Sean's view of the teacher's role in relation to talk resulting in a valuing of pupil talk in lessons. Unlike Sophia and Ruby there isn't a sense of valuing the opening up of pupil ideas, rather that pupils are seen as respondents to teacher questioning. There does seem to be some unresolved tension for Sean at this stage between what he judges to be appropriate ways to use talk to foster interest and engagement which arise from different reactions from some groups of pupils to the kinds of discussions he has adopted and a perceived need to cover content in a busy syllabus that comes from planning conversations with colleagues.

I've got two Year 10 [...] classes and they are pretty much on a par with each other. [...] I sort of think okay, the talk involved in this will be suitable, and allowing them to access more information by using research. [...] And then I found out that [...] they don't really respond well to debates or whole class discussions. It seriously does limit what you can do with them. So with those particular classes I found that [...] there are certain avenues where I could take the lesson to make it more interactive, more enjoyable for them, don't work and so it does become a bit more teacher led and a bit more, "here's the book, here's the worksheet" led. [...] We have tried to cram in the whole of [...] the chemistry unit, [...] cramming information in and it just didn't work at all because there was too much talk from myself and not enough for them to even remotely be interested because it's on the course book and the worksheet. And I mentioned this to the teacher, I said "I'm not confident with this at all", and she said yes but we don't have the time so just do it.

At the end of the second year of the study this conflict between Sean's views of the value of the teacher talk directed at the whole class and the importance of pupil talk within lessons remains. Sean implies a sense of disagreement with what he sees as the accepted view of the amount of teacher talk in effective lessons. It seems that the talk Sean sees as central to his practice involves a degree of dialogue with pupils but he has a strong sense of the efficacy of teacher talk that is at odds with guidance from other teachers.

I still find, at times, that I talk a lot. But I think it's often more to do with stopping them and I am I'm conscious a lot more of "right they're not getting that, they're not getting that, oh some of the bright kids aren't getting it". So it's more, yes I might still be talking a fair bit but the talk really now is starting to focus more on what needs to be said at that time rather than just blindly talking and wasting time. If I have to waste a bit of time to explain something and find a better way, I'm doing that a lot more. So I think that's how it has started to develop a bit more as well, is all the time looking at how the talk is impacting at their end rather than me just saying what I think I should be saying, it's more "right have my instructions had that impact, are they getting on with their work, some aren't and they're clearly struggling" and then when you get more than one student asking me 'we're not sure how we should do this' I then come back to the front to bring everyone together a lot more. So I mean it's still in development but I'm starting to understand it. Well actually the traditional thing of well if you talking from more than twenty percent of the lesson or twenty minutes of the lesson, whatever it is, then you're talking too much, it's not necessarily as cut and dry as that. It's guiding the students with their learning rather than just 'I'm not going talk because I've been talking most of the lesson', but if it is needed I'll try to cover it that way.

Sean has a clear focus on the role of talk in learning science and refers to pupil talk as a key element in his use of classroom talk. Where he differs from some of the other teachers in the study is in the extent to which the narrative of the changes in his use of talk centres around his teacher talk and a sense of himself as the key agent of talk in the classroom. He sees the implementation of classroom talk through his own spoken word, in interactions with pupils and classes structured around questioning and class discussions. 'Discussion' is a term used commonly by the teachers in the study in reference to interactive but teacher led whole class episodes in lessons. Whole class teacher led interactive talk with individual turn taking by nominated pupils was evident in observations of Sean's teaching and tended to focus on presenting the science content of the lesson to the whole group. In his fourth interview he talks about a sense of, albeit fragile, self-esteem arising from feedback from colleagues that "*the way [you were] talking to all the kids was fantastic, you were really getting into almost like a proper performance act.*" How this sense of self-efficacy developed is discussed in the next section.

6.3.2 A conflict within a scientist/teacher hybrid identity and the community of practice that remains unresolved.

The tensions evident in Sean's views on the use of talk are in the context of a difficult induction period in which feedback from appraisal observations has been critical and on the day of the interview at the end of his first year, Sean was advised that his probationary period was to be extended. Six months later, after Sean has left his permanent post and undertaken a series of short-term supply contracts the issue of the amount of teacher talk is revisited in the fourth interview.

[Appraisal staff] weren't saying anything like '[...] teacher talk was really good in terms of what you are asking the students are getting them to build up on questions, that was fantastic', It was 'well they haven't had much in their books in this lesson, how do you know what they've learned'. And I was 'well I've been going round asking the questions and they were telling me the answers and they were adding onto each other's group discussions', 'well where is the evidence'. So it was all evidence based that they were trying to focus on and it's extremely difficult to quantify and that was part of the thing that caused me to go down towards the breakdown was that I felt I was being put upon all the time and they weren't even acknowledging what I was doing well, and all the department when they were in the work room next door to me when I was teaching a lesson they were saying that was brilliant, the way you were talking to all the kids was fantastic, you were really getting into almost like a proper performance act.

As with Sophia and Ruby, there is a tension between Sean's beliefs about the role and nature of classroom talk and the performance measures that were being used to make judgements about his practice in observed lessons that he saw as "destructive" and his view that "it's all target driven and it's nothing to do with children at all". For Sean there is a misalignment between his own belief and identity, in part relating to classroom talk, that is part of his account of leaving his first post and subsequently the profession.

Sean sees the key feature of teacher talk as being about the quality of his talk rather than seeing the need to limit the duration of this. The experience in a different school has reinforced his sense that his own talk is important in generating and focusing pupils' discussion.

I'm very conscious of keeping the teacher talk to a minimum in a sense that at the same time it's more now that I think that teacher talk should be of a certain high quality [...] So yes I have got more teacher talk in a sense but is more to encourage their exploration of just of what they're doing but what you start thinking about things may be in a more abstract way because I've discovered really in the last year that students are amazing at coming out with things that even you don't think of that are very relevant. [...] Certainly I've noticed it since going to [name of school] it does seem to be less of a focus on whether they are writing it down or not as long as you're getting them involved in getting them to discuss it and that's the key because they learn more.

For Sean it is clear that he believes that pupil discussion is a powerful learning experience and that this pupil discussion is most effective when managed and steered by input from the teacher. He describes his own questioning in group work as scaffolding pupils' thinking and recognises the need for the questioning to follow the needs of the groups of pupils.

I think [pupil talk] is probably the most powerful tool because it's giving them independence of thought but in a structured way so your questioning is almost like a scaffold for what they're wanting. It's like when they are given a writing task and for lower ability groups you have a written framework and for higher ability students you'd say right about this and put the success criteria on the board, whereas the lower ability want to give the worksheet which is essentially the same as the success criteria but a little box may be a little picture, it's the same for discussions as long as you've got an idea of where you want to go but not too fixed an idea because you want them to explore [...]

Sean continues to develop his views about the roles of different kinds of classroom talk in the light of his experiences, both in the school that he left and, more importantly to him, in contrasts between the first school in which he worked and subsequent experience on short term supply contracts in other schools and he highlights the effect of working in different science departments.

Going from [the first employing school] and having a month of not doing much and then going straight into [the second employing school], [...] I was able to really link the two together and go right that's why that's better here than there or vice versa because you're

at the same things much clearer because you've still got in your mind when you go in this is what I used to have to do and this is what I'm doing now.

At this point, half way through his second year after training, Sean is reviewing his career choice and considering whether to continue teaching. Despite more positive experiences in other schools he still sees a conflict between his own identity as a teacher and his sense of what is expected of teachers within schools.

Interviewer *So we started talking about the realisation that you've come to the reality of teaching doesn't fit with your way of working say a bit more about that...*

It's partly because I've spent so long in research that it doesn't quite fit with the way my mind processes things in the way I think they should go, partly as well because of the way that education in this country has evolved [...] it's very much a case of a Band-Aid fix every so often rather than sticking to a particular method that might work [...] so you're constantly having to jump from one thing to another and my mind doesn't work like that at all.

In the last six months of the study Sean continues to work on short term supply contracts in schools and is still reflecting on and developing his ideas about classroom talk. He remained keen to be involved in the study and expressed a willingness be interviewed about his views of classroom talk. In the final interview, questioning by the teacher is seen as a central part of classroom talk. In this interview Sean unpicks his ideas about the role of the teacher's questions in terms of both the need to encourage pupils to engage in dialogue within class and the importance of eliciting pupils ideas in order to challenge 'misconceptions'. Sean refers to Bloom's taxonomy in his description of the kinds of questions he uses in his teaching.

Interviewer *At the end of three years since you first embarked on teacher training, at this point what's your sense of the different kinds of classroom talk that you use as a teacher?*

I think there's always an element of straight-out questioning, be that closed or open ended and it always seems to have to, seems to have to follow some form of pattern almost, to try and build into your lesson or series of lessons depending on the actual topic and you start off with closed questions which give the students feeling of 'I can answer

that' because there is a right answer or not and if they get it right helps you attack the misconceptions right away. And then you can build on that with more open questions and what ifs and how might and all that sort of thing honestly using as much as you can the Bloom's or Anderson version of the Bloom's taxonomy.

It is clear that the advice he was given earlier in his experience relating to the desired duration of teacher talk has continued to have an influence on his thinking about classroom talk since his first year of teaching and again he describes the conflict between this advice and his own judgements about the need to use teacher talk to steer and guide pupil discussion in lessons.

But I think there's also a massive component where it is that it's not what you immediately think when you are doing your training and your initial NQT year where if you're talking for more than twenty minutes or twenty percent of the lesson that there is something not right, you're taking too much control. You have to gauge on the class, some classes are really willing to get on board and do the discussion themselves where as others probably increasingly so, the ones that can do on their own probably fewer far between now, [...] but you have to steer the discussion and if they come out with an interesting point, stop the discussion and then encourage them to think about that, [...]

Sean re-iterates this conflict in reaction to a training session that he experienced at his first school where he experienced difficulties in the way his own teaching approach was not valued by the school.

There was a definite undertone of that was being presented by people running the course and just speaking to other teachers they always come out with the aspect of well if you're talking for too much of the lesson it's not good because the giving new information has to be done but it doesn't all have to be just you presenting it, it can be done different ways. And I that's probably where that's come from is that there is this attitude that the teacher shouldn't be doing a lot of talking and that Ofsted will, like, frown upon that. But [...] I think that's just because they've interpreted it that way, it's not that at all I don't think, it's maybe at the school I was at its maybe a case that I was a bit at odds with the doctrine that they had from that aspect because I

thought that in order for them to understand what you're talking about you have to tell them in some way.

There is a very strong sense through these interviews that Sean has a teacher identity that is resistant to the kind of changes in his practice that might have enabled him to sustain a sense of self-efficacy through positive feedback from appraisal of his teaching. Sean also states a belief that there is an inherent element in science classrooms that requires an openness and undirected nature to pupil talk in order to develop pupils' epistemology in terms of the questioning nature of science and he makes a distinction between his role as a teacher of science and as a science researcher. There is a sense here of conflict between a complex hybrid identity between scientist and science teacher and the teacher community of practice in schools.

Also to take things off almost in wild tangents that make sense and that's especially important for science because that's what science is about, asking the questions that nobody knows the answer to, may never know that you've made sense of because you've put together this constructed in the mind of, how to approach and attack it and that so I think that's how it appears to me now having both experienced in this last year of both teaching science and 'science'. It's allowed me to see how to approach getting the students to develop that key skill of exploration.

Sean continues to reflect on how he uses classroom talk in his teaching and shows a development in his understanding right through the duration of the study. However, underlying these changes in his views, there is a tension between a strong sense of his own view of what is effective in terms of how classroom talk is used and a continuing challenge from interactions with different communities of practice on his sense of self-efficacy. This is highlighted by experiences in a different school where Sean worked for a short time covering an absence.

It was almost like they were started to build my confidence up again, they were really appreciative of helping them out, my ideas, they realised that I was really receptive to and open to suggestions and things, and it was the first sort of experience within a year that I felt I was, you know what, I could do this, I could do this is a career, if the place is right. And it was at that point I sort of realised the issues I had during my NQT year, if I'd been somewhere like that it might have

been completely different. So I suppose when I'm trying to say is that it was the first time I had this appreciation of what other people such as yourself and other teachers have been saying that it does depend where you're at as to your experiences in that NQT year so I was in a bit of two minds situation there because I almost got into the situation where yes I'm definitely out of teaching, it's not for me, it's an extremely hard job and hat off to anybody that can do it well. And also on the other side that you know what I'm actually being appreciated here as a teacher, the kids are appreciating me.

Despite this latter, more positive experience that begins to rebuild some sense of self-efficacy as a teacher, Sean makes the decision to leave teaching and retrain in medical research. Ultimately the conflict between his hybrid scientist/teacher identity and the community of practice in school leads Sean to return to a role as a science researcher through re-training on a postgraduate medical research course.

6.4 Jason: A strong personal teacher identity around learning that is more independent of context and community of practice.

Jason has a particular identity in his sense of himself as a teacher that is more independent of the context and community of practice in which he works. In contrast to most of the other teachers he seems to develop a particularly individual identity in relation to classroom talk and is strongly influenced by reflection on influences to his practice from outside the school setting. Jason is a mature entrant to the teaching profession who, having decided on a change to a teaching career, undertook a part-time distance learning degree whilst working in a support role in a secondary school. He was a confident trainee teacher although he did find aspects of developing his classroom practice challenging. In responding to these challenges he seemed to find it important to understand advice and feedback from his mentors on an intellectual level. Of all the teachers in the study Jason develops the most strongly articulated personal concept of classroom talk and makes less reference to the influences of his community of practice than either Sophia, Ruby or Sean.

6.4.1 A personal conception of classroom talk

For all of the participants in the study there is a lack of a shared language for talking about classroom talk and, by and large, an absence of any of the language that is used in the literature in relation to classroom talk. Jason is different from the other teachers in that he discusses his use of classroom talk in abstract terms rather than through contextual examples of classroom activities and learning episodes. In the first interview at the end of the training year, Jason describes the types of classroom talk giving them his own idiosyncratic terminology.

Interviewer *What's your sense of different kinds of talks that you use in the classroom?*

There's the 'whole class look at me talk', erm, then there is the smaller group talk and then there is individual talk, and there is different kinds of each of those talks. There's the 'this is what you need to do' talk, 'this is what you need to know' talk and 'this is what you need to stop doing' talk. So, and those are all inside all of the different levels so you've got the whole class, there's the three different types in groups and yeah.

Interviewer *It's almost a mental picture?*

Yes very much, so I split it all up into different, not quite different boxes but yes, pyramids.

These self-created categories of talk are not completely stable over the three years of the study but the way in which Jason speaks about types of talk in terms of the purposes and participants in his own sense of categories persists, as does the recognition of both teacher-talk and pupil-talk as a conscious element of thinking about classroom talk.

Well there's the 'talking to everybody and setting stuff up' which is like the beginning of the lesson, 'you're sitting down, you're doing this, this is your first job get on with it' and then there's the 'moving them onto different tasks' which is kind of the same sort of talk and then there's the 'explanation talk', like when I have to do the explanation of the valence electrons and then there's the individual talk or small group talk when you're going round, what about this, what about that? So those are three kinds of levels I think of... And maybe the 'shouting at' talk. But yeah. (Interview at the end of the first year of teaching)

In response to the interview questions Jason is using his own peculiar meta-language to describe his understanding of different kinds of classroom talk and his view of the different purposes of classroom talk. Jason is also the only teacher in the study to be explicit about the benefit for learning of using non-interactive authoritative talk, didactic teacher exposition. This is in part unusual given the sense from the other teachers of the importance of interactivity and limiting teacher talk that is perceived by them in the school communities of practice around talk.

I try not to have too much in the way of interruption when I'm actually explaining because I find that it breaks my flow and I think it might break the flow of them understanding if I ask a sudden random question.

This recognition of the clear distinction in the role of teacher talk without pupil talk and a distinct role for teacher-to-pupil talk through questioning and more dialogic modes of teaching are unique to Jason. Of all the teachers in the study, his understanding of classroom talk seems to be the most closely aligned with Mortimer and Scott's (2003) modes of classroom talk, a model that was covered during the initial training of all the participants. Despite this, Sophia rather than Jason is the only teacher to refer explicitly to this framework for understanding classroom talk.

6.4.2 Sources of influence on Jason's understanding of classroom talk.

That Jason's way of talking about his use of classroom talk is distinct from the others may be influenced by the way he continues to draw on academic sources in developing his own teacher identity. This continues beyond the training and is not in the context of any continued formal course of study but is entirely self-directed and, it would seem, unusual.

Interviewer *What about influencing factors this year, what things would you say have had an impact on your use of classroom talk?*

Reading of different things. I've been finishing reading Hattie because that's take me a long time because that was dull. And I've been reading from this American association of school leaders or something like that, they've got interesting publications that I've been reading. I've been reading some websites of various teachers from around the world. Just sort of reading different bits and trying things; I've been flirting with SOLO taxonomy. I don't really quite get it yet,

[...] not entirely sold on it yet, but I've been sort of thinking about it and that sort of thing.

How his reading affects Jason's practice seems to be influenced by how it aligns or resonates with his developing teacher identity, either in reinforcing his views or, I would suggest more unusually, where he is challenged by the tension between what he is reading and his own understanding.

Ideas that sort of resonate with me I tend to pick up on and try them for a bit and see if they work.

Interviewer *Do you have a sense of what causes them to resonate?*

Probably whether it agrees with my preconceived notions. I guess whether they can back the stuff up is partly it and also whether it feels... Often, if it's completely opposite to what I do that may well be something that I'll try because I'll be like maybe I'm wrong but I give a try. Or often it's something that's I do that and I'll do that more or slightly differently.

Where Jason is similar to the other teachers in the study is in the limited effect that formal continuing professional development (CPD) sessions in school have had on his use of classroom talk. This is shared by all the other teachers.

[...] There have been bits and pieces [of CPD] but that tends to be [...] more about data rather than actual teaching. But we did have one particularly useless session that I can't remember what that was on, it was stupid it was about making children sit neatly and talk about things and they have to interrupt or not interrupt at all, I can't bloody remember it was ridiculous, three hours of my life I'll never have back. So yeah the was that but that I didn't like, I don't know if you picked up on that! So yeah there was that but that was crap.

It is clear from Jason's experience in school that continued training and reflection on teaching and pedagogy does not address classroom talk in specific terms. Furthermore there seems to be no development or use of any kind of meta language around classroom talk that is used by the case study teachers. It seems that the reading Jason engages with is not in itself providing a terminology or meta language with which to talk about classroom talk as a part of practice. And yet it is evident from all the interviews in the study that classroom talk is seen as an important part of classroom practice.

There is just not a shared language for discussion or reflection on this area of teacher development.

