

UNIVERSITY OF SOUTHAMPTON

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MEETING UP IN MINECRAFT: OPPORTUNITIES FOR COLLABORATION AND CREATIVITY WHEN
PLAYING AN IMMERSIVE, VIRTUAL WORLD GAME.

by

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March 2017

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List of Accompanying Materials

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Appendix B: Coding instrument

Appendix C: Coded tables of dialogue for pilot study

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Appendix F: Screenshots of the play in the Minecraft world

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DECLARATION OF AUTHORSHIP

I, Linda Cooper

declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

Meeting up in Minecraft: using games to investigate peer to peer talk in the primary classroom,

I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University;
2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
3. Where I have consulted the published work of others, this is always clearly attributed;
4. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
5. I have acknowledged all main sources of help;
6. Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
7. None of this work has been published before submission

Signed: L Cooper

Date: 18.2.17

Acknowledgements

Thank you to the following people for their help and support throughout the duration of this thesis:

To my supervisors:

Christian Bokhove, for the encouragement, boundless enthusiasm and support during this piece of research

Mike Wald who improved this thesis with his reasoned feedback

Melanie Nind for providing such a good mix of challenge and encouragement at pivotal points in in this journey

To my husband, Dave Barber – for being there and giving me space to complete this during a five year period when we were presented with more life challenges than we could ever have imagined

To Alex! Everyone who knows you is hoping that you get better soon

To Issie! For being splendid throughout.

Definitions and Abbreviations

DCSF Department for Children, Schools and Families

DfE - Department for Education

DfES – Department for Education and Skill

MMORGS - massive multi player online role-playing games

MMR Mixed Methods Research

MUVES - multi-user-virtual environments

ICT - Information and Communications Technology

IRF Initiate, Response, Feedback

IDRF Initiate, Discuss, Response, Feedback

IWB - interactive whiteboard

PE - physical education

QUAL - qualitative

QUAN – quantitative

QCA - Qualifications and Curriculum Authority

UNIVERSITY OF SOUTHAMPTON

ABSTRACT

FACULTY OF SOCIAL, HUMAN AND MATHEMATICAL SCIENCES

Education

MEETING UP IN MINECRAFT: OPPORTUNITIES FOR COLLABORATION AND CREATIVITY WHEN PLAYING AN IMMERSIVE, VIRTUAL WORLD GAME.

Linda Cooper

This thesis explores the themes of technology, talk, playfulness and creative learning. The study investigated how children in the primary classroom talk when they use an immersive gaming environment. While creativity, play and talk have been linked with technology on an individual basis, the ways in which all of these themes interact is less well documented. The research began from this observation and sought to explore how technology might facilitate the development of a dialogic environment that supports creative interaction between pupils. Groups of children from two case study schools were engaged in an immersive environment, created using the Minecraft (Mojang, 2009) gaming world, and their talk was evaluated using multimodal socio-cultural discourse analysis.

This demonstrated that, while playing the game, the research participants talked at length and with excitement. The talk patterns were tangled and intertwined, with the dialogue being difficult to transcribe and analyse. The talk showed that the immersive gaming environment gave a virtual space where children could test out their spoken ideas within a small group situation, using informal language devices. They could also virtually represent their suggestions within the Minecraft World. It created an appealing focus for the conversation and encouraged children to be active participants, enacting and evaluating their decisions through collaboration and the co-construction of knowledge. The research indicated that the value of an immersive game environment lies in the emphasis that it places on sharing, agreeing and testing ideas in a creative way.

Chapter 1: Introduction

This thesis seeks to explore the nature of peer-to-peer talk when using technology in the primary classroom in England. It draws together the themes of dialogue, creativity, play and technology and examines their use in the classroom. The research took place in two schools from different counties in the south of England. I worked with two groups of Key Stage Two primary school children, aged between ten and eleven years, over a series of visits to the schools. The research focuses on the use of a commercially produced immersive, virtual world digital game. Within each school, the research involved children jointly participating in a digital game to solve a challenge I had set them within it. Using digital video I collected data detailing how the children went about this task. I was particularly interested in how the children discussed (or did not discuss) the solution to the problem they were set.

This introductory chapter explores the rationale for this research. It also sets the research against the political, educational background and the media portrayal of digital games that occurred at the time of this research; I have included this as I feel it is relevant to understanding the importance of the study. The chapter introduces my research aims and questions and my positionality, concluding with a brief outline of the structure of this thesis.