Another aspect of the development of ideas about talk that is common for several of the teachers but clearly evident in Jason's experiences is the influence of talking with other colleagues, particularly in the first year of teaching:

I talk to everyone, absolutely everyone, there's nobody I don't talk to, all different subjects. I pair with a French teacher for my form so I talk to her a lot and she has some good ideas. I talk to my colleagues in here a lot, I talk to [my wife] at home a lot, and obviously she is a science teacher, I've spoken to her colleagues who may or may not be science teachers. Yes everyone who's got any useful input.

Interviewer *The do other people do the same here? Is that a sort of Alton High School (pseudonym) thing?*

I don't know actually. I'm not sure that everybody does talk to as many people as I do but then I talk to everybody everywhere so that's just the way I interact with the world, is to talk to absolutely everybody.

This emphasis on talk is reinforced by Jason's explicit view of the importance of discourse in his own learning and the influence that this has on his planning and teaching with the inclusion of opportunities for pupil talk.

...I can't think without talking so if I can't think without talking, there's a chance some of them can't think without talking so I like to build it in...

By the end of his second year, the interactions with colleagues has diminished somewhat as a result of time pressures, but there is still a recognition of a reflection on the influence of talk on his own learning on the way Jason views pupil learning in the classroom.

I can't learn without talking about it so I think I sort of put that on to everybody else, but I know that some people it's not as helpful for so I try make sure that there is also bits where they're not doing it. But I think it's, I have to talk through everything that I do, even if talking to myself...

A view of pupil talk as essential for their own cognitive development is expressed by Jason through another of his metaphors, in this instance, in

relation to the need for pupils to 'process' and make sense of the content of the lesson.

I think [the pupils] need to be able to talk about it, to process it. I think of it kind of like when you dream, to deal with the day, to process all the day, it was like that. They had all the stuff talked to them, they may have drifted in and out, so there is going to be a need, a time when they can think over it, talk about it, see that they didn't miss any bits of it, getting bits filled in. And I think it clarifies it in their own heads, from being able to actually talk around the ideas and go 'listen that doesn't make any sense because of this' and just by saying that I find that [...] will make it go 'oh but that's because of...' sort of thing.

In the final interview with Jason there is still some sense of tension between a perception of his own practice as involving too much of his own talk that is influenced by advice early in his training about limiting teacher talk and his own emerging recognition of the value of clear explanation of subject content and how his own classroom exposition has improved. In reflecting on his own use of classroom talk Jason cites advice from one of his pre-service mentors about limiting teacher talk:

I'm still talking more than I thought I would be, more than I tried to be, at times, during my training year when I was trying to go for that 10%, 6 minutes in a 60 minute lesson that was suggested to me by one of my mentors.

But at the same time Jason has a clear sense of the need for teacher talk with a distinct purpose for learning.

...to try and actually teach a bit of it, to do a reasonable amount of explanation, hopefully reasonably clearly, then go away and do it and sort of back off with the talking, and move out of the way.

The effectiveness of these 'explanation' elements of teacher talk is an aspect of classroom talk that Jason describes as developing during his second year in teaching as a result of a realisation that his explanations are not as effective as he would like.

I have become very conscious of not going too fast, of being very sort of 'knowing what I need to say' and 'saying it clearly' rather than just going at it and seeing what comes out of my mouth. [...] I'm trying to, when actually having to explain something, trying to be much more clear, much more useful in my explanation I guess.

Interviewer *So you feel that you have become more adept at that?*

[...] I think I have become better at it because I didn't even know that I was doing it initially. So before I was just like going 'hehehe' this, but I didn't realise there was an issue with that.

Of all the teachers, Jason has the most comprehensive understanding of the range of different types of classroom talk and the specific purpose of each form of classroom talk in contributing to the development of pupil cognition and learning. This seems to arise as a result of a combination of the value he places on reflection and drawing on sources of knowledge including both from talking to other teachers and reading on research and theory. Both of these facets, his own views about learning and the influence of his reading, with an inclination to think about his practice lead to a sense that Jason holds a fairly strong self-identity as a teacher that is more independent of his context and community of practice than the other teachers in the study.

Chapter 7 Discussion

7.1 The development of early career teacher views of classroom talk.

The first research question posed by this study is:

How do science teachers' conceptions of the different kinds of talk and the purposes of talk in science classrooms develop during their teacher training and early career?

In addressing this research question the findings presented in chapter five and six examine how the case study teachers articulate their views of the nature and purpose of classroom talk and how their views about the nature and purpose of classroom talk develop over the initial training year and then in the first two years of their teaching career.

7.1.1 How do the case study teachers articulate their understanding of classroom talk?

A key finding of the study is that the teachers did not share a common professional language with which to talk about their ideas and understanding of classroom talk. In the literature, classroom talk is often developed as a conceptual framework that connects the nature and purpose of classroom talk. Mortimer and Scott (2003) outline five linked elements of classroom talk in their work: the teaching purpose, the content; the communicative approach; patterns of discourse and teacher interventions. Viiri and Saari (2006) develop the frameworks of Mortimer and Scott in their analysis of the use of talk by beginning teachers. They identify teacher presentation, authoritative discussion, dialogic discussion, peer discussion and other types of talk including non-topic related and social talk. In developing a framework for the analysis of talk in a second language classroom setting Walsh (2003) identifies four modes of talk that combine the pedagogic purpose and types of interaction: managerial, materials, skills and systems and classroom context. A key difference in these different conceptualisations of classroom talk is the purpose behind their development. Whereas Mortimer and Scott's theoretical framework for science classroom talk grew out of a post-constructivist paradigm of understanding classroom learning, Walsh's purpose was to "...provide a descriptive system which teachers can use to extend an understanding of the interactional processes operating in their own classes." (Walsh, 2003, p.126). Mortimer and Scott present evidence of

some success with using video analysis with pre-service teachers to develop their awareness of different purposes and forms of communicative approach. Other studies with early career teachers (Viiri and Saari, 2006; Lehesvuori et al., 2011) suggest that this kind of analytical framework is complex to use in a professional development context. The teachers in this study are far less systematic in the way they discuss their use of classroom talk and the language they use is often idiosyncratic and personal. Jason is unusual in the extent to which he articulates a model of classroom talk; in his case this is his own articulation of types of classroom talk. For the other teachers in the study, classroom talk is referred to either in terms of the participants or the purposes of classroom talk but these two aspects are not clearly unified for the teachers.

Types of classroom talk

The most common typology of classroom talk used by the case study teachers related to the participants in the talk and the organisational structures of the talk. Pupil-to-pupil talk was often referred to in terms of the numbers of participants intended to interact, paired pupil talk, group tasks involving talk and classroom discussion. The term 'classroom discussion' seems, for most of the teachers, to describe whole-class teacher-led interactions involving turn taking. In discussing the different kinds of talk used in the classroom there is a general sense in which talk and interactions between pupils and between the teacher and pupils are an important part of the learning environment. However, there is less focus on the intended purposes and content of the talk when discussed by the teachers than is evident in the kind of analytical framework outlined by Mortimer and Scott. Chen et al.'s (2016) focus on the ownership of questioning in terms of the activities and the learning has some resonance with the way in which classroom talk is described by the participants in terms of the structures of the talk. Some of the teachers such as Ruby, Jason and Sophia were oriented toward more pupil ownership of the talk though it is less evident that there is a sense in which there is ownership of ideas by the pupils. Where the teachers refer to pupil talk as something that they see as important it is often from a more general sense of the benefits of a lively and interactive classroom, "*it kills that horrible silence of everybody sits and write something*" (Ruby I2p7), "*[the pupils] talk to each other about how they should be doing it and I liked it a lot*" (Sophia I1p12). Over the course of the second year of the study it has become more usual for some of the teachers to discuss the learning purpose of pupil-to-pupil talk, often in

relation to the need to assess pupils' understanding of the content of the lesson. There is a sense in this aspect of the purpose of the talk of a shift toward the ownership of the ideas by the pupils but I don't think it extends as far as the teacher adopting a coaching or mentoring role as described by Chen et al. (2016). Sophia describes developing peer teaching in her classroom and building "*mini teachers*" which suggests a more pupil owned talk but it isn't clear here whether there is a genuine dialogic nature to the talk or that the pupils are taking over the authoritative role of the teacher in presenting the science content of the lesson.

The absent shift in thinking among the teachers in this study appears to be an epistemic one. There is no suggestion of any movement in most of the teachers' views of the possibilities of the classroom for developing the 'epistemological framing' (Lehesvuori et al., 2013) of lessons to develop pupils' thinking about the processes of science. The two teachers, Ruby and Sophie, who express most clearly an intended purpose for classroom talk to stimulate and develop scientific inquiry and thinking in their pupils, seem to have an epistemological alignment in their view of the purpose of talk from the beginning of the study. Indeed, if anything, there is a move away from this by Ruby who experiences pressures to focus more on the factual information of the science curriculum. The same constraints that Lehesvuori et al. (2013) identified in their study are evident in the influences on the teachers in this study. Time constraints are imposed by the curriculum planning in the teachers' departments leading to a pressure to cover the factual content of the curriculum. The culture of accountability that is noted by Chen et al. (2016), Bleicher (2003), and Pimentel and McNeill's (2013) studies is a clear influence for some of the teachers in this study. This resonates with Ball's (2003) account of an increasing culture of performativity in English schools. How this influence plays out in the individual teacher's perception of their use of talk seems to depend on the interplay between the school culture and the individual teacher's epistemological positioning and this is discussed in more detail later in this chapter.

Arguably the most explicit recognition of the role of dialogic pupil-to-pupil talk is highlighted by Jason who describes his own experience of the significance of talk in learning, "*I can't think without talking*" (interview 3) "*I think they need to be able to talk about it to process it*" (interview 5). There are resonances in Jason's view of talk as part of learning at a cognitive level with Vygotskian views of learning that underpin Mortimer and Scott's (2003)

definition of dialogic interactions. The other area of classroom talk referred to by the teachers that suggest a degree of implicit recognition in the value of dialogic classroom talk is in one-to-one interactions between the teacher and pupils. There is some blurring of the purpose of this kind of classroom talk between recognising and valuing the pupils' ideas in lessons with the establishment and development of relationships between teacher and pupil. Though, for some teachers at least, there is a sense of the recognition of a form of classroom talk that is focussed on the pupils' ideas and in understanding their thinking in a way that the literature on classroom talk would recognise as dialogic.

There is something of a divide within the group of teachers between those who most strongly articulate a view of classroom talk focussed on the pupils, through paired and group work or class discussion, and those who focus on the teacher talk in their interviews. David and Luke are the most strongly aligned with a view of talk focussing on the teacher. In Luke's initial training year he talks about developing his use of talk to manage the classroom environment. He sees his use of talk as an aspect of his professional knowledge, "*like I've been trained to talk in a certain way to some extent*" (Interview 1). This is not to say that Luke has a view of the classroom that excludes pupil talk. Indeed, he explicitly recognises changes in his view of what teaching entails that challenge his initial view of a didactic role for the teacher, but it is evident in the interviews that developing classroom talk for him centres on the development of his own classroom talk. A focus on teacher talk to establish and develop interactions with pupils in terms of "relationship building" and managing behaviour remains a strong part of Luke's discussion about classroom talk throughout the three years of the study.

It seems that there is a difference in personal belief or alignment between the different teachers that orient them toward either a pupil focussed or teacher-focussed view of how their use of talk developed over the course of the study. The findings suggest a possible typology of teacher identity toward classroom talk and the development of their understanding of classroom talk. Whilst there is not a clear divide, the way in which the development of professional knowledge of classroom talk presents in this study suggest that there are '*talkers*' and '*listeners*'. The teachers in the study who could be described as *talkers* have an orientation toward thinking about talk that centres on their own talk and the role of the teacher in communicating and disseminating knowledge. Those who might be

described as *listeners* are more oriented toward pupil talk and dialogic forms of teaching. The *talkers* focus more on the development of their own language, particularly in the early part of the study. Some of this focus is in relation to managing a classroom environment and establishing teacher-pupil relationships, whilst for others there is a focus on developing the skill of explaining scientific ideas. David, in particular, talks about wanting to develop his teaching through better use of his own talk; “what words I’m using” (interview 1) and seeing his own talk as providing a “*narrative*” that “*holds one bit [of a lesson] to another*”. These differences in orientation toward talk could relate to a broader view of the nature of learning. *Talkers* might be considered to hold more transmissive views of the nature of learning whilst the *listeners* have a constructivist or socio-constructivist view of learning. I would suggest that the origins of their view of learning stems from the biography of the teacher and their own experiences of learning. The source of the orientation toward classroom talk is something that is considered further later in this chapter.

It would be simplistic to suggest that *talkers* and *listeners* are clear categories of orientation towards talk. However, the relationship between a teacher and these orientations appears to be important in how knowledge about classroom talk develops. There also might be a hybrid identity that holds a mixture of these two views of learning. Sean shows some degree of hybridity in having both a teacher focussed ‘*talker*’ position in that his discussion of talk focuses on teacher-led interactions but also recognising a more dialogic element to teacher-led talk. He is using classroom talk to create discussion about ideas that enable some insight into different points of view where there is recognition of the importance of pupils’ ideas. This suggests an implicit development of more dialogic interactions as described by Mortimer and Scott (2003, p.33). An interactive dimension is also evident in his use of the term ‘discussion’ but it seems from the way he talks about these phases of his lessons that they are generally teacher led. Some of the observations of Sean, Luke and David, that were undertaken to inform the interviews, suggest that both of these teachers commonly use a kind of teacher-led whole class discussion that moves between the authoritative and dialogic dimensions of Mortimer and Scott. In these episodes there is a sense of what David describes as the narrative of the lesson and there is interaction with pupils. However, there is frequent shifting along the dialogic/authoritative dimension where impromptu questions move between emphasising pupils’ ideas and using the pupil voice to provide the authoritative science view.

In looking for the extent to which the dialogic-authoritative dimension is evident, even implicitly, in the way that the teachers talk about classroom talk, care needs to be taken when inferring evidence of these aspects of classroom talk. When Sean talks about “...*taking their ideas and going right okay that’s a good idea, how would that make a difference, so you are opening their way of thinking out to the rest of the group...*” there seems to be a strong sense of the dialogic in the way he talks about “*opening their way of thinking*”. In the final interview Luke describes “... *lessons with year seven where suddenly they just start asking questions and it just turns into like half an hour or forty five minutes of the kids genuinely interested and asking questions back and forth...*”. Here there is a clear sense of the pupils having some ownership of the interactions and indeed initiating the questions. However, it is likely that whilst the pupils’ curiosity initiates the questions, the focus of the talk is on the scientific view rather than the pupils’ ideas and hence represents another form of authoritative classroom talk, albeit one less common in science classrooms given the crowded nature of the English science curriculum.

Purposes of classroom talk

The teachers’ ideas about the nature of classroom talk are also revealed in their discussion about the purposes of classroom talk. Whilst their talk about the nature of classroom talk often begins at a descriptive level in terms of the organisational structures of the talk, more of their thinking about the nature of classroom talk is revealed as they articulate the purposes they see for classroom talk. Aspects of the communicative approaches proposed by Mortimer and Scott (2003) are evident in some of the teachers’ discussion of the different purposes of classroom talk. Luke, for example, describes being more interactive when the purpose of his talk is to give “*explanations*” of the science content of the lesson than when the purpose of the talk is to give instructions and manage the activities in lessons. The themes relating to the purposes of classroom talk that emerge in the interviews were science learning, relationships with pupils and the development of life skills. In terms of science learning three sub-themes were identified across the cohort: the presentation of knowledge, implied dialogic modes of teaching and assessment for learning.

The presentation of the science content knowledge in lessons is an area that seems to generate some tension in the teachers’ views of the purposes of science classroom talk. There is a general sense from the teachers from early in the study that interactive modes of talk are an essential part of

effective teaching. From my own experience as a teacher educator there is a culture of teaching in English secondary schools that sees 'didactic' as a pejorative term and there is a sense in the interviews that acceptance of this culture is not questioned by the teachers. Sean describes feedback on an individual lesson that seems to have been critical in his training year when he was criticised for 'lecturing' pupils. But to what extent does this view of the need for interaction translate to recognition of the purpose of classroom talk in science learning? The idea of dialogic teaching which takes a Vygotskian perspective on learning is strongly argued in the literature, particularly in relation to problematic areas of learning in science; those areas where the learning demand (Leach and Scott, 2002) is high, or misconceptions (Smith et al., 1994) or phenomenological primitives (diSessa, 1993; diSessa, 2002) are evident. A socio-constructivist perspective on learning and the idea of alternative pupil frameworks or misconceptions is addressed in the university based elements of the teacher training course undertaken by all the case study teachers. Yet the extent to which there is explicit recognition of the relationship between classroom talk and pupil learning in science is limited in the discussion of classroom talk by the case study teachers. There is often a tension between the teacher's individual identity and personal view of learning, theoretical perspectives on learning introduced in the training year and the culture and community of practice in which the teachers find themselves working. This three-way tension is discussed in more detail later. However, it is evident to some extent in the ways that the different case study teachers articulate their views of classroom talk. For some, such as Jason and Sophia, there is a clearly expressed view of the importance of interactions with pupils in supporting learning. Both Sophia and Jason express clear views that recognise that pupil talk may be important in developing the pupils' individual conceptual frameworks. To some extent there is a constructivist or socio-constructivist paradigm apparent in the way they articulate the purpose of classroom talk and the need for dialogic teaching. In contrast Sean and Luke both express the importance of interactions and pupil talk in their teaching but it is less evident that they hold a constructivist view of learning and both are strongly oriented toward teacher talk.

The tension between an orientation toward dialogic approaches to learning and the nature of school science as a canon of knowledge to be transferred from science teacher to pupil influences perceptions of classroom talk. It is interesting to note here that the study by Christodoulou and Osborne (2014) found that in shifting the learning objectives of lessons to a more epistemic

aim resulted in more discursive modes of classroom talk. There is something distinctive about the view of science knowledge as an undisputed canon that seems to constrain the modes of classroom talk among science teachers. Indeed, in Ryder and Leach's (2008) findings, even with an epistemological focus to teaching there was a tendency by some teachers to present an epistemological view of science in an authoritative manner. In the context of this study it is clear that teaching the nature of science is not a dominant feature of science teachers' view of their role and this influences their conception of talk.