1.1 Rationale for the research

The research occurred as a result of a long interest in the use of technology acquired as a past primary school teacher, Information and Communications Technology (ICT) coordinator, Initial Teacher Trainee educator of technology and as a parent who has regularly observed young children using technology as a social, playful tool. I have noted over years of primary practice that the role of technology in the lives of children has grown both in educational and in social contexts. I have also observed how children gain so much enjoyment and motivation from the use of technology. In particular, children talk about the digital games they play with intensity and passion. Having been a teacher I have witnessed classroom and playground dialogue about the games the children were playing. They appeared to provide the backdrop for ongoing conversations that continued between home and school lives. Further exploration demonstrated that many of the games played by children appeared to promote creative, multidimensional environments that required determination and persistence to complete.

Something about the games kept the children 'hooked' for many hours, an attribute that I often hoped they would emulate in their classroom work. This inspired me to examine further the uses of technology with a particular focus on games and how these might be used profitably in the primary classroom.

Throughout my journey as a teacher and university educator, I have also come to recognise the importance of the use of sustained dialogue in learning and I am disheartened by the absence of meaningful, pupil dialogue when observing lessons in classrooms. This statement is not intended to imply that, as a teacher educator, I know better than others. Indeed, looking back I can see that there were instances in my own teaching career where I should have given more time for classroom discussion. Perhaps my time as a teacher educator, and my increasingly long length of service, has afforded me time to reflect on the importance of language use. It was from this position, that a rich dialogue is imperative to successful learning, that I began my research.

This interest was accompanied by a personal belief that good learning outcomes are realised via the application of a social constructivist approach to education. Children learn through the collaborative engagement with ideas, not in isolation. As such, the research occurred through the desire to ascertain whether dialogue could be promoted through the use of a commercially produced digital game in a way that would result in productive learning outcomes.

This thesis was also relevant to my own university role. When I started the project, my job involved examining with students the importance of including creative learning processes in primary education. I am interested in the 'processes' of learning and harnessing approaches that engender creative responses in children. The opportunity to take an in depth study of this was immensely attractive and influential in my decision to undertake this research.

1.2 Policy context

The project commenced at a time of flux for the fortunes of Information and Communication Technology in the Primary National Curriculum (DfEE and QCA, 1999) in England. Thus, I briefly contextualise this project against the wider educational landscape of ICT in UK schools.

1.2.1 ICT in education

At the start of the research, in September 2012, ICT was a National Curriculum (DFEE and QCA, 1999) subject, but as of 18th January 2012 the Programme of Study, Attainment Targets and

statutory assessments for ICT had been 'dis-applied' in schools. The driving force behind this move stemmed from the fact that the Programme of Study was deemed to be 'not fit for purpose' (DfE, 2012). Education Secretary Gove, commented that ICT in England's schools was a 'mess', the current curriculum was 'dull and off-putting' and that it did not 'allow enough opportunities for innovation and experimentation' (Kershaw, 2012). The DfE (2012) stated that this 'dis-application' period provided a good opportunity for schools to develop a more ambitious and rigorous approach to ICT in order that the teaching of this subject could be improved.

Prior to the coalition government's announcement on the dis-application of the Programme of Study, ICT was a subject that had received a great deal of attention, investment and development under the previous New Labour government. As Selwyn (2008, p.701) notes,

realising the potential of new technology was one of the central educational themes of New Labour's 1997 election manifesto, with information and communications technology (ICT) established subsequently as a prominent feature of the Blair administration policy portfolio.

Technology was central to the New Labour education manifesto, with ICT being the means by which a future workforce would be up-skilled to ensure employability (Buckingham, 2007). Over a decade of technological development in schools saw the implementation of numerous ICT related initiatives. For instance, the emergence of the National Grid for Learning in 1998 was one of many New Labour ICT landmarks. In addition, in 2003/4, the DCSF initiated the Primary Whiteboard Expansion Project, which provided funding to 21 local authorities to help purchase interactive whiteboards for classroom use. Meanwhile, the Primary National Strategy's Literacy and Numeracy Frameworks had ICT interwoven throughout their programmes of study (DfE, 2011). The British Educational Communications and Technology Agency (BECTA) was established in 1998 and was a driving force in ICT development in schools until funding for this was discontinued in 2011. Futurelab was also created in 2001 via a government funded start-up capital grant with a remit to strengthen use of digital media in schools. Technology, according to New Labour policy, was an unquestioned benefit with the task of the government being to remove any barriers to its adoption (Buckingham, 2007).