The role of the teachers' biography and identity

Whilst it is difficult to find clear evidence in the interview transcripts there is a sense here that there are different motivations between these four teachers from the very beginning of their careers between the teacher as talker and teacher as listener. Luke and Sean are both confident and outspoken in the way they engaged with both the university and school based elements of their training and seemed to be, at least in part, motivated by the role of the teacher as talker and disseminator of science. Both Luke and Sean had strong subject identities with undergraduate degrees in chemistry and both had postgraduate or postdoctoral research experience. Part of their orientation towards teacher talk may have been related to a sense of the professional self-esteem arising from being the disseminator of science knowledge in the classroom. The establishment of self-efficacy during training and early career appears to be an important motivator of the development of classroom talk. Authors such as Tschannen-Moran, Woolfolk Hoy (2001) and Skaalvik and Skaalvik (2010) make the connection between self-efficacy and teacher behaviour. For some of the teachers in this study the sense of self-efficacy in authoritative communicative approaches in the classroom appears to be a driver in their development of an understanding of classroom talk. Both Luke and Sean were positive about the role of pupil-led 'curiosity' questions that offered them the opportunity for pupil initiated but authoritative talk. Jason and Sophia on the other hand had less self-confidence in their subject knowledge during training. Jason had been a mature student with the Open University and his undergraduate study was in both science and science education: Sophia had studied sports science at undergraduate level. For Jason and Sophia there is a clearer motivation in the role of the teacher in facilitating pupils' talk. In this respect these four teachers suggest a dimension in the identity of the teachers between talker and listener. There may be a connection

between the case study teachers' subject background and their views on classroom talk. Adam, like Sophia, had a background in sport science and found the subject knowledge element of his early classroom teaching challenging. I would not suggest that there is a direct connection between pre-service experience and teacher identity in relation to classroom talk but it appears that this may be another aspect of the complexity with which the teachers' views of classroom talk developed over the three years of the study. Although there is a difference in the emphasis and explicitness with which the teachers talk about the purpose of talk for learning science, there is, for all the teachers in the study, at least some implicit recognition of a dialogic purpose for classroom talk in pupil learning. For Adam and Jason the purpose of more dialogic forms of talk is to develop more secure understanding of ideas or as Adam describes it "*deeper thinking*".

There are some aspects of the teachers' views of the purpose of classroom talk that are common in feedback to teachers following formal lesson observations in school. One purpose of classroom talk that is emphasised by all the teachers in the study is in the assessment of progress in lessons. Assessment for learning is an area of practice in teaching that has become strongly rooted in professional practice in England as a result of the influence of authors such as Black and Wiliam (1998) through the implementation of the national strategies materials and the development of the teachers' standards (Department for Education, 2011b) and as a result of the Ofsted framework for inspection (Ofsted, 2015). The judgements of teaching and teachers through Ofsted inspection of schools has been a strong influence on the culture and community of practice in school. The term "AfL" (abbreviated from assessment for learning, a term first used by Harry Black (1986) and adopted by the Assessment Reform Group (Broadfoot et al., 1999) to distinguish it from summative assessment of learning) is commonly used in school in feedback to trainees and early career teachers. In this study the language of assessment for learning becomes part of the lexicon of the teachers in talk about talk more than terms like dialogic teaching. Ruby describes a sense of frustration with the tension between what she sees as genuine assessment for learning through interactions with the pupils and a school culture of written feedback that is intended to make classroom assessments visible to others: "*[The pupil] sat and talked to me for ten minutes, they shared, they were brilliant. But you've got to document it, otherwise it doesn't count.*" (13p9).

An aspect of classroom talk that is often referred to by the teachers in the study but is not well developed in the literature on science classroom talk is the purpose indicated by the teachers for classroom talk of developing the social dynamics and interactions of the classroom and the intended purpose of developing pupils' social and emotional learning. Classroom talk is, in part, seen as being the means by which teachers developed teacher-pupil relationships with the intention of supporting learning. Again, it is Luke and Sean for whom the purpose of classroom talk in developing teacher-pupil relationships is the most emphasised. For both Luke and Sean there is a view that one purpose of classroom talk is to establish and develop these connections with pupils in order to improve behaviour in the classroom. They are both clear that this has benefits in classroom management, particularly with pupils who exhibit challenging behaviours.

Ruby, Sophia and Jason discuss a different perspective on the purposes of classroom talk that is not directly related to learning science. For these teachers the way that they use talk also has a purpose in developing the life or learning skills of the pupils. Ruby is the most strongly oriented toward seeing classroom talk as about learning life skills. For her there is a purpose in talk that improves pupils' communication skills and, in particular, communication skills relating to argumentation. For Jason this in part relates to the inner city context of his school. He talks about working to develop the "*socialisation*" skills of the teaching groups with whom he works with regularly to enable them to work with each other. Sophia also makes a connection with the literacy focus that she experiences within her school.

7.1.2 A teacher focussed model of classroom talk

The origins of my own interest in the development of teacher knowledge about talk in science classrooms stems from personal experiences of engaging both trainee and experience teachers with Mortimer and Scott's (2003) analytical framework for interactions in science classrooms. This experience suggested that whilst for experienced science teachers the analytical framework offered a potentially powerful self-evaluation tool but was problematic for trainee teachers. In a professional development session with a science department, the participating teachers seemed able to identify the purposes and communicative approach in both their own practice and video clips of other teachers. In contrast, experience as a teacher educator with PGCE trainee teachers suggests that in the early stages of professional development, teachers find this level of reflection problematic. So what do

the findings of this study offer in terms of accessing a framework of classroom talk as a professional development tool? A university based session that introduced Mortimer and Scott's framework to the teachers in this study during their initial training year appears to have had some influence on at least one of the teachers and was revisited by Sophia at the end of the last interview. However, the meaning of the communicative approaches has become confused with other elements of meta-language around classroom talk:

Sophia I remember, [...] at University and it was like a scale and I can't remember the actual labels on the scales but it was like, I've got in my head Socrates, but it's not Socrates, it was like dictative, interactive and like a scale, where you were on that, [...] And when I'm teaching now I was think about where I am on that grid, because it had facilitator, active facilitator so I try to be an active facilitator but I know I have moments when I'm completely dictative and I get annoyed with myself about getting into that position so the next lesson I try being more facilitative.

The development of Mortimer and Scott's framework by Viiri and Saari (2006) extends the five aspects of Mortimer and Scott's analytic approach in a way that is intended to make it more accessible to student teachers as an evaluative tool. Their talk types relate more directly to the modes of talk that are recognised by the teachers in this study, with presentation, discussion, and peer discussion. The findings of this study suggest that in talking about classroom talk, teachers view talk through either a modal lens or purposive lens or indeed, both lenses at the same time. So the discussion of classroom talk tend to centre around the mode of talk in terms of the participants, ownership or leading of the talk or in terms of the intended purpose of the talk. Figure 7.1 maps the modes of talk in the frameworks of Mortimer and Scott (2003) and Viiri and Saari (2006) against aspects of the way the case study teachers talked about their own understanding of talk. All of the teachers in the study recognise different modes of classroom talk and recognise the significance of both teacher talk and pupils' talk. In the way they represent these ideas they address the participatory mode of the classroom talk using terms like class discussion somewhat loosely to indicate who is participating and the turn-taking modes of the talk. They also represent their ideas about classroom talk through their intended purpose for the classroom talk. It is notable in figure 7.1 that several of the intended purposes of classroom talk do not relate directly to the kind of science

learning intentions set out in Mortimer and Scott's analytical framework. It may be significant that the intended aims of the teachers in the study articulate a dimension of classroom talk that is not explicitly recognised in the analytical frameworks in the literature on science classroom talk. Some of the purpose of classroom talk is not seen from a Vygotskian perspective of social learning in terms of constructing the science knowledge on the social plane of the classroom, but rather is a more general orientation toward interactions between teacher and pupils in developing the relationships of the classroom and engaging pupils with the science learning. For some of the teachers there is also an element of seeing talk as about developing the social life skills of communication through talk in science lessons.

Aspect of communicative approach (after Mortimer and Scott, 2003)	Talk type (after Viiri and Saari, 2006.)	Participant modes of talk referred to by the case study teachers	Purposes of talk referred to by the case study teachers
Authoritative non-interactive communicative approach	Teacher presentation	Teacher to class talk Pupil to whole class talk	Presenting ideas and knowledge Lesson narrative
Authoritative interactive communicative approach	Teacher guided authoritative discussion	Teacher to class talk Teacher to pupil talk Teacher led class discussion	Covering the curriculum
Dialogic communicative approach	Teacher guided dialogic discussion	Teacher to Pupil talk Teacher led class discussion	Learning ideas and concepts Assessment of learning Engaging pupils interest
Dialogic communicative approach	Peer discussion	Pupil-to-pupil talk	Learning ideas and concepts
	Other	<i>Non-verbal talk</i>	Classroom management Emotional/social development Relationships with pupils Developing communication skills

Figure 7.1 Modes of talk in analytical frameworks mapped against teacher talk about talk.

7.2 Sources of knowledge and influences on teacher knowledge of classroom talk.

The second research question examined aimed to identify the sources of knowledge of classroom talk, asking the question:

How do sources of knowledge about the forms and purposes of classroom talk in science and influences on practice relate to the professional knowledge of early career teachers?

In this section of the discussion I will explore what the findings of this study suggest in relation to the sources of knowledge about classroom talk that the teachers draw upon in their early career. One of the key findings is that the nature of the development of ideas about classroom talk is complex and problematic. Whilst there is some evidence of direct connections between inputs to the teachers in relation to classroom talk, perhaps more than other aspects of practitioner knowledge, talk appears to be an area of professional knowledge that lies on the overlap between different elements of professional knowledge development. In the following sections I will examine the nature of professional knowledge through the lens of the case study teachers' perceptions of classroom talk and influences on this. In doing so I argue that classroom talk for these science teachers, by existing on the periphery of different aspects of professional knowledge, offers unique insights into the complexity of teacher knowledge development.

7.2.1 Sources of, and influences on, knowledge about classroom talk

The findings identify two areas of influence on the teachers' use of talk:

- Sources of knowledge: Inputs to professional knowledge from different elements of the teachers' initial and continued training and development;
- Influences on classroom talk: aspects of the teachers' current workplace and individual identity that influence their use of classroom talk;

The interviews probed the teachers' perceptions of the sources of their knowledge of classroom talk, both through open questions and with a ranking exercise that asked them to place possible sources of professional knowledge in order of influence in each year of the study. In the findings of this study the teachers articulate their view of classroom talk and the

sources of and influences on this knowledge. This section considers in what ways the approaches to describing professional knowledge in the literature help to understand the complexity of these influences and offer a framework for understanding how this knowledge develops in the case study teachers' early career. The construction of professional knowledge that emerges in the interviews over the study is complex and multifaceted. In exploring this complexity the terms sources, domains and influences are used. In this context source is intended to refer to a recognised input to the teacher's knowledge with a traceable path from source to professional knowledge, for example a mentor's feedback on a lesson or a taught PGCE course session at university. Influences are suggested as a more implicit and less traceable input to the teacher's professional knowledge such as the influence off the school ethos and culture or the biographical experience of the teacher. Domains of knowledge are conceived as areas or regions of professional knowledge and relate to attempts in the literature to systematically describe teacher knowledge.

Domains of knowledge about classroom talk

One approach in the literature to attempt to define and describe the specific nature of teacher professional knowledge is to try and categorise domains of professional knowledge and in doing so identify that which is unique to teaching. Shulman's theoretical framework of teacher knowledge has been most influential through the development of the concept of pedagogic content knowledge (PCK), a concept that has been developed in the literature since its inception (Abell, 2008; Kind, 2009). Some of the teachers in this study related their development of ideas about talk to a sense of their knowledge of talk that suggested some parallels with Shulman's PCK. David and Luke, in particular, have a view of the development of the teacher's explanatory talk that indicated their sense of the difficulty involved in developing the language and way of speaking to make complex ideas accessible to pupils. This has a clear connection with the concept of PCK. There is a particular knowledge recognised by David that is specific to teaching within his specialist subject. Luke describes a 'teacher mode' of talk in science lessons. For David, especially, professional knowledge of teacher talk lies in the overlap between pedagogic knowledge about classroom talk and the subject knowledge of science. Indeed the three teachers who were the most focussed on the teacher talk throughout the study all suggest a view of the development of classroom talk that might be argued to exist within the domain of PCK. There is also a form of PCK expressed by Sean in

terms of learning the '*pitching [of] information*' and responding to teacher pupil interactions at the appropriate level. There are clear influences on the teachers' use of talk that could be described as lying within the domains of pedagogic and pedagogic content knowledge. For all the teachers, particularly in their initial training, developing behaviour management skills is closely connected with their development of different kinds of classroom talk and clearly has a strong influence on their practice and sense of the nature and purpose of talk. This is mainly in the form of a restriction on their use of talk in a classroom environment where behaviour management presents a challenge. As Sean puts it: "*knowing that [a class] don't really respond well to debates or whole class discussions, it seriously does limit what you can do with them...*". So it seems possible to make connections between the features of professional knowledge that emerge in the findings of the study, but does this help to understand the way in which the teachers' knowledge of classroom talk developed?

I would argue that one of the unique elements of professional knowledge about classroom talk is that it is both ubiquitous in daily practice and at the same time underdeveloped as a consciously articulated aspect of practice. There are aspects of classroom talk that are recognised by the teachers as unplanned and instinctive in action. In part this may be a feature of early career teachers, as Viiri and Saari's (2006) study found. Intentional patterns of classroom talk were available to an experienced teacher but problematic for a student teacher to enact in practice. Many of the decisions and practices of classroom talk are determined in the moment of practice. In Eraut's (2007) dimensions of cognition of practice, decision making about talk exists mainly in the instant/reflex and rapid/intuitive modes of cognition. Where there is deliberative/analytic decision making it is not strongly connected to a shared framework of knowledge. There also seems to be a transition in terms of the deliberative/analytic aspect of decision making about classroom talk that occurs as the teachers in the study move from the trainee stage to their first employment. As a trainee there is an expectation of formal documented lesson planning and a dialogue with mentors about planned intentions that is absent as soon as the teachers qualify. David, in particular, seems to be expecting to develop planning for classroom talk more than happens when he moves into his first year. In the demands of the increased teaching load and professional duties, planning quickly becomes expedited and any element of deliberative planning for talk wanes. There is some suggestion that this may re-emerge for some of the teachers as they gain experience. Jason, for example, seems to develop a sense of

deliberative decision making about talk in lessons that responds to the attitude of pupils as they arrive at lessons.

A striking feature of the interviews is the lack of any shared professional framework of classroom talk. During the initial teacher training PGCE course undertaken by all the participants, they were introduced to analytical frameworks as self-evaluation tools to employ in reflecting on their own practice. The two frameworks covered in the training session were open versus closed and low to high order (Bloom et al., 1956) dimensions in questioning and Mortimer and Scott's (2003) framework of classroom interactions. The latter is clearly the more complex of these and presents a twofold challenge to the teachers. It draws upon a socio-constructivist approach to learning that for some trainee teachers is a significant change in their view of learning and as a self-reflection tool it requires a certain level of awareness of one's own practice. Both of these challenges are significant for trainee teachers. For some of the teachers in the study, Luke, David, and Sean in particular, the shift in their view of the role of the teacher from a disseminator of subject knowledge to a more problematized view of learning was a significant part of how their ideas about classroom talk changed during the initial training year. In contrast, both Sophia and Ruby started their training with a view of their role in the classroom that was more aligned with socio-constructivist views of learning even if this wasn't something of which they were explicitly aware. At the very end of the final interview with Sophia, after the scheduled questions, she was asked if there were any other aspects of her views of talk that hadn't come up in the interview and she referred back to the Mortimer and Scott framework, albeit in a somewhat misremembered form, as something that she had been thinking about in relation to her current practice.

Adoniou's (2015) six domains identified in a study of teacher knowledge of literacy offer an alternative description of knowledge domains to Shulman (1986) that emerge from teachers' own discourse about their knowledge. Of these domains, 'knowledge about content' and 'knowledge about teaching' relate directly to aspects of Shulman's domains (subject matter knowledge and pedagogic knowledge). Related, but seen as distinct by Adoniou, are knowledge about theory and learners. In this study the knowledge about theory of classroom talk is not apparently a strong aspect of the teachers' professional knowledge. Knowledge about learners is more of an influence on the teachers use of classroom talk and is drawn upon more often in their accounts of classroom talk. The other two domains, 'school context' and

'sociocultural politics' identify more situated cultural forms of professional knowledge. As well as domains of knowledge, as elaborated in section 2.1.1 of the literature review, Shulman (1986) also identifies forms for representing that knowledge. Shulman describes teacher knowledge forms as: propositional, consisting of principles, maxims and norms; case, consisting of prototypes, precedents and parables; and strategic knowledge.

Teacher knowledge forms about classroom talk		
Propositional knowledge		
Principles	Maxims	Norms
Bloom's taxonomy Zone of proximal development Open/closed questions Elicitation of pupil ideas Learning styles Dialogic/authoritative interactions	No more than 20% teacher talk Teacher led Q&A Insisting on quiet for teacher-to-whole-class talk Meet and greet	Relationships with pupils Developing social skills
Case knowledge		
Prototypes	Precedents	Parables
University session Reading Academic assignments	Feedback from mentors Reflections on experiences	Personal philosophy Experiences of learning

Figure 7.2 Elements of classroom talk relating to Shulman's (1986) forms of professional knowledge.

Relating Shulman's forms of knowledge to classroom talk, figure 7.2 identifies aspects of classroom talk as articulated by the teachers in the study. A number of principles relating to talk are identified by the teachers and in terms of case knowledge, these theoretical propositions originate from the university component of the PGCE course or from the teacher's own reading. Mentor feedback appears to be a source of maxims around classroom talk and these centre on either limiting the duration of teacher-to-

whole-class talk or developing behaviour management strategies. The teachers also express ethical and philosophical norms in relation to classroom talk. Relationships with pupils as developed through classroom talk are important for all of the teachers. This aspect of classroom talk is overlooked or marginalised in most of the studies that analyse talk in science lessons, yet for the teachers in the study this was an important aspect of their knowledge of classroom talk. Shulman's third form of teacher knowledge, that of strategic knowledge, attempts to capture the form of knowledge that is evident in the conflicts and contradictions that inevitably arise in the complexity of classroom practice. This seems like a rather catch-all category and perhaps somewhat falls short of effectively describing the complexity with which more clearly defined forms of knowledge are enacted. The description of the forms of case knowledge do, however, seem to relate to the ways in which the teachers in this study talk about the sources of their knowledge of talk. There is clearly a personal and idiosyncratic construction of knowledge for each of the teachers as evidenced in the vignettes in chapter 6. As Clandinin and Connelly (1996) suggest in their work, there are individual personal histories played out in the development of the teachers' knowledge that might be described as 'personal practical knowledge'. Perhaps a better articulation of this complex 'strategic knowledge' sits within the more situated models of teacher knowledge that emphasise the social and cultural aspects of professional knowledge.

An aspect of the study design that created something of a cul-de-sac in the findings was the examination of whether there is any evidence of threshold concepts as presented in the literature review (Meyer and Land, 2003; Davies, 2006; Davies and Mangan, 2008; Land et al., 2008). The response of the teachers in the final interview suggested that they did not recognise the characteristics of threshold concepts in their own professional knowledge development. This presents three possible conclusions: that threshold concepts can be identified from outside a learning domain but not be recognised by the learners within it; that the framework of threshold concepts is not as useful a description of problematic learning as the cited authors suggest; or that threshold concepts do not exist in the complexity of professional learning.

Threshold concepts are a framework that is arguably helpful in curriculum design in undergraduate learning (where the idea was developed) but is not an adequate framework for describing the complexity of professional knowledge. This complexity is discussed further in the next section.

However, it may still be useful from a teacher educator's perspective to identify troublesome aspects of knowledge transformation within classroom practice. The area of change in the context of classroom talk for which there is most evidence in this study is in the change from a transmissive view of the role of the teacher to a more dialogic classroom environment. In Cove et al.'s (2008) study they identified a threshold concept among early career teachers which they describe as:

Teaching is about learning, both the particular achievements of individual children (often those who have presented 'problems' for the beginning teacher) and also the progress made by the class as a whole. (Cove et al., 2008, p.5)

There is certainly a common experience for the more teacher-talk oriented teacher in the study to have changed their view of the role of the teacher from transmission of knowledge to focus on the learning of individuals and groups of learners. In this respect there is some connection between the threshold concepts identified by Cove et al. and the changes seen in the teachers in this study. The clearest argument for the existence of threshold concepts in this study can be made for:

- Understanding the constructivist role of the teacher in co-constructing knowledge with learners.
- Recognising the problematic nature of learning as a challenge to didactic modes of teaching.

For these significant changes in the views of the teachers about their role an argument can be made for each of the characteristics of a threshold concept. There is a strong indication of these changes being transformative and integrative in the way they affect different aspects of the teachers' views of their practice. They are bounded in the sense that the concepts are clearly part of a specialist pedagogic knowledge. More difficult to claim is the irreversible nature of transformation suggested by Meyer and Land (2003). For some of the teachers there is clearly a tension between their recognition of the value of constructivist approaches in the science classroom and pressure within their community of practice to cover the content of the curriculum. This perceived need to cover content creates a pressure toward more didactic approaches to teaching.

Other changes that are seen in the study do not clearly fit the description of threshold concepts as transformative, troublesome, integrative and bounded. In this respect the findings of the study reinforce Atherton et al.'s (2008)

finding that threshold concepts are harder to identify in the less well defined domains of professional learning. There is clear evidence in the study that there are changes in the teachers' professional knowledge about talk, however the argument for these changes as threshold concepts is problematic. I would argue that it is the situated nature of knowledge about classroom talk that excludes any potential threshold concepts. Since the knowledge of classroom talk is influenced by factors that are both internal to the teacher and external in their community of practice, it is not possible to clearly define bounded concepts within a described body of knowledge. This complexity also explains why the teachers in the study did not recognise the features of threshold concepts in their experience of knowledge change.

Social and cultural influences on knowledge of classroom talk

The personal knowledge of classroom talk that is evident in the individual teacher's personal account of the development of classroom talk suggest that there is an interaction between five aspects of social and cultural influences on their knowledge. These are the internal individual beliefs and biography of the teacher, interactions with specific influential individuals and interaction with the communities of practice within the school in which they work (see figure 7.3).

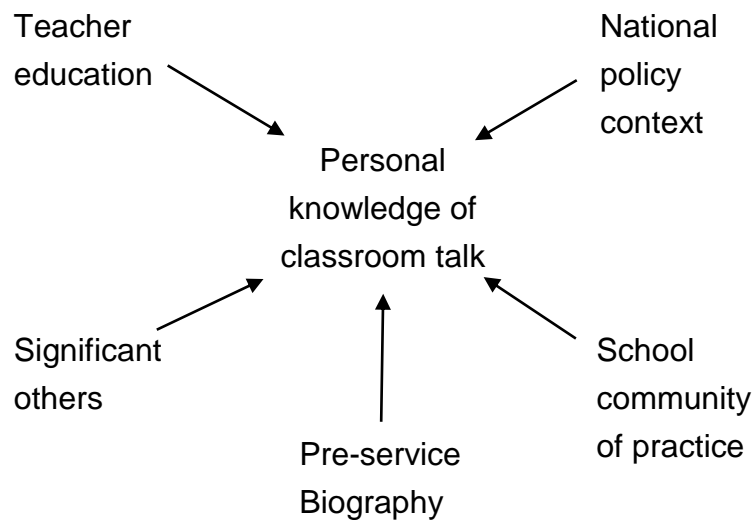


Figure 7.3 Social and Cultural influences on classroom talk

The personal biography of the teacher, their narrative of professional knowledge, is influential in underpinning their beliefs and view of the role of a teacher through the formation of their starting teacher identity. In opting for the term biography the intention is to encompass the components of the

teacher's individual identify, beliefs and views that arise from their previous experience of learning prior to embarking on a teaching career. It was not the aim of the study to establish a rich narrative of the teachers' life history in the way that authors taking a more sociological approach might do, notably Ball and Goodson (1985) and Goodson and Pik Lin Choi (2008). However, the findings of the study suggest that the experiences, beliefs and views of learning that are established through the life story of the case study teachers are elements in the construction of their knowledge of classroom talk. Figure 7.4 presents the aspects of the teachers' biography that influence their views on classroom talk.

In the development of knowledge of talk for the case study teachers there is a clear difference in their view of the role of the teacher as they begin their initial training course. This has an effect on the development of their understanding of talk. There is a difference between a teacher-talk, transmissive-oriented identity and a more constructivist, pupil-talk oriented identity among the teachers in the study. There is also a personal narrative of experiences and reflections that develops during the teacher's career. It is striking that in all the later interviews experience and personal reflection are ranked together as the most influential sources of knowledge by all the teachers in the study. The vignettes presented in chapter 6 demonstrate how the development of the individual teachers' knowledge of classroom talk is influenced by an interaction of complex factors that encompass a range of domains of teacher knowledge. These interacting domains play out in the development of an individual narrative that is presented by the teachers as they construct and make sense of their understanding of classroom talk. It may be that this personal narrative development of knowledge is particularly strong in the context of classroom talk. Ranking of sources of knowledge by all the participants consistently rates the influence of continuing professional development as low. This is down to either the perception of professional development as having little influence generally, or the absence of any development relating directly to classroom talk. As a consequence, it may be that the lack of a clear consensus of agreed good practice between the schools in which the teachers worked leaves an element of freedom to develop a more personally held view of classroom talk. In two of the vignettes presented, that of Sean and Ruby, there is an element of conflict apparent in the interaction between the individual teachers' view of the roles

Pre-service biographical influences on the development of teacher knowledge of classroom talk	
Experiences as a learner at school	Emergent Pedagogic influences
Experiences as an adult learner	
Experiences of instructing others	
First career self-efficacy	Emergent teacher identity influences
Beliefs of the purpose of education	
Views of the role of a teacher	
School science subject knowledge experiences	Emergent epistemological influences
Undergraduate science studies	

Figure 7.4 Aspects of the teacher biography that influence knowledge of classroom talk

of classroom talk and the culture of good practice that they experience within the school. The complexity of multi-participant interactions in developing knowledge and practice around talk is better captured in situated or social learning theories of professional knowledge than in those theories that articulate professional knowledge in domains. Lave and Wenger's (1991) concept of communities of practice as an account of professional knowledge has resonance with the account of knowledge development presented in this study.

The literature review outlines Lave and Wenger's (1991) three constructs: the domain of knowledge as an interest in classroom practice and learning shared by the different participants in the community of practice experienced by the teachers; the participants as the colleagues and line managers of the participant teachers and the practice as the account of the teachers' views of classroom talk in relation to their own practice. For all of the teachers in the study there is a transition from acting as peripheral participants in their placement schools and within the cohort of Science PGCE students at their training institution to being members of a science department in their first school. The 'boundary crossing' between multiple communities of practice described by Tuomi-Gröhn et al. (2003) creates a complexity in the formation of the teachers' identity and knowledge about classroom talk.

Several authors (Edwards, 1997; Maynard, 2001; Hodkinson and Hodkinson, 2004; Woodgate-Jones, 2012) have used the concept of communities of practice in emphasising the situatedness of professional knowing among trainee teachers in the UK. The relationship between the individual teacher and the community of practice influences the development of the teachers' knowledge, beliefs and identity during their initial training. In the context of classroom talk, however, the 'boundary crossing' that exists in the transition into the first teaching post is as influential in the development of the teachers' knowledge of talk as the involvement in communities of practice as a trainee teacher.

Lave and Wenger's description of communities of practice presents a complex picture of professional knowledge development but one in which professional knowledge of a domain is established through the interactions and practices of participants in the community. As Brouwer et al. (2012) note in their study of a school setting, the positive view of a community of practice as a knowledge generation setting is not always held by the participants. In the experiences of the teachers in this study there appears to be a range of experiences of the influence of communities of practice on knowledge of classroom talk. Sophia, Luke and David have largely positive experiences of the influence of their community of practice on their knowledge of talk. For Jason there is a sense of a less influential community and for Ruby and Sean, for different reasons, the influence of the community of their school is problematic and conflicted. One reason for this may be in the experiences that these two teachers have of a divide between the immediate community of their colleagues within the department, and the more removed influences of the school leadership team that they experience through line management and appraisal systems. The social and cultural influences on the development of knowledge about classroom talk could be considered as being the biography of the teacher, the community of practice in which they work and significant others (see figure 7.3). In making the distinction between the community of practice and significant others, there is a reflection of the findings in this study that indicate a complex and sometimes conflicted relationship between the influences of knowledge on the teacher. The cultures and actions that are perceived as part of a community of practice are evident as influences on the teachers' knowledge, but for most of them there are individual colleagues and mentors that have an individual influence on their view of classroom talk. Both of these external elements of the community of practice are mediated through the teachers' individual

biography in establishing a personal belief about the role of the teacher, an identity or habitus (Bourdieu, 1977).

The community of practice in relation to the development of knowledge of talk is not enacted through direct sharing of practice around talk. There is little evidence in the findings of the study of explicit discussion or sharing of practice in relation to classroom talk within the science departments or wider school. Instead the influence of the community of practice exists through perceptions from the teachers of what is expected of them in terms of good practice and the constraints and affordances that these place on the way in which their use of classroom talk develops. What Ball (2003) refers to as the “terrors of performativity” are experienced by some of the case study teachers in a way that influences their views of classroom talk. This pressure of performativity is experienced either through a perceived pressure to cover the curriculum at the expense of spending time ensuring secure learning, or through critical feedback of lesson observations that form part of the NQT induction and appraisal process. There is some reason for optimism in that, for some of the teachers at least, there is a move away from proscribed notions of what constitutes good practice in the light of the new OFSTED inspection framework which states that “Inspectors must not advocate a particular method of planning, teaching or assessment” (OFSTED, 2015, p.10). However, the communities of practice in the schools still exert an influence through a perception of what constitutes good teaching experienced by most of the teachers in the study.

For several of the teachers in the study a more influential element of the community of practice on their view of classroom talk were individual teachers within either the school community of practice or a wider professional community in the role of tutor or mentor. David provides a good case of this influence. Whilst he describes a limited influence from what might be seen as the school community of practice in general, David is influenced by an individual colleague whom he refers to as his “go to guy”. For Sophia, a significant other in this context is a colleague who was a fellow trainee and with whom she completes her first two years of teaching. This peer relationship seems to be significant for Sophia, more so than other colleagues, including her formal NQT mentor. There is also a formative influence for all of the teachers from their mentors and tutors during the PGCE course. Since I am one of the tutors, given my area of research interest, it is perhaps not a representative picture of a typical experience but it is worth recognising the enduring influence, albeit a small one, of the

formative aspects of training. The findings of the study suggest that explicit input for these teachers on classroom talk was almost non-existent after the initial training course.

In identifying the teacher biography as an influence the intention is to capture what some authors refer to as a teacher identity with experiences as a learner, held beliefs about the learning and the role of the teacher in learning, and a moral position in relation to education in a wider sense. The narrative of some of the case studies over the three years of the study suggest that the development of professional knowledge of classroom talk depends on the nature of the interaction between these components of influencing factors that vary for individual situations. The complexity of these interactions is most evident where there is a sense of misfit or conflict between the biography of the teacher and the community of practice. This is clearest in the case of Sean and Ruby. For both these two teachers there is an apparent conflict between the practices in classroom talk that they perceive as being promoted within the community of practice of the school and their own beliefs about the role of the teacher. The experiences of these two teachers, different as they are, both suggest that the development of knowledge in practice is a result of the interaction between sources of professional knowledge and the biography of the teacher. Part of the navigation of this professional knowledge biography is driven by the individual teachers' need to retain a sense of self-efficacy in the performative culture that they experience in some schools. The experience of Sean in the way he accounts for the development of his understanding of classroom talk suggests parallels with studies of teacher burnout in relation to school context and classroom management (Brouwers and Tomic, 2000; Skaalvik and Skaalvik, 2010). Both Brouwers and Tomic and Skaalvik and Skaalvik draw upon a self-efficacy framework (Bandura, 1977; Bandura, 1997; Tschannen-Moran and Hoy, 2001) to understand the effect of teachers' perception of the school context and their sense of what they can accomplish in their role. Ruby presents an interesting counterpoint to the typical negative relationship between job satisfaction and self-efficacy identified by Skaalvik and Skaalvik. In their study there was a relationship between autonomy and time pressures and the self-efficacy of teachers. However, Ruby seems to find a way to hold on to feelings of self-efficacy in her teacher identity despite recognising both time pressures and a decrease in autonomy as negative aspects of her job satisfaction. This maintained self-efficacy, in contrast to Sean's biography, seems to be an important aspect of the development of Ruby's understanding of classroom talk.

Professional knowledge of classroom talk in an “evidence-based profession.”

The complexity of professional knowledge of classroom talk sits at two levels within any attempt to define and measure classroom talk. The nature of classroom talk itself is complex. Frameworks for analysing classroom talk effectively have to capture the complexity and overlapping elements of talk that result in multi-aspect analytical frameworks for talk in science classrooms. In capturing this complex nature of interactions and purposes of talk in science learning, these frameworks inevitably become problematic as self-evaluative or professional development tools. The second layer of complexity arises from the nature of classroom talk as a product of the teachers' knowledge of classroom talk itself. This self-referential nestedness means that, in the early stages of teacher development at least, the level of conscious planning and intentional action is limited. In Eraut's (2007) model of professional knowledge, the processing of knowledge of classroom talk remains largely in the Instant/Reflex and Rapid/Intuitive realm of process. The development of understanding of the use of different modes of talk results from a complex interaction between explicit forms of knowledge about classroom talk, the teacher's biography and emerging identity and the community of practice in which they develop their early identity in the classroom. These different levels of complexity suggest that the language of current political discourse on evidence-based practice of developing an *“invaluable knowledge and evidence base about “what works”, which can be shared across the whole profession”* (Department for Education, 2015, p4) is, at best, naïve in its ambition. As with the two levels of complexity, this aim is problematic both on the level of identifying “what works” and of sharing this across the profession. Classroom interactions in all lessons are a social construct and exist in the moment between the individual pupils and the teacher. Intuitive and instant responses are influenced by complex interpersonal elements that are individual to the teacher, professional motivations and feelings of self-efficacy. Even with relatively simple aspects of classroom talk that have been proposed as having the potential to improve learning such as the use of more open questions (Wragg and Brown, 2001) or extended thinking or wait time (Rowe, 1986) that are widely known and were presented to the teachers in this case study in their training, have a limited influence on the daily interactions in the classroom. Despite an explicit focus on some of this research evidence there is little evidence of

it being reflected in the case study teachers' articulation of their ideas about classroom talk. If there is to be a change in the relationship between teachers and research evidence it may be that this needs to come through a change in the community of practice in which they work rather than individual professional development.

In their study of science teachers engagement with research findings, Ratcliffe et al. (2005) found a positive view of research among science teachers but identified the need for research to be readily transferable to practice and congruent with teachers' beliefs about effective practice. Is it feasible that a body of evidence from randomised control trial studies might be influential in changing practice? To achieve this the research would need to be able to reduce classroom interactions to controllable interventions to enable comparisons to be made of 'what works best'. Indeed, even given that there might be some aspects of interactions that could be reduced to a controllable and measurable component, this assumes that there is an agreement of what constitutes 'working better'. Would such research be able to establish evidence of a direct causal link between an intervention relating to classroom talk and measurable outcomes in improved learning? The form of research evaluation that this policy shift in the UK focusses on is perhaps best modelled by the US based Institute of Education Science What Works Clearinghouse. This online searchable database aims to present a rating of the 'effectiveness' (defined as causing an improvement in outcomes) of given interventions (program, product, practice or policy). Within this database there are, unsurprisingly, very few interventions that are described as being at the teacher level of action. Whilst it may be possible to take the quasi-scientific approach of rating the effect size of specific policies or products that can be controlled at either a macro or micro level, it would be impossible to generate testable interventions that are only actioned at a classroom level through the complex social and learning interactions of individual teachers. It may be that this complexity is the reason why continuing professional development experienced by the teachers in this study was perceived as having such a limited influence on their understanding of classroom talk. There is also a risk inherent in this approach that effect ratings can throw up potential positive effects that lead schools to make school-wide decisions about practice at a classroom level that fail to recognise the complexity with which interventions are transformed and enacted at the level of the individual teacher.

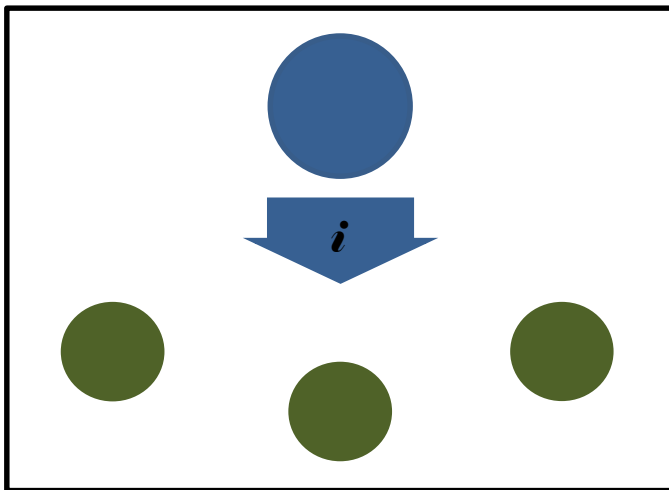
7.3 Developing a model of classroom talk that is accessible to early career teachers.