However, not all New Labour initiated policies were successful. Selwyn (2008) asserts that it is an unavoidable fact that the New Labour ICT agenda failed to achieve the much-promised technological 'transformation' of the UK education system. He argues that, although New Labour managed to increase the physical presence of technology in the classroom, ICT failed to

alter substantially the nature of UK education as New Labour had assumed it would (Selwyn, 2008). Lankshear (1997) notes that programmes for 'upskilling' teachers to use new technologies suffered from applied technocratic rationality, a view that technology has an independent integrity and power of its own as opposed to relating what is known about new technology with effective pedagogy. Dawes (2001) echoes this by arguing that the government implementation of ICT initiatives were technology led rather than educationally led.

While these dilemmas were playing out on a political stage, teachers were having their own problems keeping up with the pace of change. Although teachers had more access to technology, the effective use of it did not automatically follow. Hennessy *et al.* (2005) suggest that this is because increasing investment in technology infrastructures was not matched by investment in the time and resources needed to develop new ways of learning and teaching. They note that this was exacerbated by the profession's caution when accepting the role of new technologies in the classroom – there was evidence of a conservative approach to harnessing the powerful potential of using ICT to support learning. These authors also point to the top-down implementation of ICT, which governments imposed on educationalists, and that led to critical questioning of the value of ICT instead of the profession adopting a sense of ownership over it. Added to this was the concern that the National Curriculum Programme of Study (DFEE and QCA, 1999) for ICT was deemed outdated. All this contributed to a situation of dissatisfaction with ICT that culminated in the disapplication of the curriculum.

While schools in England awaited the new arrangements for ICT, other educationalists put forward their views about ICT and its place in the primary curriculum. Rose (DCSF, 2009) in his Final Independent Review of the Primary Curriculum firmly embraced the role of technology. He placed ICT centre stage and made it one of the core curriculum requirements and one of the essentials of learning and life. However, the future of ICT within the curriculum was soon to be subject to a much more profound change. In the following years ICT was replaced by the new computing curriculum (DfE, 2013) signalling a new political perspective. ICT, in the form of digital literacy, retained a central place within the curriculum, but it was the addition of a new theme, which required children to learn to code, that caught the attention of both the media and the teaching profession.

This overview shows how much controversy there has been about the role of ICT in education and the level of uncertainty - at both a political and professional level - about its value in primary education. This was the situation that confronted teachers at the time of commencing the research, and it was influential in my decision to explore the role of technology. As an ICT

specialist the political context motivated me to develop a research interest that explored the ways in which technology enhances and promotes and good teaching.

1.3 Children, technology and the media

I commenced this research from the stance that technology has much to offer the educational world and that digital video games are engaging objects. As I watched children play games I became more interested in what they could offer. This contrasts with the media portrayal of digital games, which was (at the time of starting the research) almost entirely negative. As Gillen and Merchant (2013) note, few parents have had first-hand experience of gaming in a virtual world and the media reaction to immersive on-line play is often one of moral panic. The possible threats posed by games, like fears of internet addiction, where children are viewed as wasting their time on-line, and the potential for financial exploitation have been well documented in the media (Collins, 2011; Greenfield, 2009; Cornwall, 2008 to mention just a few). For example, Collins (2011) cites Baroness Greenfield who argues that too much time staring at a screen can cause physical changes in the brain that lead to reduced attention and behaviour problems. As Merchant (2015) argues, although there are clear safety and security issues associated with online activity that should not be ignored, there may also be potential benefits associated with games that should be further explored. This research therefore stands to act as a form of empirically based evidence that may serve, in a small way, to balance media reporting on this subject.

1.4 Research aim

Sinclair and Coulthard's (1975) seminal work noticed that children's talk was organised into a three-part exchange of Initiation, Response and Feedback. This was associated with the teacher asking closed questions, the child responding and then the teacher providing feedback. Further researchers suggested that talk in the primary classroom consisted of predominantly teacher based, whole class interactions that offered children few opportunities to extend dialogue that involved explanations, elaborations and collaboration (Barnes, 1976; Dillon, 1984; Nystrand *et al.*, 1997; Wells, 1999; Cazden, 2001).

In contrast, other researchers present the potential for an alternative view of talk in the primary classroom in the form of dialogic talk (Alexander, 2004; Mercer, 2000; 2004; Mercer and Hodgkinson, 2008; Mercer and Littleton, 2007; Littleton and Mercer, 2013). Mercer and Hodgkinson (2008) suggest that the most frequently used types of talk in the classroom consist

of using rote, recitation and instruction and argue for the use of dialogue (as opposed to 'talking') where children are engaged in explaining, questioning, discussion, evaluation, negotiation, speculation and building on answers.

In 2010, Alexander's Cambridge Primary Review championed the role of dialogue in learning. It presented a view of technology that highlighted the importance of digital literacy as one way to promote the primacy of talk in the classroom as a chief educational aim. Hennessy (2011) and Mercer *et al.* (2003; 2010; 2010a) also suggested that technology like interactive whiteboards (IWBs) provided a useful vehicle around which children might talk in a more extended form akin to the dialogic talk referred to above. Moreover, Wegerif (2007; 2010; 2011; 2013) argued that not only could technology enable dialogic forms of talk but also that the talk was creative in nature too. These pieces of work had a profound impact on me and resonated with my experience as a teacher. They inspired me to develop this research project around the ways technology might enrich and extend dialogue in learning contexts.

I was also influenced by the work of Gee (2007) when starting this research. His book *What Video Games Have to Teach Us about Learning and Literacy* claims that video games can be good learning environments because they are based on a sophisticated understanding of how we learn. Merchant (2015; 2010; 2009) and Marsh (2010) also investigated the diverse literacy practices that accompany game play and this made me want to explore the area further. I was particularly curious about games where children could immerse themselves in virtual worlds and play as avatars alongside their peers within the world using an online environment. I was interested in the potential for additional methods of interaction both within and outside of the game and the opportunities for learning this may generate. Merchant (2015, p.292) argues that the research base in this area is 'still in its infancy'. He states that empirical research on online environments crosses disciplinary boundaries and that there is no comprehensive and systematic literature available, concluding that the state of research in this area is one of diversity rather than depth and invites further sustained investigation. Therefore, this study adds to this limited body of knowledge to date and focuses on how an immersive gaming environment may or may not engender discussion.

The research questions for this study became:

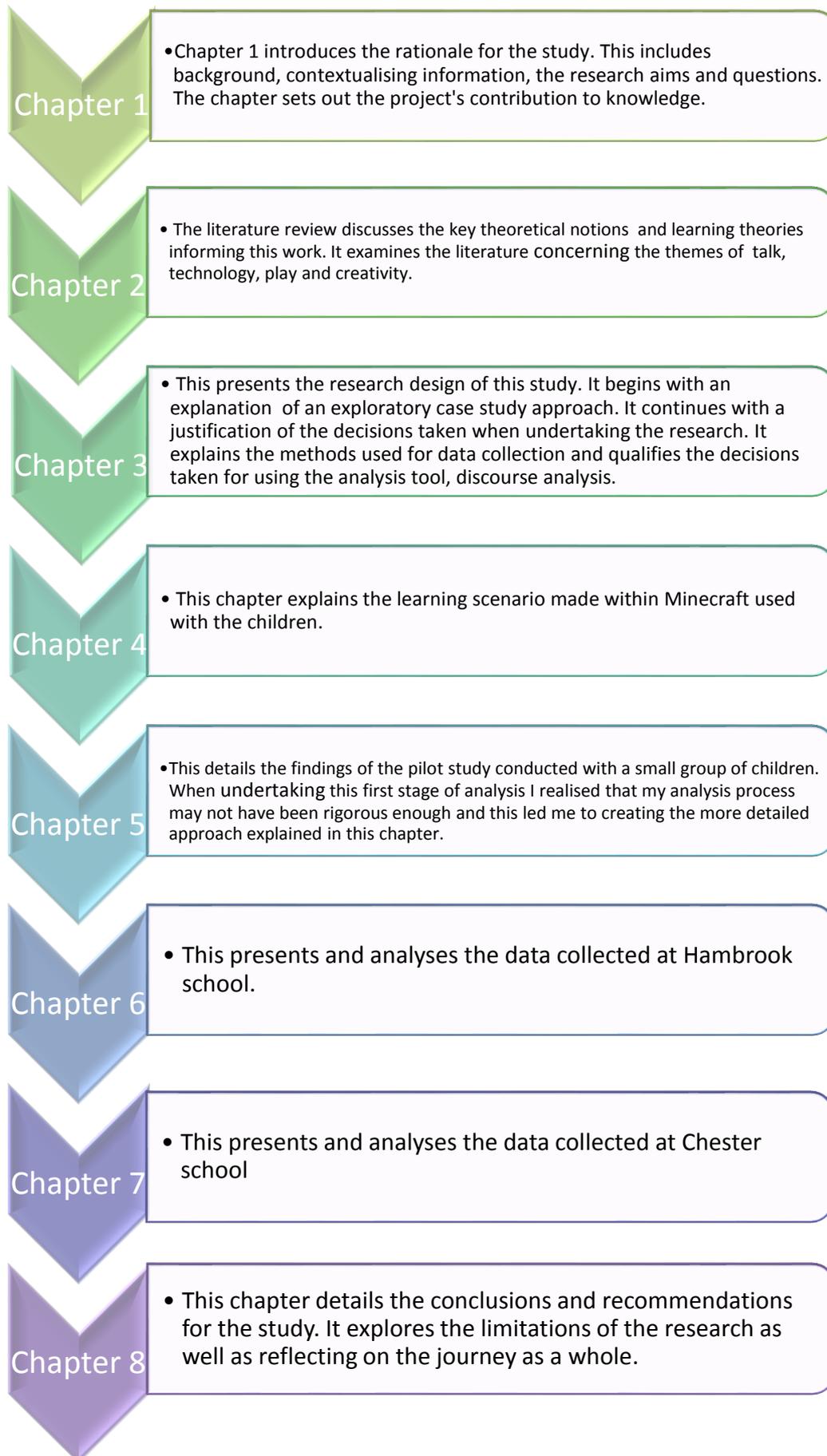
1. What are the features of children's group talk when using an immersive gaming environment?
2. How do children use talk to make meaning when using an immersive gaming environment?

I struggled with my third research question, which focused on the theme of creativity, as I discuss in Chapter 5. Ultimately, its addition acted as a turning point in my study as without it I felt the research was of less interest. The third research question became:

3. How might an immersive gaming environment encourage creative responses from children?

1.5 Structure of the thesis

Figure 1.1 depicts the structure of this thesis



Chapter 2: Literature review

There are four concepts explored in this thesis: talk, technology, creativity and play. However, before embarking upon a detailed examination of these concepts it is important to understand the relationship between them as this is fundamental to the focus and direction of this research.

In this section, I explore the evidence that seeks to identify and explain the relationship between technology, dialogue, creativity and play. In doing so we will see that a number of associations are examined, but that the relationship between all four of these concepts has not been systematically investigated. This observation is relevant because I have sought to understand what happens to dialogue when technology, creativity and play converge in the form of an immersive, interactive educational game. Figure 2.1 illustrates this relationship, it shows the centrality of dialogue in this research with other the themes surrounding it.

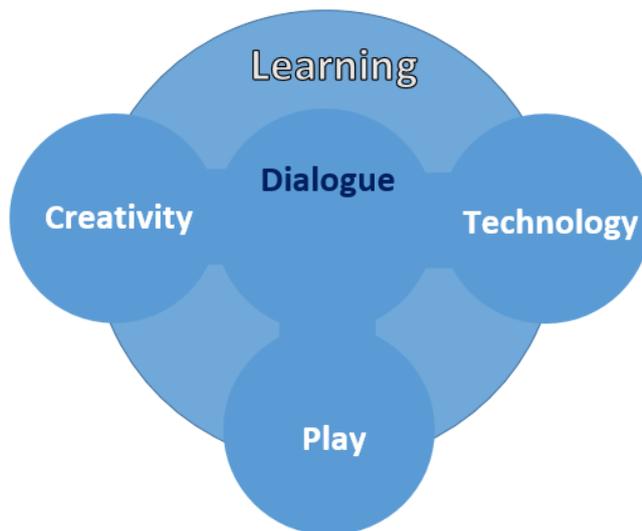


Figure 2.1 Key features examined in this research

This literature review is presented in two sections. The first section explores the key theoretical notions and learning theories that have informed this work particularly in relation to those who connected language to thought processes and meaning making; Daniels (2005, p,125) calls this 'dialogical consciousness'. The second section examines the empirical research conducted in this field of study. In this section I investigate the links between 'creativity and