Mortimer and Scott's (2003) five part framework for describing and analysing science classroom talk has been used as a tool for both analysing science classroom discourse by researchers (Mortimer and Scott, 2003; Scott. et al., 2005; Lehesvuori et al., 2013) and as a tool for supporting the development of early career teachers (Mortimer and Scott, 2003; Viiri and Saari, 2006; Lehesvuori et al., 2011). Whilst the framework offers a comprehensive tool in terms of the analysis of classroom talk patterns by researchers, the findings of both the existing literature and of this study suggest that there are difficulties in using the framework with trainee and early career teacher teachers as a professional development tool. This study found that when aspects of the Mortimer and Scott framework were presented to the teachers in the study during their initial training these were not drawn upon explicitly by the teachers in their developing knowledge of classroom talk. Specifically the classes of communicative approach and patterns of discourse were introduced to the teachers in the study about half way through their initial training year as a part of a session on classroom talk that included a coding exercise where the teachers in the study observed a video recorded lesson and identified elements of the communicative approach used in the example lesson. Only Sophia refers explicitly to the framework and does so at the end of the second year of her career and with a limited recall of the terminology of the framework that is mixed up with other aspects of the meta-language of teacher-talk relating to forms of questioning. It is also a clear finding of the study that there is not a shared language with which the teachers talk about classroom talk. The complexity of the Mortimer and Scott framework and the absence of shared discussion of classroom talk in the communities of practice in which the case study teachers work result in a lack of shared meta-language.

In this section the Mortimer and Scott framework is developed in a format that recognises the lack of shared meta-language and draws upon the tendency of the teachers to discuss talk in terms of the participants in the interactions. In doing so a model is suggested that describes the five different aspects of the Mortimer and Scott framework within talk maps that represent the spatial pattern of the interactions. Figure 7.5 shows the symbolic representation of common modes of classroom talk that were both observed in this study and referred to indirectly in the interviews. The different elements of the Mortimer and Scott framework are identified for

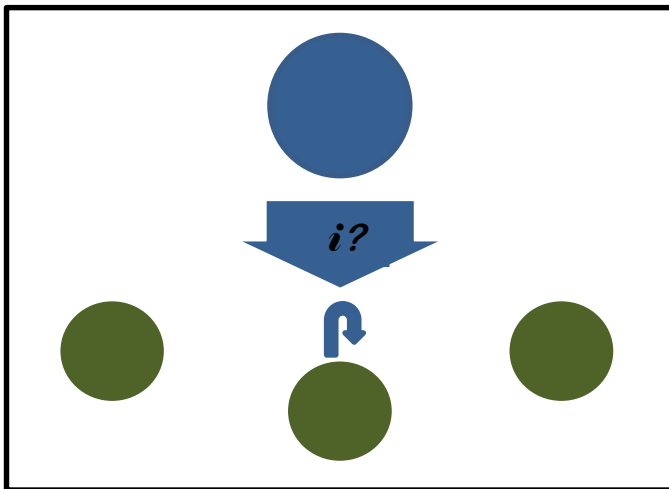
each of these 'maps'. Each map is given a title that attempts to describe the nature of the interactions in language that is used by the teachers in the interviews.

The purpose of presenting this model of science classroom talk is to represent the components of Mortimer and Scott's analytical framework in a format that reflects the findings of this study with regard to the way in which teachers develop their understanding of the nature and purpose of classroom talk. The intention is to facilitate access to the analytical nature of Mortimer and Scott's framework in developing an understanding of the purposes, communicative approaches and patterns of interaction that are evident in science classrooms for early career teachers. In the suggested model, outlined in figure 7.5, the forms of interaction are represented symbolically in terms of the spatial characteristics and the participants of the interactions. The aim here is to draw upon the evidence from this study to facilitate early career teachers by making a theoretical framework of patterns of discourse more accessible. Eight common modes of classroom interaction are described in the model in either teacher-to-whole-class interactions or teacher-to-individual-pupil or group interactions. In each case the communicative approach is indicated by the colour and direction of arrows that indicate interactions between the teacher and pupils. Thus each arrow indicates the initiator and recipient of the interaction and the intended content of the interaction between the pupils' ideas and the scientific story. A ? symbol is used to indicate interactions that typically use questions as part of the classroom talk. The term interaction is used here to indicate a spoken talk episode within the classroom that involves the teacher. The model does not address non-verbal interactions or internalised discourse, nor does it represent pupil-to-pupil interactions. The aim in this model is for early career teachers to be able to relate the features of Mortimer and Scott's framework to their developing understanding of how they use talk in the classroom. Each of the modes of classroom talk is described using a language of practice that is used by the teachers in the study in talking about their understanding of classroom talk. The terminology used in Mortimer and Scott's framework is mapped to these modes of talk but the intention is to use language that is commonly used by teachers in their communities of practice.

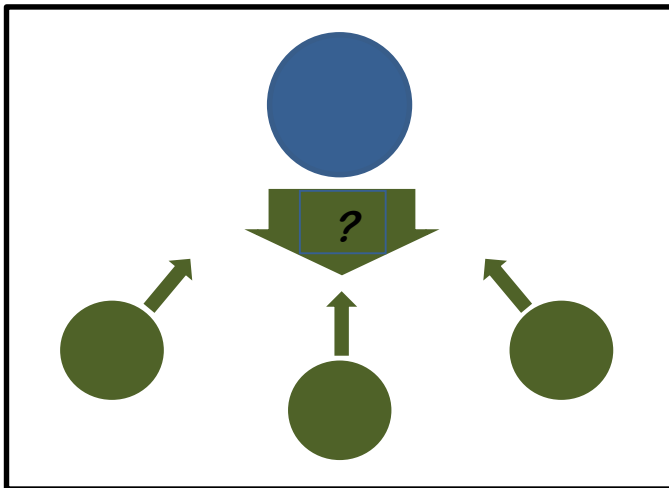


Whole class interactions

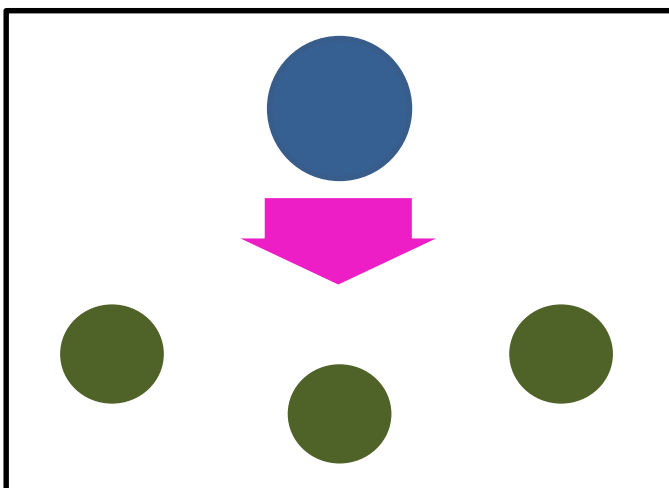
Teacher presentation:
Presenting the science view to a class or group of pupils.
TP: opening up the problem, introducing and developing the scientific story
Content: scientific
CA: Authoritative non-interactive
TI: Shaping and sharing ideas



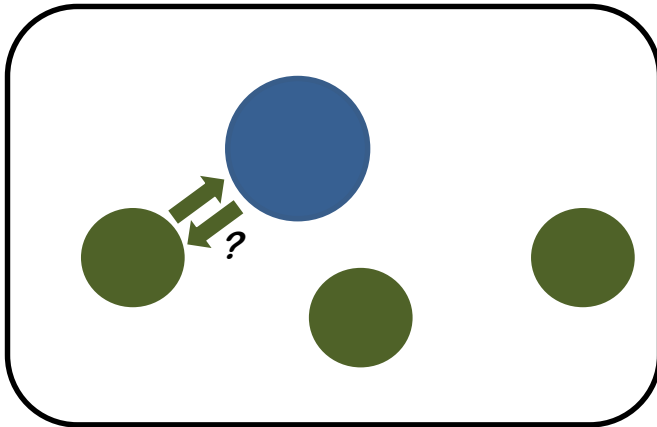
Teacher interactive presentation:
Presenting the science view to a class or group of pupils with turn taking from individual pupils.
TP: opening up the problem, introducing and developing the scientific story
Content: scientific
CA: Authoritative-interactive
PoD: I-R-E triads
TI: Selecting and marking ideas



Quick Progress Checking:
Quick probes of pupils' version of the science view with a whole class.
TP: probing pupils' views
Content: scientific
CA: Dialogic-interactive
PoD: I-R-E triads
TI: checking student understanding



Task setting
Giving instructions to the whole class.
Content: managerial



Individual/Group interactions

Eliciting pupils ideas:

Probing and eliciting the views of individual pupils.

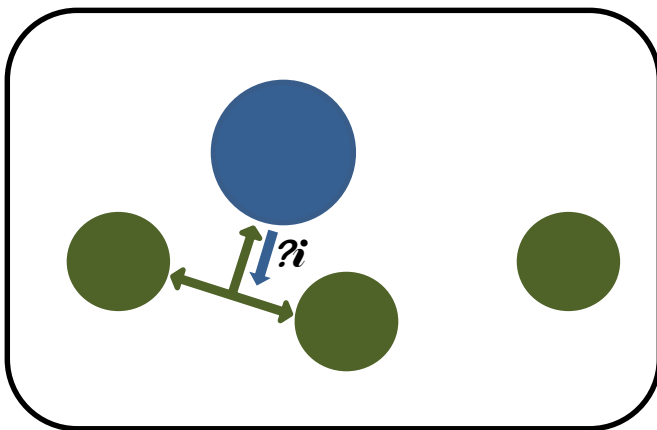
TP: Probing pupils' views

Content: everyday or scientific

CA: Dialogic-interactive

PoD: I-R-E

TI: checking pupil understanding; reviewing.



Scaffolding

Interactions with pupils' version of the science view followed by evaluative follow up interactions.

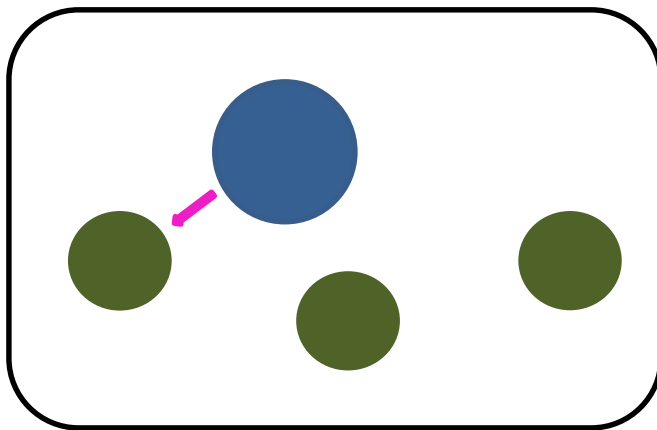
TP: supporting internalisation

Content: scientific

CA: Dialogic-interactive

PoD: I-R-F-R-F sequences

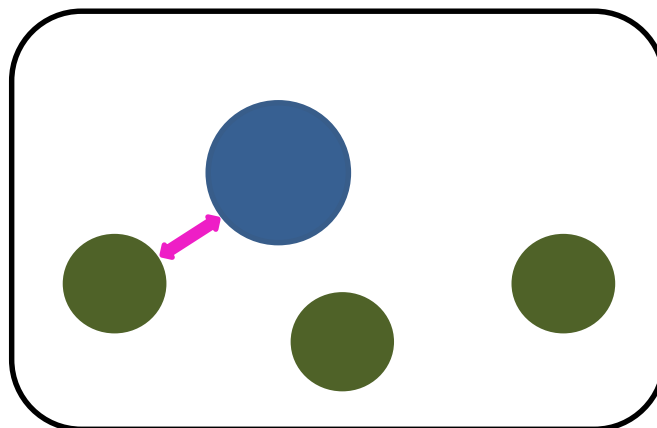
TI: checking pupil understanding; selecting, shaping and marking ideas.



Task checking

Interactions with pupils' engagement with tasks/activities.

Content: Managerial, instruction setting








Relationship building

Interactions with pupils' aimed at developing working relationships.

Content: Managerial

Key to talk maps

	Teacher	<i>i</i> Interaction is intended to communicate the scientific story <i>?</i> Interaction involves questions
	Pupil	
	Authoritative science focussed interaction	Aspects of communicative approach from Mortimer and Scott (2003) TP Teaching purpose CA Communicative approach PoD Pattern of discourse TI Teacher interaction
	Pupil ideas focussed interaction	
	Management and organisation focussed interaction	

(arrow direction indicates the initiator and intended recipient of interaction. Wide arrows indicate whole class recipient)

Figure 7.5 Talk maps: a participant focussed model of science classroom talk based on Mortimer and Scott's (2003) analytical framework of science classroom talk.

Chapter 8 Conclusions

The final chapter outlines what has been learnt from the findings of the study in relation to the two research questions. The limitations of the findings are then discussed and, finally, implications for teacher education practice and policy are examined in the light of the findings.

8.1 What do the findings of the study tell us?

The origin of the research questions that were examined in this study is in my own experiences as a teacher educator. Experience has highlighted a problematic aspect of the development of professional knowledge. The findings of the study highlight the complexity of the development of knowledge about teaching and learning for practicing teachers. This complexity is amplified in the context of knowledge about classroom talk. I would argue that this amplification is a result of the confluence of a complex area of practice and knowledge with an under-developed professional focus and discourse around talk.

The first research question asked:

How do science teachers' conceptions of the different kinds of talk and the purposes of talk in science classrooms develop during their teacher training and induction?

The literature on science classroom talk presented in chapter 2 indicates the same complexities that are evident in the way in which the teachers in this study talk about the use of classroom talk. The capacity of early career teachers to make use of theoretical frameworks for science classroom talk does seem to be limited as found in the study by Viiri and Saari (2006). There is no evidence that the teachers in this study use any theoretical frameworks as a structure for reflecting on, or developing, their understanding of the nature and purpose of classroom talk. Even where the theoretical frameworks persisted in the case study teachers' views they were not clearly articulated and recalling them was, unsurprisingly, partial and confused. The complexity of understanding the nature of classroom talk from within, as the teacher participating in the interactions, is further compounded by an apparent lack of shared language for talking about talk. The way in which the case study teachers spoke about their use of talk showed no common terminology or framework for discussion, despite the shared experiences in training. It is striking that none of the case study teachers

experienced any continued training that they perceived as relating to classroom talk.

The second research question asked:

How do sources of knowledge about the forms and purposes of classroom talk in science and influences on practice relate to the professional knowledge of early career teachers?

The development of teacher knowledge about the nature and purpose of classroom talk in science classrooms involves a number of complex influencing factors. Influences include theoretical frameworks introduced in formal teaching during initial training, coaching and guidance from both the school based mentor and university tutor, and communities of practice. Further individual factors that influence teacher knowledge are the epistemological and pedagogical identities and beliefs held by individual teachers as a result of their own biographies and experiences of learning.

It is clear from the experiences of the different teachers in the case study that the development of their understanding of classroom talk beyond the initial training year is very heavily influenced by the community of practice in which they work. There is an inter-relationship between the views of the community of practice, in terms of what is presented as good practice, and the personal beliefs and knowledge of the teachers. For two of the case study teachers there is a problematic interaction between what they believe is the right way to use different forms of classroom talk and what the culture of the school in which they work asserts as best practice through appraisal and performance management. In finding a resolution to tensions for the case study teachers between their own knowledge and that of the community of practice there is a clear need to feel a sense of validation of professional competency. This sense of self-efficacy can be threatened by tensions in these influences on professional knowledge.

8.2 Limitations of the findings of the study

As a longitudinal case study approach, the findings of the study draw upon the practices, experiences and narratives of teachers over the first three years of their teaching career. This authenticity allows for a rich analysis of the ways in which teacher knowledge of classroom talk is conceived and articulated by early career teachers and thus adds a dimension to the analytical and observational approaches taken in most of the literature on science classroom talk. Adopting a longitudinal case study approach has enabled the study of teachers' practices and changes in practice over time. However, there are some limitations to the findings that emerge in this study that need to be recognised in drawing conclusions and identifying the implications of these findings.

Is what the teachers say they do and what they actually do the same?

One of the constraints imposed on the methodology early in the development of the design of the study was the extent to which the longitudinal case studies would be able to triangulate the interview data with systematic observations of classroom talk by the different teachers. Lesson observations were undertaken at the same time as the interviews wherever this was possible. The observations recorded the pattern of the teacher-pupil interactions using Mortimer and Scott's (2003) analytical framework to create the kinds of maps of teacher-pupil interactions used by Viiri and Saari (2006) and Lehesvouri et al. (2013) (see figure 8.1). The practical limitations on data collection constrained the number of observations that could be undertaken for each of the case studies. It would not have been possible to collect sufficient observation data in this study to make reliable claims about the modes of interaction used by the teachers. The lessons that were observed may not have been typical of the teachers' usual practice, if indeed they have what could be described as 'usual practice'. All of the teachers in the study described their use of classroom talk as varying between different age groups, ability groupings and, for some, different class dynamics. It is beyond the scope of this study to establish a reliable view of the nature of classroom talk employed by each teacher across the range of their teaching approaches.

It must also be recognised that the presence of the researcher in observations is likely to have had an effect on what is observed. All of the teachers who volunteered to participate in the study had been observed by the researcher prior to data collection in the author's capacity as University

Tutor supervising a teaching placement. To minimise the effect of an unbalanced power relationship, all of the data collection took place after the final assessment of the initial training course. The typicality of the lesson observations need to be seen within the context of the teachers in the study being aware of the nature of the research from the consent process and from previous interviews. There are also some lesson observations where the nature of the lesson observed were clearly not typical of the teacher's usual approach, for example where they were trying out the use of different technologies in a lesson.

There is also a question of the distinction between the teachers' knowledge of an explicit pedagogy of classroom talk and implicit action in classroom talk. Much of the decisions made regarding classroom talk by the teachers must be done within the moment and within the complexity of classroom settings. As Eraut (2000) argues in his typology of non-formal learning in professional contexts, there are implicit, reactive and deliberative forms of learning taking place as a result of different contexts and time frames for learning. Eraut suggests that episodic experiences may accumulate to determine actions through tacit knowledge without the individual holding a conscious awareness of the process. If this is the case, and it seems likely in the context of classroom talk, the interviews may not unpick these tacit forms of knowledge. By using interview data, the findings of the study inevitably focus on the teachers' explicit knowledge, albeit in some cases a loosely formed and emergent knowledge. The interaction of tacit and explicit knowledge in classroom talk would be an interesting, if problematic area for further study.

As a result of these limitations the study used lesson observations to inform the interviews. By being able to observe the teachers at the time of some of the earlier interviews the interviewer was able to make better sense of some of the responses and to probe responses by the teachers in relation to the observation. This limitation suggests an area for further research in using systematic observations to identify changes in teacher talk approaches in trainee and early career teachers that is discussed in the next section.

The transferability of case study findings

In justifying the decision to employ a case study methodology in chapter 3, issues with the limitations of generalisability from case studies were discussed. Flyvbjerg argues that claims that 'one cannot generalise on the basis of an individual case' is a misunderstanding or oversimplification

(Flyvbjerg, 2004, p.421). Flyvbjerg goes on to make an argument that is pertinent in the context of this study around the need for phenomenological studies of complex human learning within context-dependent case studies. However, in moving to consider the implications of the findings in the next section it is important to signal a degree of caution in relation to the generalisability of the cases in this study. Whilst there are several cases in the study there are aspects of both similarity and difference that make generalisations complex. There are some aspects of the cases that are consistent but not necessarily typical of all teachers. All of the teachers in the study followed the same training course, a PGCE, at the researcher's employing institution. As a tutor on the course I was also involved in delivering specific sessions on classroom talk and this was informed by my research interests in classroom talk. It may be that this creates a unique cohort that is not representative of other PGCE trainees, though experience at other institutions suggest that whilst not universal in including this focus, the training these teachers received is not unusual in including some focus on understanding the types and roles of classroom talk.