technology' and 'dialogue and technology'. These themes are then brought together in a discussion of how they are all connected. Additionally, as I proposed to use an immersive virtual world digital game as the vehicle by which the study is carried out, I discuss the literature on the use of play in computer games and how this have been linked to learning with children. The most important themes are ultimately summarised in a tabular form at the end of this chapter. This chapter enables me to start to conceive an 'artefact' in the form of a computer game to be used to implement and test the ideas developed in this study as well as informing a framework which has been used to analyse the data.

2.1 Theoretical perspective

This study is based on the belief that learners are social beings that construct knowledge through active learning that is a result of interaction with others and through experience with their own surroundings (Pollard, 2008). Littleton and Mercer (2013) note that accounts of learning have traditionally focussed on individual thinking and have bypassed how we think collectively. They suggest that sociocultural theory takes 'account of the cultural and social basis for human thinking and of the use of language as both a means for social communication (- a cultural tool) and for thinking individually (cognitive tool)' (Littleton and Mercer, 2013, p.11). This approach underpins this research as it concerns the learner constructing knowledge but also recognises the significance of the social processes and cultural world that the learners inhabit. This enables not just individual construction of knowledge but co-construction of knowledge. This philosophy therefore suggests that the co-construction of knowledge only occurs if children can actively engage with new concepts and assume some control over their learning via the responses they offer. Hardman (2008) argues that a social constructivist/sociocultural view of learning contests the notion of teaching as transmission where knowledge is presented as fixed, closed and immutable and should be instead challenged and open to questions. This approach also 'raises the possibility that success and failure might be explained by the quality of the educational interaction experienced by pupils rather than just considering the intellectual capacity of the individual students or the skill of the teacher' (Mercer and Littleton, 2007, p.4). Moreover, a sociocultural approach recognises that learning cannot be detached from the social identities, power-relations, interests and agendas of participants (Nind *et al.*, 2016). This last theme became increasingly important to this research as analysis of the collected data progressed.

The constructivist thinker Piaget (1932) was opposed to the transmission of knowledge instead seeing children as playful, active discoverers of reality. He regarded mutual interaction

between children as a particularly rich source of progress. His emphasis on play, his interest in the process of learning and his value of interaction are themes central to this study and he is therefore an important figure to consider in this research. Interestingly, Piaget (1932) viewed inequalities of power and status as a hindrance to a child's development and found that if a child was confronted with an adult's viewpoint they might just simply accept it or ignore it. (Mercer and Littleton, 2007). A child, however, could provide a different viewpoint but from another individual that was more of an equal in power and this would help them to move forward and resolve difference (Mercer and Littleton, 2007). Piaget (1932, p.409) argued that, 'discussion was only possible among equals'. Palmer (2001) notes that while Piaget emphasised group learning he also emphasised autonomy within that group. Group learning should not blind members into accepting a point of view without consideration of the individual's own viewpoint. Autonomy required the individualization of knowledge that could occur in group learning (Palmer, 2001).

Researchers influenced by socio-cultural theory are informed by the work of Vygotsky (Goswami, 2004). The central reason for Vygotsky's (1978) prominence to this study is that he promoted the relationship between culture, social interaction, language and cognitive development as the core of the developmental process. Vygotsky (1981, p.163) advocated learning as a social process, stating that, 'social relations or relations among people genetically underlie all higher functions and their relationships'. Vygotsky described language as having two main functions, a communicative tool that was used for sharing and jointly developing knowledge as well as a psychological tool used for organising our individual thoughts (Mercer, 2000). Importantly, Vygotsky argued that our ability to think was, in the first instance, social and only later became individual (Mercer and Hodgkinson, 2008). Children's thinking was shaped by the relationship between social activity (intermental activity) and individual thinking (intramental activity) with language acting as the mediator between the two (Mercer and Hodgkinson, 2008).