Conversely, the findings show that the development of understanding of classroom talk is complex, influenced by individual biographies and by the context and community of practice within which teachers work. There is a danger here that by presenting the complexity and individuality of professional knowledge there is an implication that all teachers are completely different and that the findings from studying one group of teachers merely serves to describe that group of individuals. In the next section I will argue that however unique and complex the individual cases, there are a number of implications that are presented by the findings of this study.

8.3 Suggested future research

There are two key strands that emerge from the findings of this study that suggest potentially fruitful avenues for future research: developments of theoretical models intended to be accessible to early career teachers and characteristics of modes of talk among teachers with different orientations toward classroom talk.

The genesis of this thesis was in my experiences of using theoretical frameworks of analysis (specifically Mortimer and Scott's framework) (Mortimer and Scott, 2003) as a professional development tool. Experiences indicated that, whilst it is a potentially useful tool for self-analysis by experienced science teachers, it was difficult for trainee teachers to make use of this in reflecting on and developing their own understanding of the types and roles of classroom talk. In section 7.3 a representation of classroom interaction as talk maps is presented. This draws upon the findings of the study to incorporate the ways in which early career teachers talk about talk with the aim of making a more accessible analytical framework.

Whether this model is able to support early career teachers in reflecting on, and ultimately widening and changing their classroom talk practices, is an area that warrants further research. Would trainee teachers be able to use the Talk Maps as a reflective tool to review their own use of classroom talk? An evaluation of the talk maps as professional development tools might establish the extent to which they prompt and support reflection on types and purposes of classroom talk. Future research might also examine whether or not training interventions resulted in changes in practice that were evident in patterns of classroom interactions. Since the Talk Maps are developed from Mortimer and Scott's (2003) analytical framework, analysis of the patterns of interactions in trainee teachers lessons of the kind used in this study to inform interviews would present a possible approach to look for changes in teacher talk practices (See figure 8.1).

A second focus for observational analysis of talk patterns would be in exploring the extent to which different orientations toward classroom talk by different teachers is evident in the patterns of interactions in their classrooms. A methodological approach considered in the design of this study was to use a questionnaire tool to evaluate the epistemological beliefs of trainee teachers. One such possible instrument developed by Woolley et al. (2004) assesses the beliefs of teachers relating to constructivist and

traditional approaches to teaching and learning. This teacher belief survey (TBS) draws on a larger sample (n=198) of teachers in the US to design an instrument that is able to measure changes in teachers' beliefs about these elements of learning. I would argue that, whilst not designed specifically for assessing views about talk in classrooms, it does identify underlying beliefs about learning that are likely to have an effect on the way teachers' understanding of classroom talk might develop. It would be potentially interesting to see whether there was any connection between the epistemological beliefs of the teachers and the patterns of interactions that they employed in their classrooms. Chapter 4 presents profiles of the extent to which different teachers talked about different aspects of classroom talk and this too might be triangulated with analysis of classroom talk patterns.

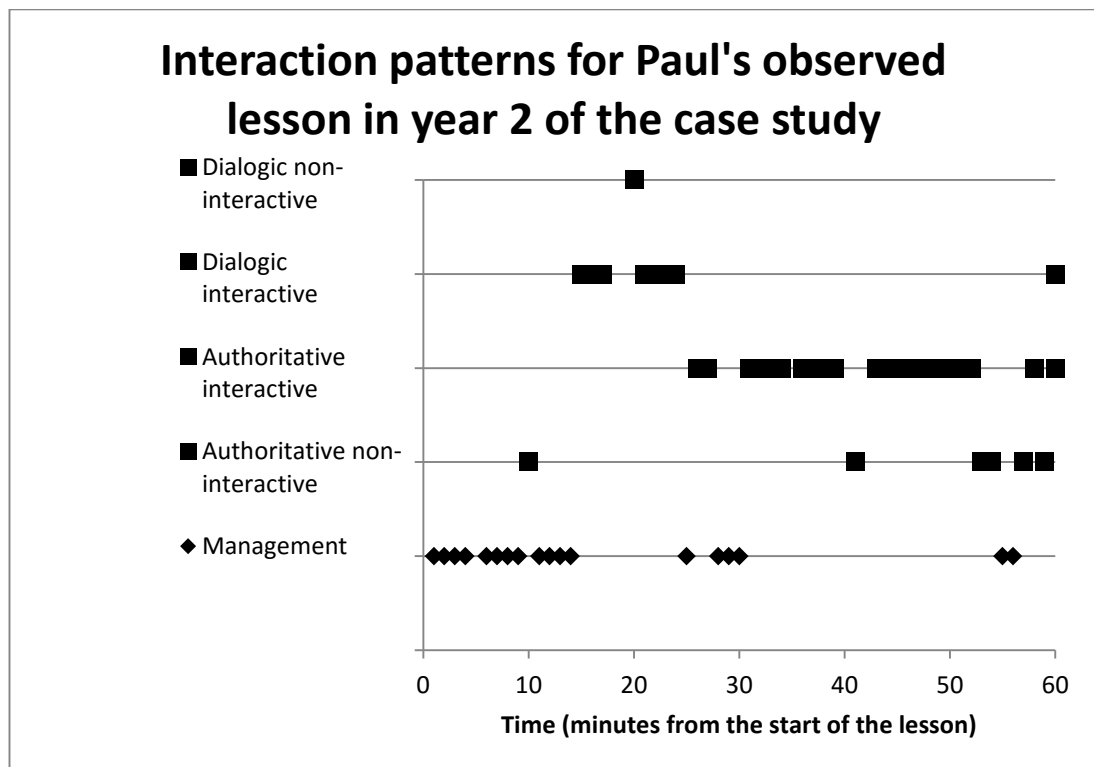


Figure 8.1 Talk pattern analysis used to inform the interviews, developed from Viiri and Saari (Viiri and Saari)

Whether it is possible to make clear connections that begin to correlate the beliefs of early career teachers with the way in which they develop their knowledge of, and perhaps practice of classroom talk, may be questionable. However, a deeper understanding of the link between personal belief and practice in the context of classroom talk might be a useful tool in developing teacher education and professional development.

8.4 Implications of the findings

8.4.1 Implications for teacher education practice

The 2016 government white paper responding to the Carter Review of Initial Teacher Training (Carter, 2015) states that:

We will strengthen ITT content, focusing on helping new teachers enter the classroom with sufficient subject knowledge, practical behaviour management skills, understanding of special educational needs, and a greater understanding of the most up-to-date research on how pupils learn. (Department for Education, 2016, p.12)

There are clearly implications evident in the rhetoric of policy change in teacher education in England and Wales and the advent of what might be described as a national curriculum for teacher education. With central government seeking to define teacher training 'content' that focuses on subject knowledge and practical behaviour management skills, there are tensions between the findings of this study and the simplification of the process of teacher training to the delineation of 'required content'. It is clear from the findings that the process of developing practice in response to input on a teacher training course is far from straightforward. I would argue that the way in which the development of the case study teachers' professional knowledge incorporates the interaction of influences from their personal beliefs about learning, biography and their community of practice means that simply defining the content that trainee teachers must cover is unlikely to translate into the 'improvement in teacher training' that is a stated aim of the current government.

On a more practical level, there are several implications in the conclusions of this study for the implementation and practice of teacher education, both in initial teacher training and continued professional development. The findings of the individual case studies offer an understanding of the way in which the individual teachers develop their understanding of classroom talk. The influence of personal biography through the teacher's own experience of learning and their epistemological orientation through the early part of their career exert a strong influence on teachers' views of the nature and purpose of different types of classroom talk. This suggests that it may be important to recognise the epistemological orientation of the trainee teacher. There are two ways that teacher educators might respond to this. It may be important to challenge the beliefs of the trainee teacher about the purpose of talk. There are certainly clear accounts in some of the case studies here of the

transformation in the views of the teachers about the role of classroom talk during the training year that challenged their transmissive view of learning. Alternatively, there may be a challenge here for teacher educators to recognise the strongly held views of early career teachers and support them in developing a personal characteristic around talk. It may be that there are some trainee teachers who, to be successful, need to be able to maintain an approach to classroom talk that differs from the views advocated by their mentors, tutors and even communities of practice. Some of the teachers in this study experienced feedback from colleagues that they perceived as presenting a 'right' and 'wrong' kind of classroom talk. There are experiences of criticism of modes and proportions of teacher talk that created tension for the individual in creating a perception of good and bad forms of classroom talk. The experiences of these teachers suggest that their professional development might be more effective if feedback on classroom talk recognises different modes and purposes. The possibility that using non-interactive teacher talk more than is indicated in the experience of feedback might be effective in some circumstances.

The findings of the study also present a clear account of the complexity of knowledge of classroom talk that present issues for initial teacher training. It is clear from the experiences of all the case study teachers that, with no shared language or indeed concept of the nature of classroom talk, engaging with theoretical frameworks as a tool for self-evaluation and reflection is problematic. A synthesis of a theoretical framework and the way in which the teachers in the study conceive their view of classroom talk in terms of the participants and purposes of the talk is used to develop symbolic maps of classroom talk. The purpose of the talk maps is to provide a more accessible framework for reflecting on classroom talk. The contrasting experiences of the teachers in their early career also highlight the need for initial training to equip teachers with the personal resources and tools to sustain self-reflection and analysis of experience during their early career. It is clear from the findings that the most important source of professional knowledge is seen as reflection on experiences. It is striking that none of the teachers in the study recognised any of the formal continuing professional development as influencing their knowledge of classroom talk. Given the problematic nature of theoretical frameworks such as that of Mortimer and Scott (2003) in the early stages of training it would seem beneficial to develop and evaluate a model that would give trainee teachers a self-evaluation tool for reflecting on their use of different modes of classroom talk.

In the interviews all of the teachers saw the role of their training mentor, and in some cases other colleagues, as a significant influence on their knowledge of classroom talk. As with continuing professional development it is evident that the formal feedback in schools, either as part of the NQT induction or appraisal process, is far less apparent as a formative influence. The role of the mentor in the initial training year could have a significant effect on teachers' understanding of classroom talk. The university tutor's role in school visits has a considerable influence despite the infrequency. This suggests that there may be a difference between mentor and tutor in the nature of feedback in relation to classroom talk. In the case of this study the fact that I am one of the tutors for the case study teachers requires some caution in generalising a difference of role, though a study by Amos (2014) finds a clear difference in the role of University tutors to school based tutors. Given the drive to move teacher training to increasingly school led models and the growth of School Centred Initial Teacher Training (SCITT) providers, the loss of the University Tutor role in the formation of teacher knowledge has potentially negative implications in the understanding of the nature of classroom talk.

Whilst much of the implications of this study are pertinent to all teacher training, the strong influence of the teachers' own identity and experience in relation to the nature of learning has implications for science in particular. There is an emphasis in school science on acquiring a canon of knowledge. This may result in more transmissive and didactic teacher identities among science teachers than in other subjects. Whilst not making any generalisable claims, it is interesting to note that in terms of 'talkers' and 'listeners' among the case studies the former tend to be males with a specialism in chemistry and the latter, females with a specialism in biology. Whether this tendency is apparent in the identities of a wider cohort of science teachers is perhaps an area for further study.

8.4.2 Implications for teacher education policy

The complexity of professional knowledge and teacher knowledge in particular is evident in the range of influential theorists working on the nature of professional knowledge and teacher knowledge. However, there is currently a challenge to this recognition of the complexity of professional knowledge in the policy direction toward establishing an evidence-based profession. Arguments made by authors such as Ben Goldacre (2013) and Carl Weimen (2007) for a move in education, at both a policy and practice

level, towards the medical model of evidence based practice that relies in randomised control trials to provide evidence of what works best, appear to be gaining influence in policy decisions in education. In the Secretary of State's foreword to the government consultation paper, 'A World-class Teaching Profession' (Department for Education, 2015) they outline proposals for:

A new fund which will support high-quality, evidence-based professional development programmes, led by the Teaching Schools network and rigorously evaluated for impact. Not only will this have the immediate effect of spreading good practice more widely – particularly targeting those schools which need the most support to improve – it will also build a lasting legacy by establishing an invaluable knowledge and evidence base about “what works”, which can be shared across the whole profession. (Department for Education, 2015, p.4)

Whilst it can seem a straightforward argument that drawing upon evidence to make judgements about practice, there are a number of potential issues in the comparison with evidence-based practice in medicine that relate to the forms of professional knowledge that currently determine practice in teaching. I would suggest that there are some fundamental differences between the nature of the teaching and medical profession that relate to the role of classroom talk:

- The problematic nature of randomised control trials in classroom settings;
- The personal and relation-based form of interventions used by teachers;
- The complex and often intuitive nature of decision making in classroom discourse;
- The role of belief and philosophy in teachers' actions and professional knowledge.

The latter two of these issues are evident in the findings of this study that shows how the knowledge and decision making of the teachers in the study develop over their early career. This raises a challenge to the argument in current policy development in England for the adoption of a medical form of evidence-based practice. It suggests a question over whether the medical evidence-based practice model is appropriate as a paradigm for teacher professionalism, or whether the nature of professional knowledge that emerges in the findings of this study should be challenged as inadequate for

a more evidence-based future for the profession. So what is the nature of professional knowledge that emerges in this study in relation to classroom talk and how does it develop over the initial years of the case study teachers' careers?

The previous chapter discussed the nature of the professional knowledge of classroom talk that the teachers described in the interviews. This complexity of professional knowledge and the metacognition of the teachers suggests that the focus on classroom talk has highlighted the complex nature of teacher knowledge. Rather than acquiring and deploying a broadening repertoire of actions and interventions it seems that teachers learn over the first few years of their career (and likely beyond) how to develop the complex multiple relationships with individual learners. The nature of classroom talk is influenced by the teacher, the class, individuals within the class and the school setting within which the teacher works. All these parts influence a complex, intuitive and tacit knowledge and practice of classroom talk. Yet it does not seem that this knowledge is entirely instinctive and completely tacit, the findings of all the case studies show that the teachers are aware of the different kinds of classroom talk that they use and hold a clear sense of the purpose and intention of different forms of talk. All of the teachers in the study recognise differences in their classroom talk with different learners. There is a shared view among all the teachers in the study of using different modes of classroom talk with groups of learners of different ages, academic ability and temperament. This understanding of a complex range of factors and purposes for classroom talk is not clearly articulated by the teachers with any shared language or framework for discussion with other colleagues but it clearly purposive and considered.

In the context of evidence-based practice this complexity raises a challenge to the instrumental testing of "what works". It is hard to see how this complex professional knowledge that is often held in very tacit and contextualised terms could be formulated as interventions that could be implemented in controlled trials and generate data to support what works best. This form of evidence of what works would be problematic in terms of defining both the 'practice' that is being tested and the goal against which 'success' is measured. In terms of classroom talk it is possible to conceive of small components of the whole that is classroom talk such as the duration of episodes in discourse, the participants, the nature of interactions etc. but could this then be controlled in terms of testing whether it works? What indeed is it that would constitute working better? It is clear from the views of

the teachers that the purposes behind the way in which they use classroom talk are varied and driven by a motivation beyond measurable learning outcomes. Rudolph (2014) raises a concern that one potential danger in the move toward a more experimental model in education research could lead to a move to make the real world of education more like the experimental world of this paradigm of research by constraining and dictating practices in an attempt to simplify real world complexity. The findings in this study present a challenge to this possibility in highlighting the complexity with which knowledge is mediated by the individual identities of teacher. The experience of some of the case study teachers does raise a concern that such a move would make the kinds of tensions between individual identity and perceptions of good practice more common and potentially more damaging to teachers' feelings of self-efficacy.

The findings of this study suggest that, even with evidence that certain aspects of classroom talk involve practices that have a measurable influence on outcomes, it may be problematic for teachers to implement them in their approach to classroom talk. The way in which classroom talk is conceived by teachers is personal and results from a complex interplay of factors. Thus the implementation of a particular practice relating to talk may in itself be complex and depend on the individual teacher. It may be reasonably straightforward to communicate a new drug, intervention or treatment in a medical context. It is clear from the experience of Sean in this study that, even where there is a very explicit attempt to change the way in which a teacher uses classroom talk, the individual teacher's knowledge and belief complicates the intervention. The challenge that such complexity presents to a hard-science methodology in education research is a case made by Rudolph:

We should rightly be concerned when policymakers [...] seek to push particular research models and methodological approaches in a misguided attempt to secure knowledge outcomes [...] that are unlikely to be obtained given the nature of the activities and enterprise in question. (Rudolph, 2014, p.17)

What is clear, however, from the experiences of the case study teachers is that classroom talk in science, and indeed more generally in school, is an area of professional practice that is not typically examined, discussed or developed in any systematic way in schools. There is little evidence of input in schools to the professional development of teachers in relation to classroom talk beyond simplistic criticisms of practice such as having 'too

much teacher talk' and crude norms of proportions of time and durations of teacher talk to pupil talk. Given the complexity of science classroom talk that is highlighted in both the literature review and findings of this study this is, perhaps, not surprising. It raises a challenge for the teacher profession to begin to examine more explicitly the nature of professional knowledge of classroom talk and the relationship of this knowledge in a move toward an 'evidence-based' profession. Perhaps the greatest challenge in this development is for school communities of practice that have become increasingly performative in their practice (Ball, 2003) to recognise the importance of individual differences as a strength of practice. Indeed, given the nature of classroom talk, is it possible to establish evidence that it is different patterns of classroom talk between different individual teachers that might produce the 'best' outcomes rather than attempting to identify best practices in isolation that all teachers can be expected to adopt? This would certainly present a shift in the nature of communities of practice in school for some of the schools in which these seven case study teachers worked. It would also present a strong counter-argument to ideological moves to more scientific evidence-based models of practice.

8.4 Conclusion

The longitudinal case studies presented in this thesis have highlighted the complex nature of teacher knowledge. This is particularly evident in the development of teachers' understanding of the nature and purpose of classroom talk. The nature of classroom talk is such that it is impossible to disentangle the different aspects of professional knowledge. Teachers' decision making about interactions and modes of talk within the classroom is largely implicit and is influenced by a range of factors. The interaction between the individual teachers' beliefs and knowledge about learning and the culture of the community of practice in school can create tensions in the teachers' views of the effectiveness of different modes of classroom talk. The individual case studies highlighted the significance of conflict between different influencing elements on an individual teachers' knowledge development.