As well as language, Vygotsky (1978) emphasised the use of cultural tools to help understand the world, this too is an important concept relevant to this research. For Vygotsky (1978), the more knowledgeable other acted as a 'making sense resource' for children who gradually came to understand new concepts 'through participating in the cultural life of the community and by using artefacts, technology and rituals' (Mercer and Littleton, 2007, p.13). Cultural tools are not only physical tools and artefacts but also symbolic tools. Language was considered to be a cultural tool (Mercer and Littleton, 2007; Smith, *et al*, 2015). Additionally, and pertinent to this research, is the fact that Smith *et al*. (2015) note that children use tools from their own culture

to learn about the world. In this sense perhaps, the tools to be used in this study would not only be the other children with which they communicate, but also the immersive virtual game.

Some of the criticisms of Vygotsky's (1978) work are relevant to this research. In particular, Fox (2001) has criticized Vygotsky's emphasis on the importance of language in the process of learning. Fox (2001) argues that Vygotsky's viewpoint was based on the belief that language preceded thought and this needs to be reviewed. Fox (2001) suggests that if thought cannot exist without language then a child is devoid of thought until they can speak and ignores implicit knowledge held of the world that is not verbalised. Moreover, Gray and Macblain (2015) argue that Vygotsky's emphasis on spoken language ignores other forms of possible communication that signify thought processes. The spoken word is just one form of communication that is supplemented by other forms of languages that might be portrayed through symbolic representation and non-verbal gesture. This is important to this study – to assume that dialogue is the only way to analyse intention would be to ignore all the other communication of understanding shown through gesture and body language.

The 1920' essays compiled by Bakhtin (but not published until 1981) concerning language and the philosophy of language resonates strongly with this research; I repeatedly return to Bakhtin's work throughout the duration of this thesis. Bakhtin (1981) explored the notion of dialogue and dialogic speech and presented an approach to communication that contrasted with that of Vygotsky (1978). Wegerif *et al.* (2004) explore Bakhtin's (1981) work and suggest the theory that dialogues are developed by different perspectives and that meaning arises in the context of a difference between voices. This contrasts to Vygotsky's (1978) perspective who suggested that thinking developed via interaction between more knowledgeable people and cultural tools as detailed above, although often Vygotsky's and Bakhtin's philosophies are often incorrectly presented as similar theories (Wegerif, 2010).

Wertsch (2009) has worked extensively on interpreting Bakhtin's work for educational purposes. He comments on both Bakhtin (1981) and Vygotsky (1978) and argues that in certain essential respects Vygotsky did not succeed in providing a genuinely sociocultural approach. Vygotsky (1978) did not articulate how specific historical, cultural, and institutional settings were tied to various forms of mediated action. Wertsch (2009) sees this is a limitation in Vygotsky's analysis of the social processes underlying individual mental functioning. Wertsch (2009, p.46) continues,

In his account of intermental processes Vygotsky focused on small group interaction, especially the interaction of the adult-child dyad. His ideas about the general genetic

law of cultural development, the zone of proximal development, and the various forms of semiotic mediation involved all tended to rest on analyses of this type of "interindividual" (Shotter, 1982) interaction. What is somewhat ironic for someone interested in formulating a Marxist psychology, he made precious little mention of broader historical, institutional, or cultural processes such as class struggle [and] alienation

In contrast, Bakhtin's analysis of language and voice is concerned with the broader issues of a speaking subject's perspective, conceptual horizon, intention, and world view (Wertsch, 2009). He stressed the notion that voices always exist in a social milieu, there was no such thing as a voice that existed in isolation (Wertsch, 2009). During speech acts, which Bakhtin (1981) classed as 'utterances', the person being addressed was just as important as the speaker themselves. Bakhtin saw meaning making as an active process which would only occur when two or more voices connected. He was concerned with 'addressivity, the quality or turning to someone else' (Bakhtin, 1986, p.99), which demanded that utterances always make connection with others. In the absence of addressivity 'the utterance does not and cannot exist' (Bakhtin, 1986, p.99). Haworth (1999a) interprets this notion as the ability to signal reciprocity – which does not have to be harmonious or tolerant – as a feature that makes talk dialogic. Reciprocity, and the importance of the addressee as well as the speaker, will therefore be important in understanding the speech acts documented in this research.