There is very little shared professional language for talking about talk. The teachers in the study did draw upon some elements of theoretical understanding of classroom talk but this was done without any access to a professional meta-language of talk. Teachers tend to talk about classroom talk in terms of the participants and purposes of different communicative approaches. This focus on participants and purposes is embedded in the talk maps suggested in the study as a professional development tool for early career teachers.

The findings of the study present challenges for teacher educators by highlighting the complexity and strong influence of individual teachers' identity in the formation of their professional knowledge about classroom talk. The findings call into question a one size fits all view of best practice. If teacher identities around the nature of classroom talk are to enable effective practice and foster self-efficacy in early career teachers, teacher educator need to recognise the importance of the individual biography and orientation of teachers. Perhaps the best approach to supporting teacher development in classroom talk is to provide an accessible self-reflection tool and a useable shared professional language for talking about talk. I would also argue that there is a need for educational researchers to challenge the ideological shift toward scientific models of evidence-based practice if we are to retain a teaching workforce that is able to value the power of individual relationships between teacher and student. Teachers need to make rapid intuitive decisions in their daily interactions with pupils. These decisions require a level of tacit knowledge that sits within the individual identity and

beliefs of teachers and requires the education community to value the individuality of teachers. On an optimistic note, I hope that the shift in school inspection away from a right way of teaching and the pressure of retaining teachers in a challenging recruitment environment lead schools to see the importance of valuing individual self-efficacy in the face of ideological rhetoric about evidence-based practice.

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Glossary of terms relating to talk

The following terms are used in this thesis in relation to classroom talk:

Authoritative – used with the meaning developed by Mortimer and Scott (2003) to indicate talk with purposive focus on communicating the accepted science view of a concept within a curriculum context.

Classroom talk – used to capture the wide range of verbal communication that are seen to form part of teaching approaches recognised by teacher. All forms of verbal transaction and interaction by both teacher and pupils are encompassed in the term classroom talk.

Dialogic – the term dialogic is used here to draw distinction between authoritative and dialogic approaches to spoken classroom interaction. Dialogic approaches recognise the importance of pupils' views and of the need to incorporate pupils' draw out and work with these ideas as part of science learning. Wegerif (2008) argues that this form of classroom discourse is better described as dialectic but for the purpose of this study of teacher knowledge the more commonly used term, dialogic, is adopted to describe approaches that recognise and elicit pupils' ideas in classroom talk.

Discourse – the term discourse is used to identify forms of classroom talk that involve verbal exchanges between multiple participants in the classroom. Typically discourse would be between teacher and pupil or pupils or between pupils.

Discussion – the term discussion is used in materials presented to teachers to indicate talking with others with aim of exchanging ideas. The term is also used frequently by the teachers in the study in the context of *class discussion* to indicate a usually informal exchange of verbal interactions between the teacher and participating pupils within the class.

Questioning – talk between teacher and pupil initiated by the teacher's use of questions. The term is used frequently by the teachers in the study to describe verbal interactions with pupils initiated by a question from the teacher. Types of questioning referred to by the teachers included open and closed questions and the cognitive order of question based on Bloom's taxonomy.

List of Abbreviations

AACTE	American Association of Colleges for Teacher Education
AfL	Assessment for Learning
BTEC	Business and Technology Education Council (awards)
CDA	Content Discourse Analysis
CHAT	Cultural Historical Activity Theory
COP	Community of Practice
EBITT	Employment Based Initial Teacher Training
EPSE	Evidence-based Practice in Science Education
CPD	Continuing Professional Development
DfE	Department for Education
GCSE	General Certificate in Secondary Education
OFSTED	Office for Standards in Education
IRE	Initiate Response Evaluation
IRF	Initiate Response Feedback
ISA	Individual Skills Assessment
ITT	Initial Teacher Training
NQT	Newly Qualified Teacher
PCK	Pedagogic Content Knowledge
PGCE	Post Graduate Certificate in Education
SCITT	School Centred Initial Teacher Training
SETT	Self-Evaluation of Teacher Talk
SOLO	Structure of Observed Learning Outcomes (taxonomy)
SWH	Science Writing Heuristic
TBS	Teacher Belief Survey

Appendix A

Interview schedules

The following appendices include the interview schedule for interviews 1,3 and 5 and the card sort statements for the two ranking exercises in the end of year interviews.

A.1 Year one interview schedule for semi-structured interviews.

When you started your training you must have had ideas about what teaching involved, has this changed over the year?

How did the lesson I watched reflect these changes?

Tell me about how you go about planning lessons.

Tell me about different kinds of talk you use in your classroom.

What different strategies for questioning do you use?

How do you decide what question to ask in lesson?

Does the kind of talk you use vary in different lessons and with different groups.

I'm going to show you some sets of cards that describe different kinds of classroom talk, the first one has teacher to class talk:

Can you put them in order of how often you use them: (Every lesson, most lessons, about half of lessons, occasionally, rarely)

The next ones are teacher to pupils talk.

The last set is pupil-to-pupil talk.

Which types of talk do you think have the most and least impact on pupil's learning?

Why?

Where there is a difference in ranking, ask why.

Has your understanding of classroom talk developed since the start of the course?

Can you recall the experiences that have changed your use of classroom talk?

Do you feel your training prepares you well for using talk in the classroom to support learning?

The next set of cards describe different aspects of your training. What impact have these had on your use of talk in the classroom?

What do you think might help you develop your use of classroom talk over the next year?

What concerns do you have about the development of your understanding of talk over the next year?

A.2 Year two interview schedule for semi-structured interviews.

Second Interview schedule.

Have your ideas about what teaching involves changed over the year?

Has the process of planning lessons changed during the year?

Tell me about different kinds of talk you use in your classroom and how this has changed over the year.

How did the lesson I watched reflect these changes?

What different strategies for questioning do you use?

How do you decide what questions to ask in lessons?

Does the kind of talk you use vary in different lessons and with different groups?

I'm going to show you some sets of cards that describe different kinds of classroom talk, the first one has teacher to class talk:

Can you put them in order of how often you use them: (Every lesson, most lessons, about half of lessons, occasionally, rarely)

The next ones are teacher to pupils talk.

The last set is pupil-to-pupil talk.

Which types of talk do you think have the most and least impact on pupil's learning?

Why?

Where there is a difference in ranking, ask why.

Has your understanding of classroom talk developed since the start of the course?

Can you recall the experiences that have changed your use of classroom talk?

Do you feel your PGCE training prepared you well for using talk in the classroom to support learning?

The next set of cards describe different aspects of your training. What, if any, impact have these had on your use of talk in the classroom?

What do you think might help you develop your use of classroom talk over the next year?

A.3 Year three final interview schedule for semi-structured interviews.

Final Interview schedule.

What different kinds of talk do you use in your lessons?

What do you see as the different purposes of classroom talk in your lessons?

Does the kind of talk that you use vary in different lessons and with different groups or ages?

In what ways do you feel your understanding of classroom talk has developed since you began training as a teacher?

Can you recall any particular experiences that have changed your use of classroom talk?

Are there any changes in your understanding of classroom talk or the ways you use it in your lessons that might be described by any of the following statements? (Prompt sheet provided)

Changes have become part of who I am as a teacher

Changes have altered my practice in ways that I don't expect to undo

Changes have involved me making connections between different parts of my knowledge and practice

Changes have been difficult and complex to master

Changes I have made are unique to the skills and knowledge of teachers

I'm going to show you some sets of cards that describe different kinds of classroom talk, the first one has teacher to class talk:

Can you put them in order of how often you use them: (Every lesson, most lessons, about half of lessons, occasionally, rarely)

The next ones are teacher to pupils talk.

The last set is pupil-to-pupil talk.

Which types of talk do you think have the most and least impact on pupil's learning?

Why?

Where there is a difference in ranking, ask why.

Do you think that your response to the cards has changed over the course of the last three years?

The final set of cards describe different aspects of your training. What, if any, impact have these had on your use of talk in the classroom?

A.4 Card sort statements used in end of year interviews.

Card sort statements describing teacher-whole class talk:

Presentation of knowledge and ideas without pupil interaction.

Presentation of knowledge and ideas with pupil interactions.

Questions to the whole class with one pupil responding.

Questions to the whole class with all the pupils responding.

Teacher led class discussion.

Giving instructions and directions to the whole class.

Card sort statements describing teacher-pupil talk:

One-to-one questioning to support pupils thinking (scaffolding).

One-to-one feedback to prompt pupils' completion of tasks.

Card sort statements describing opportunities for pupil-pupil talk:

Paired work requiring discussion between two pupils.

Group work requiring discussion between pupils.

Activities requiring pupils to present to the rest of the class.

Individual work that doesn't require discussion between pupils.

Card sort statements describing different aspects of the PGCE training that might contribute to professional knowledge of classroom talk:

Year one interview

School placements –classroom experience

School training sessions – INSET and PGCE sessions in school

University sessions

Mentor feedback on lessons

University tutor feedback on lessons

Your own reading

Academic assessments

Year two and three interviews:

Classroom experience

School INSET and CPD training

University sessions

PGCE Mentor feedback on lessons

University tutor feedback on lessons

Your own reading

Academic assessments

NQT Mentor feedback

Advice and discussion from colleagues

Self-reflection and evaluation

Science faculty meetings

Online resources and forums

Appendix B

Sample transcripts

Appendix B contains partial sample transcripts each from one of the semi-structured and unstructured interviews in year two of the study.

B.1 Extract from sample transcript of year two semi-structured interview

Sophia Y2 Interview 2

Interviewer how do those lessons reflect this year for you?

Sophia 1 I think that the time of day, like in terms of perfection the time of day, I think I was quite independent in the year seven lesson and leaving it quite open ended to classroom discussion, feeding back, talking as a class, but I think it was more dictated in the period six because I know what they're like if I leave them to discuss the two long... and especially period six and I knew how much content I had to cover so I think I was a little bit more regimented probably and didn't allow class discussion as much but I think I did a lot of talking in the year seven lesson with them when they were doing the practical which, I always do practicals, I go around and talk to them, question them. Which is really good for me because if I just wait until the end, and you know well 'what did you put' they don't have a clue sometimes. If you go and talk to them one-to-one I think they get some sort of answers from you. So I think that sort of classroom discussion is easier to do in a practical, it's hard to do when you doing concept because quite often they don't know and they can't discover, they've got nothing already in their minds. But I think doing practical they can get information for themselves before you talk to them.

Interviewer are you conscious then that when you're planning there's quite a difference between lessons that are focused on practical skills rather than content?

Sophia 2 I think with concepts as well, especially, with your key stage 3 not so much, but with key stage 4 I'm conscious that you need to keep classroom discussion to a minimum because of the content and if we get the content done within the lesson and

we have opportunity to do at the end I'm more likely to do more open discussion at the end and spend more time on that. Because I know that I've embedded it and it's already there rather than getting to the end of the lesson and not actually have reached it, because I spend too much time talking about just one outcome because I know the following lesson I'm going to be behind and then the following lesson, so I think that that does affect my classroom discussion, the amount of time that I have, which is really annoying.

Interviewer it annoys you?

Sophia 3 it does annoy me because I don't give them a chance for the like, it depends on their ability, but I could give them more of a chance to think about it for a little bit longer and maybe do a bit of research, but sometimes I just don't have time for that, I have to tell them. But then I do sometimes. It works both ways, not all my lessons I just tell them, drill them. I think I'm still quite creative giving them things to, like, look at and discuss, but it does frustrate me that I can't spend time talking or listening to them talk.

Interviewer and that time pressure comes from where do you think?

Sophia 4 the specification.

Interviewer to follow the specification directly what you have a...?

Sophia 5 this year I have because it's a bit new to me. I don't want to miss anything, I don't want to be accountable for, or spend too much time in the classroom discussion and then it being exams and I've missed a chunk of work, and that comes up in their exam. That's a lot of pressure isn't it?

Interviewer you talked about 'getting it done', can you explain to me what you mean by that?

Sophia 6 covering what they need to know for their exams.

Interviewer so in terms of your classroom talk, what does 'covering it' mean?

Sophia 7 covering the outcomes.

Interviewer how do you know if you've covered the outcomes?

Sophia 8 in my assessment. I didn't do any peer assessment today, I didn't have time, but I do a lot of peer assessing and we do a lot of whiteboards and traffic lights. But I think, I'm not really sure, I don't know, I've observed a few teachers but I think generally I do, most of my tasks I do put time into them to discuss in pairs and also time to feedback to the class and get different perspectives. I don't just go this is what you will be learning this is the answer. Which would save time sometimes. But yes I think I do, but in the back of my mind I'm aware of the restraints that I have on time.

Interviewer so there are constraints on the way you organise your classroom in terms of the talk?

Sophia 9 I always start off with talk, most of my lessons, get ideas and from me to know where they are already?

Interviewer for them to talk?

Sophia 10 yes, generally. I have actually, well I've started veering a little bit away from talk because a whole school approach is to use literacy, so I've started getting them to read a bit more. But then I use that with talk as well so I try and get people to read out loud, so that's another type of classroom talk which they don't, most pupils don't really like. The confident pupils do but I think it's a good skill to have.

Interviewer so they are vocalising ideas that they've written down before?

Sophia 11 yes so they put down, and also interpreting and yes...

Interviewer so that is a form of talk?

Sophia 12 yes.

Interviewer and what about writing something down is that a form of talk?

Sophia 13 I think it's a form of talk because it's what they are saying in their mind.

Interviewer so some of it could be internal?

Sophia 14 that's the difficulty actually with talk, well vice versa with their talk, and their written skills, it depends on the character, the pupil. Some pupils really confident with talking and then they can't actually transferred that to paper. And then other pupils can write amazingly, I've got a few level 6 pupils in my year

nine class and they write really intricately with loads of detail, that make sense in paragraphs. And then asked read it out loud and they panic and they can't give their answer in the form of talk, classroom like discussion. So I try to give time where an important part of the lesson and do a lot more presentations.

Interviewer and that's a difference between individual pupils?

Sophia 15 well that's big difference, but I don't know whether they should, whether it matters. I don't know yet because I'm not as experienced but does it matter if they can't stand up and communicate in front of groups of people or verbally discuss an idea if they can actually write and put it onto paper, does it make a big difference? I don't know yet. It's a thing I'll learn over the years I think?

Interviewer it is an interesting question, does it matter the other way round if they can verbalise it can't write it down?

Sophia 16 well in terms of their exams it does.

Interviewer so if examinations were oral they would have to be able to speak it. So the examination format has an impact?

Sophia 17 I suppose it does in science, but in other subjects because you still do orals in English and MFL.

Interviewer to get a sense that you're doing less talk because of that or just that it's changing the way, changing your focus or emphasis?

Sophia 18 I'm not sure. I don't think I do less talk I think, yeah every lesson I have some form of talk. I go round the classroom, I talked one-to-one, I get some feedback, I model through talk.

Interviewer model in the sense of?

Sophia 19 so I'll get the pupil to model their answer and then get another pupil to feedback what they can improve, then I'll discuss their answer and then we have a classroom discussion. If we doing like criteria we can put ideas down as a class and feedback. So I think that's one of my important parts of my lesson is when I get the pupils to discuss their work because they can actually see what each other writing.

Interviewer so they discuss it in pairs groups?

Sophia 20 yes definitely.

- Interviewer so the second lesson today was there less of that the normal?
- Sophia 21 yeah, well I think that I did allow them to discuss ideas but I got the impression that they were quite excitable and they were veering off topic so I kept it to a minimum. I didn't cast out completely because I did want them to discuss the pictures of genes, alleles, I want them to feed back. And I want to work together to get the offspring, so they had to discuss at different points, but not for like a long period of time.
- Interviewer that notion of talk being something that is not focal but maybe internal, is that a new idea or is that something you thought all the way through.
- Sophia 22 that's my own personal view.
- Interviewer How long have you held that view if that's possible to answer?
- Sophia 23 because when I talk or I write this is just the way my brain works but I can see in my head, I visualise going through the words of what I'm saying, I don't know if that's the same for everybody, but that's just my perspective. I think that you have to think about it and actually talk through it in your mind and I know, I'm aware that I do that and some people do that, but I'm also aware that a lot of my pupils do not do that. They just literally write down what they think at that moment, they don't think about it before, they don't have that discussion in their mind before they write things down. So that's when I have to intervene and actually talk to them, to make them have this conversation with me, this dialogue.
- Interviewer so do you see yourself as providing one of the voices of which you already have both in your head?
- Sophia 24 yes... Like a devil's advocate. 'Why do you think that, could you explain that a bit further?' And they don't have that in their mind at the moment, I don't think in my year eights and year nines, I don't think why have I written that why have I written that down, they just write it down because that's what they think the answer is. But if I can get them to think about it a bit more well why do they believe that they can justify it then I think they could have a lot more detail in their discussion in

their answers. That's just at the moment that's how I feel, that's what I get the impression of.

Interviewer and that's come from your own reflections on how it feels to learn yourself. And this may be an impossible question but do you have a sense that that's something that developed for you as you grew up and became experienced as a learner or do you think that's something that, that is your approach...

Sophia 25 I don't think I've always had that no, I think that it's something that you can teach them to do which we doing lessons, so I give them open-ended questions all the time, but it's something that I believe you have to learn to do, reflecting at evaluating. It's high ended high-level skill and as you get older, as your brain develops you learn more and I think it becomes easier. But then that is not always true because some of my year sevens can reflect and evaluate their thoughts and some of my year 11's can't, so I think it just depends on how your brain works, what you understand or your ability possibly. But for me personally as I've got older I've become more reflective.

Interviewer do you think that's something that you're planning and design of lessons, you're conscious of trying to develop that in the pupils?

Sophia 26 mmm, because you're always trying to push them to justify and evaluate and try and aim to get towards those skills that are at the higher end of the spectrum, so for them to be, to reach that you've got to intervene and provide them with the tools or questions to understand what they need to do.

Interviewer do you think they're different parts of the syllabus that require different things, are there some lessons, some topics you teach where that is less the case or is it universal?

Sophia 27 yes I think with chemistry, I think is less open to discussion because this is it, this is the periodic table, this is the answer, this is what you find and is quite dictative, it's the spec at the moment. And that's what they need to know but I think with biology and also a bit of physics, like around when you're doing the big bang in the red shift and creationism and also with biology with ethical issues, IVF or something that has a little bit more open discussion and they cannot she reflect and justify

their answers but not so much in chemistry. That's the impression I get at the moment but I suppose in chemistry in a little bit higher, at triple or A-level, I think it is maybe a bit more open to speculation.

Interviewer so would you envisage the development of that ability to have internal dialogue being something that they would develop as they get older and progress to more complex understanding that they will be using in other subjects?

Sophia 28 I don't know if they can be, some things can be, I don't know if it's more, I think classroom discussions more linked other subject areas. The pupils that I found to reflect the best are at a high level are usually better at English and constructing paragraphs and writing contradictions and justify their answers, but then that's not always, that's the majority but there are some pupils who can hardly write but can discuss their answers quite clearly.

Interviewer so the focus on literacy skills could be quite important, could be quite an important connection.

Sophia 29 yes I think so, from my experience.

Interviewer and yet at the beginning there was a sense in what you are saying, tell me if I'm wrong, that the focus on literacy had moved away from talk?

Sophia 30 yes I realise now that you can't have a lot of discussion unless they are aware of how to construct sentences, or use scientific keywords or common keywords.

Interviewer you talked about this, I think, in interviews before, about constructing sentences so that's a realisation forming over the year or right now as we talk?

Sophia 31 I think it's been throughout the year.

Interviewer have your questioning strategies changed over the course the year at all?

Sophia 32 I'm not aware that they have.

Interviewer so you'd feel they were broadly similar?

Sophia 33 yes I think so.

B.2 Extract from sample transcript of year two unstructured interview

Jason Y2 Interview 1

Interviewer Talk to me a little bit generally first of all about the challenges of your first term.

Jason 1 The challenges I've had have been to start with trying to remember what the hell I'm doing, I'm finding that I'm not, because I don't have to plan everything to the same level of detail, I'm not doing. Which is mixed in terms of its benefits in that I'm no longer completely frazzled at all times and running into the classroom and going I know what I'm teaching but I don't think I actually can. But I don't think I'm always giving as good a lesson each lesson. So for example today the planning of my lessons was minimal today so I walked into my first lesson of the day and I knew pretty much what I was doing, I knew we were going outside and I knew that we were collecting leaves and I knew that, I had some bits of a PowerPoint and some bits of paper to give them but other than that it was kind of like I know vaguely where we're going but I don't know what I am going to say to them at the beginning, in all its entirety and I don't know quite how we're going to finish the lesson off but I know that will get to the end of the lesson. Then my last lesson of today before this revision session was, I had no idea what I was doing with them when I walked in this morning and they had a lesson, today it wasn't very useful for them but the lesson that I did with them today will be useful next lesson. But if I had been more sort of planned with it then it might have been useful for them this lesson for today. So I feel like, yeah, although I'm able to actually get on with it and do it better without just constantly being tired it's not quite as good in some ways.

Interviewer It's interesting, and something that I wanted to bring up with you, there was a sense last year that you had been kind of liberated from the constraints of planning and that was just in terms of the documentation and now you have been liberated even from that I guess, but do you have to do any formal lesson plans?

- Jason 2 Only when I'm being observed and even then I don't actually have to do it, it's kind of optional if you feel like it so...
- Interviewer so there's a sense in which you have been freed from that and yet you are saying that hasn't entirely freed you from something?
- Jason 3 yes...
- Interviewer what's the missing bit, you said when you go into these lessons having planned it quite quickly that there is some stuff missing...
- Jason 4 just things like, exactly what questions I am going to ask or exactly how I am going to shove them through the different bits, like the different bits that I want to do but I won't necessarily know exactly at what point they should be doing it and I might change my mind about the timings more, everything is a little looser so generally I pretty much know where I'm starting, when I'm going to do what I want them to have done but I don't always know exactly how it's going to happen.
- Interviewer and does that vary in how successful that is?
- Jason 5 yes I have days when it works brilliantly but I also have days when it's like... That was a disaster so yes it's very mixed in terms of how it works out and I think a lot of it is how on the ball I am so if I'm fully awake with it then a looser lesson works better than a tighter lesson but if it's the last lesson on a Friday and I've had a hard week I don't know exactly what I'm doing it can sometimes go awry.
- Interviewer is it different in terms of different subject areas?
- Jason 6 no because I only teach one, basically I only teach biology.
- Interviewer do you think that has an impact, would you feel different if it was physics, your main subject?
- Jason 7 if it was physics I would have to plan it more because a lot of it I'm not as good at physics as I am at biology.
- Interviewer okay so biology doesn't feel like you're out of your subject area?
- Jason 8 no biology feels more like I can do it easily in biology whereas in physics it would need to be a bit more thought about and

structured and planned and chemistry that would be disastrous so...

Interviewer how else is it different now than it was at the end of last placement as a student?

Jason 9 it feels realer, in that I have to think about things like interventions and data and stuff now she feels like it's real, the interventions and data that I'm doing. Because before is very much like, yeah it matters what I'm doing but I don't really understand what I need to do about it, I'm letting people tell me what I need to do about it. Whereas now, although I may not actually know what to do about it, it's more me to sort of go to people with the ideas and say how about if I try this rather than going I don't know what I'm doing.

Interviewer and is that effective, is it working?

Jason 10 it is better because it makes me more reflective about the whole thing so rather than turning up and doing and being told to do this I actually have to go away and think about it and what might work and then talk to people about what might work.

Interviewer you mentioned interventions and data, and they have an impact on what you're doing in the classroom?

Jason 11 very much, I've got a year nine GCSE group who fingers crossed won't actually be doing the GCSE this year because their horrific, they're just so not ready for it. So they struggle with, on exam papers they struggle with how science works questions and data and that sort of thing so with that in mind I now have specific lessons where we work on how science works stuff, data, so every fortnight I pull out the this is your how science works lesson, we will go through a booklet, we'll talk about it, we'll peer assess, all that sort of jazz in the hope that that will sort of drag that up a bit because I know that they can recall but I know that they can't necessarily look at, they don't understand the whole processes of how science works as well as they could do and they can't analyse data which is what they have to do so they have very specific things that are purely on that to try and pull it up to the recall bit.

Interviewer do you think your use of talk has changed this term?

Jason 12 it probably has, yes it has. I think I'm less conscious about how I use it so, no maybe not less conscious but I'm less, I don't claim to have as little as possible at all times now. I'm happy for there to be more as long as there is enough and not too much but I don't do it down to there must be 10% of the lesson will be teacher talk which is sort of what by the end of the second placement I was trying to aim for. But that doesn't, I thought about it since and that doesn't actually make sense to me as much as it did in that you can't necessarily fit a clear explanation into 10% of your lesson talking time. So I think I'm doing more than trying to do it better, whether I'm succeeding in doing it better I'm not sure.

Interviewer tell me a bit more about that sense of trying to establish whether you feel you do it better or not, what would better be and how would you know it was better?

Jason 13 better would be clear explanation that the kids got and I think that for some of the time it works pretty well but I know that other parts of the time it really doesn't, I got a really weak year eight set, like really properly weak, I've got one kid who can't speak English beyond about six words and can't speak Bangladeshi beyond about six words and is very really SEN and that set I find that I do what I think is a clear explanation but it really isn't, I'll say off you go and they'll say I don't understand, great. So whether that is that I've misjudged where their starting point is or whether it's that I'm explaining it badly I'm not quite sure. I think it's mainly that I'm misjudging the starting point but I don't think it can be that every time or whether it's just that they're assuming that they don't understand because I know that a couple of the kids give them the task they won't even bother looking at the task before their saying I don't understand so difficult to judge at the moment.

Interviewer interesting and I'm looking at the transcript of what you said last year and you said right in the interview thinking ahead, I'm going to try less of the standing at the front and talking and try to do more with particular individuals or small groups and that's changed, you've got a different route there?

Jason 14 I have and I think that's a response to the actual classes I have so the stronger classes or the more mature classes I do tend to

do that a bit more with the weaker and younger classes that just doesn't work because if I try and do that, if I try and concentrate on a small group the rest have gone completely off task because of their behaviour issues, generally, and they just don't, without me being constantly there to go you need to be thinking about this they can't cope so for example my year nine top set group they can, they could be sent off and I can go around and talk to them individually, or even my year 10 BTEC class, I can talk to individuals or a couple of people at a time and that's okay because the rest of them are getting on with what they're doing. I only had three science classes which is, yeah. So this one other class I'm finding that I can't do that at all. So it's mixed, it's depending on the actual class and the circumstances of the day as to whether I'm actually able to do that.

Interviewer so do you start with a particular pattern of talk and then you kind of modify it or...

Jason 15 exactly yes so I'll think, I'll walk into the lesson thinking I'm going to talk about this and then give it to them and then we can move on and then something will happen and it will either work brilliantly and that's fine, and that will work fine for the lesson or something will happen that will derail it, like they don't understand what a measurement is or that sort of thing and it's sort of like right okay, I'll have to start again and then it turns into very much a sort of standing at the front and talking lesson because then I've got nothing to actually give to them to do because I've really not planned for it to go in the direction that it is doing.

Appendix C

Nvivo coding structure

Appendix C contains the list of coding nodes used in nvivo with the descriptions of the nodes.

Node name	Influencing factors
Description	Parent node for all aspects of practice and context that influence choices and decisions about the use of classroom talk.
Node name	Influencing factors\Classroom and pupil influencing factors
Description	Parent node for aspects of practice and context located within the participants experiences of the science classroom and pupils that influence choices and decisions about the use of classroom talk.
Node name	Influencing factors\Classroom and pupil influencing factors\Ability difference
Description	Different classroom talk used depending on the academic ability of pupils.
Node name	Influencing factors\Classroom and pupil influencing factors\Behaviour
Description	Constraints on classroom talk from negative behaviours and perceptions of negative behaviour or increased opportunities for talk arising from appropriate or improving behaviour.
Node name	Influencing factors\Classroom and pupil influencing factors\Different topics suit different kinds of talk
Description	Different classroom talk used depending on the topic of science being taught.
Node name	Influencing factors\Classroom and pupil influencing factors\Gender differences
Description	Influence of gender on decisions about classroom talk or perceptions of gender differences in pupil response to different types of talk.
Node name	Influencing factors\Classroom and pupil influencing factors\Getting to know pupils as individuals
Description	Influence of familiarity and relationships with pupils on decisions about classroom talk.
Node name	Influencing factors\Classroom and pupil influencing factors\Impact of practical work
Description	Influence of practical work in science on decisions about classroom talk.
Node name	Influencing factors\Classroom and pupil influencing factors\Physical environment

Description	Influence of the physical environment on decisions about classroom talk, seating arrangement and facilities in the classroom.
Node name	Influencing factors\Classroom and pupil influencing factors\Pupil age
Description	Influence of pupil age on decisions about classroom talk.
Node name	Influencing factors\Classroom and pupil influencing factors\Pupil reluctance to talk
Description	Influence of perceived unwillingness from pupils to engage in talk in the classroom on decisions about classroom talk.
Node name	Influencing factors\Classroom and pupil influencing factors\Variety of activity
Description	Different kinds of talk used as part of a motivation to include a variety of activities in lessons.
Node name	Influencing factors\Individual teacher influencing factors
Description	Parent node for aspects of practice and context relating to the individual teacher's view of their own knowledge and identity that influence choices and decisions about the use of classroom talk.
Node name	Influencing factors\Individual teacher influencing factors\Confidence - subject knowledge
Description	Constraints on classroom talk from limited subject knowledge or lack of confidence in subject knowledge or a positive Influence on talk from improving subject knowledge.
Node name	Influencing factors\Individual teacher influencing factors\Curriculum knowledge
Description	Constraints on classroom talk from limited curriculum knowledge or Influence of improved curriculum knowledge.
Node name	Influencing factors\Individual teacher influencing factors\Learning theories
Description	Explicit reference to learning theories as influences on decisions about classroom talk.
Node name	Influencing factors\Individual teacher influencing factors\Teacher identity
Description	Parent node for nodes relating to participants sense of their own identity as a teacher and the effect of this on classroom talk.
Node name	Influencing factors\Individual teacher influencing factors\Teacher identity\Becoming experienced
Description	Reference to feeling more experienced and confident in themselves as a teacher,

Node name	Influencing factors\Individual teacher influencing factors\Teacher identity\Delivering knowledge
Description	Implied or stated view of teaching as transmission of knowledge.
Node name	Influencing factors\Individual teacher influencing factors\Teacher identity\Facilitator
Description	Implied or stated view of teaching as facilitating learning.
Node name	Influencing factors\Individual teacher influencing factors\Teacher identity\Inspiring pupils
Description	Implied or stated view of teaching as inspiring curiosity and fostering a desire to learn.
Node name	Influencing factors\Individual teacher influencing factors\Teacher identity\Less teacher led lessons
Description	Change in lessons to become less teacher led with more independent activity for pupils.
Node name	Influencing factors\School influencing factors
Description	Parent node for aspects of practice and context relating to the school setting and community of practice that influence choices and decisions about the use of classroom talk.
Node name	Influencing factors\School influencing factors\Assessment regime
Description	Constraints on practice from the demands of formal summative assessment e.g. examinations, internal progress tracking etc.
Node name	Influencing factors\School influencing factors\Community of practice
Description	Expectations from colleagues, line managers and school ethos
Node name	Influencing factors\School influencing factors\Professional performance indicators
Description	Influence of formal appraisal and observation processes within school
Node name	Influencing factors\School influencing factors\School inspection
Description	Constraints on classroom talk from perceived expectations of external evaluation of teaching, e.g. Ofsted inspection.
Node name	Influencing factors\School influencing factors\The need to cover content
Description	A perception of the need to cover curriculum content.
Node name	Influencing factors\School influencing factors\Workload

Description	Constraints on classroom talk from limitations of time and the demands of managing workload.
Node name	Knowledge of classroom talk
Description	Top tier parent node for explicit and implicit knowledge of forms of classroom talk.
Node name	Knowledge of classroom talk\Modes of classroom talk
Description	Parent node - Explicit mention of an organisational structure to classroom talk.
Node name	Knowledge of classroom talk\Modes of classroom talk\Non-verbal dialogue
Description	Forms of dialogue between teacher and pupil not requiring any verbal discourse. Typically referring to dialogue through written work.
Node name	Knowledge of classroom talk\Modes of classroom talk\Pupil-to-pupil talk
Description	Paired or group talk between pupils.
Node name	Knowledge of classroom talk\Modes of classroom talk\Pupil to teacher talk
Description	Talk between pupil and teacher initiated by the pupil.
Node name	Knowledge of classroom talk\Modes of classroom talk\Pupil to whole class talk
Description	Individual or group talk by pupils directed at the rest of the class e.g. presentations.
Node name	Knowledge of classroom talk\Modes of classroom talk\Teacher led class discussion
Description	Teacher led class discussion around an open question, issue or topic.
Node name	Knowledge of classroom talk\Modes of classroom talk\Teacher questioning
Description	Questions directed at one or more pupils within a whole class Q&A or individual work by the teacher.
Node name	Knowledge of classroom talk\Modes of classroom talk\Teacher-to-individual-pupil talk
Description	Talk initiated by the teacher between teacher and one or a small group of pupils.
Node name	Knowledge of classroom talk\Modes of classroom talk\Teacher-to-whole-class talk
Description	Talk by the teacher directed at the class as a whole.
Node name	Knowledge of classroom talk\Personal concept of classroom talk
Description	A framing of a concept, model or general sense of what classroom talk means to the teacher .

Node name	Knowledge of classroom talk\Planning for talk
Description	Parent node – Reference to planning in relation to classroom talk

Node name	Knowledge of classroom talk\Planning for talk\Activity led
Description	The talk is determined by the choice of activity

Node name	Knowledge of classroom talk\Planning for talk\Choosing the right words
Description	Planning or reflecting on keywords and choices of terminology.

Node name	Knowledge of classroom talk\Planning for talk\Planned questions
Description	Planning questions to use in the lesson.

Node name	Knowledge of classroom talk\Planning for talk\Planning time for teacher-pupil talk
Description	Planning activities that are intended to provide time for one-to-one and small group interactions by the teacher.

Node name	Knowledge of classroom talk\Planning for talk\Planning variety
Description	Planning a range of activities and modes of talk to provide variety.

Node name	Knowledge of classroom talk\Planning for talk\Spontaneity of talk
Description	Accepting or preferring classroom talk as an instinctive and spontaneous response to the context of the lesson.

Node name	Knowledge of classroom talk\Planning for talk\Structuring whole class discussions
Description	Planning opportunities for class discussion and developing lesson structures to support this.

Node name	Knowledge of classroom talk\Purpose of classroom talk
Description	Parent node - Knowledge of classroom talk implied through discussion of the purpose of classroom talk.

Node name	Knowledge of classroom talk\Purpose of classroom talk\Assessment of learning
Description	Classroom talk with the purpose of assessing pupils learning

Node name	Knowledge of classroom talk\Purpose of classroom talk\Classroom management
Description	Classroom talk with the purpose of managing the learning environment and pupil behaviour.

Node name	Knowledge of classroom talk\Purpose of classroom talk\Developing communication skills
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Description	Classroom talk with the purpose of developing oral and written communication skills
Node name	Knowledge of classroom talk\Purpose of classroom talk\Developing science skills
Description	Classroom talk with the purpose of developing specific science skills
Node name	Knowledge of classroom talk\Purpose of classroom talk\Emotional and social development
Description	Knowledge of classroom talk implied through purpose of enhancing social skills such as confidence.
Node name	Knowledge of classroom talk\Purpose of classroom talk\Engaging pupil Interest
Description	Classroom talk with the purpose of creating an engaging learning environment.
Node name	Knowledge of classroom talk\Purpose of classroom talk\Learning ideas and concepts
Description	Classroom talk with the purpose of understanding science concepts.
Node name	Knowledge of classroom talk\Purpose of classroom talk\Relationships with pupils
Description	Classroom talk with the purpose of establishing and developing relationships with pupils
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Node name	Sources of professional knowledge
Description	Parent node - sources of knowledge about talk.
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Node name	Sources of professional knowledge\Acting as a mentor
Description	The Influence of mentoring other colleagues
Node name	Sources of professional knowledge\Colleagues
Description	Advice and feedback from school colleagues without a formal mentoring role.
Node name	Sources of professional knowledge\Continuing professional development
Description	Engagement with CPD either in school or on training courses at other venues.
Node name	Sources of professional knowledge\Formal appraisal
Description	Feedback from formal appraisal processes.
Node name	Sources of professional knowledge\Mentor feedback
Description	Advice, coaching and feedback from a formal mentor.

Node name	Sources of professional knowledge\Observation of classrooms
Description	Experiences of observing other teachers.
Node name	Sources of professional knowledge\Online teacher resources
Description	Online teacher resources as a source of knowledge.
Node name	Sources of professional knowledge\Own experience as a learner
Description	Drawing upon own experiences of learning and school.
Node name	Sources of professional knowledge\Reading
Description	Reading as a source of professional knowledge.
Node name	Sources of professional knowledge\Reflection on practice
Description	Evaluation and reflection on experiences as a trainee and forming judgements about the effectiveness of teaching approaches employed.
Node name	Sources of professional knowledge\Research and theory
Description	University teaching, reading and academic assignments relating to theoretical perspectives and research evidence.
Node name	Sources of professional knowledge\This research project
Description	Influence from involvement in this research project.
Node name	Sources of professional knowledge\University sessions
Description	Reference to taught university PGCE sessions
Node name	Sources of professional knowledge\University tutor
Description	Feedback and coaching from university tutor.