Bakhtin (1981) was also concerned with social language and speech genres that were communicated through ventriloquating. He argued that social language and genres were acquired from birth through encounters with the community and artefacts. Languages were then ventriloquated through the voices of others, where a speaker would adopt voice types distinct to that social environment (Haworth, 1999a). For Bakhtin, the process of ventriloquation was only worthwhile if the speaker could reformulate a speech genre for their own purpose and populate it with their own intention and purpose. The speaker may resist, reshape and re-accent a speech genre so that it became, 'half-ours and half someone else's' (Bakhtin, 1981, p.345) which in turn created a new meaning. For Bakhtin the relationship between the speakers and the speech genre was therefore important and could be more empowering or less empowering (Haworth, 1999a). Haworth's interpretation of Bakhtin's ideas is to say that a dialogic speech act would therefore be 'multi-voiced, versatile and playful with the authority of generic form' (Haworth, 1999a, p101). This idea will be important to this research when recognising and classifying dialogic communication. In contrast, a monologic

speech act would be more fixed in nature where meanings are not appropriated to be recast and reshaped so that that new versions of knowledge are produced.

Freire is an additional key thinker who promoted the importance of a dialogical stance; his thoughts are relatable to this thesis. Freire (Shor and Freire, 1987) felt that dialogue was essential for knowledge and understanding. He postulated that, 'dialogue is the moment where humans reflect on their reality as they make and remake it' (Shor and Freire, 1987, p.13). He argued that the extent to which humans were communicative beings ensured, 'we are able to know that we know, which is something more than knowing' (Shor and Freire, 1978, p.13). For Freire, teachers and students should be able to, 'reflect together on what we know and don't know, we can then act critically to transform reality' (Shor and Freire, 1987, p.13). He suggests that knowing was an ultimately social event; the object to be known about was not in the exclusive possession of the teacher but was more about an exchange of ideas (Shor and Freire, 1987). Moreover, like Bakhtin (1981), Freire suggests a dialogical situation implies an absence of authoritarianism where students feel free to speak. However, Freire adds a new dimension by arguing that students should not always have to say something because they feel pressured to participate, this would create a false democracy or a fake discussion. This is an interesting point for this thesis. It suggests that potential non-participation from an individual does not necessarily mean that a conversation is not dialogical in nature. It also led me to consider the importance of different forms of participation – body language could perhaps be just as important as the spoken word.

Freire's pedagogical stance is also characterised by the importance of listening. He notes that every student utterance should be carefully attended to and that other students should also listen intently when a peer speaks, with the students being encouraged to do most of the talking instead of the teacher (Shor and Freire, 1987). Boyd and Markarian (2011) interpret this as ensuring that space is made for the student voice in order to have more awareness of a student's everyday knowledge. Modulating and limiting my own interjections as well as noticing how the students are listening to each other, would therefore be important during the data collection for this study.

The final theorist that is relevant to this research moves away from pioneers of talk to one concerned with technology. It would be difficult to complete a review of the theoretical ideas central to this piece of research without considering the contribution of Papert. Papert (1993) drew on Piaget's (1932) constructivist ideas of children as builders of their own intellectual structures, to introduce the notion of constructionism. Papert (1993, p.142-3) argued that

constructionism was his, 'own personal reconstruction of constructivism, [and] has its main feature in the fact that it looks more closely than other educationalists at the idea of mental construction'. He believed in creating playful objects to learn with, objects to build with through which children could then understand more complex concepts. For Papert (1993, p.142) constructionism literally had the connotation of the construction set starting with objects like,

Lego sets and extending to include programming languages considered as "sets" from which programs can be made and kitchens as "sets" with not only cakes but recipes and [where] mathematics-in-use is constructed

The model of the way children learn to talk, a process that took place without deliberate teaching, influenced Papert (1993). He saw the classroom as an inefficient learning environment that forced children into learning situations that generated negative feelings about learning through direct instruction. Instead, children should play with objects designed for them to encourage thinking. In this way, children could use their body and senses to learn about objects. This playful approach to learning, without direct instruction, using an object with which to interact, is a strategy that would become integral to this research. The ideas of Papert (1993; 1994) are returned to throughout this thesis.

2.2 Empirical research

The next part of the literature review examines the empirical research conducted in this field of study.

2.3 Dialogue in the classroom

This thesis investigates how children use dialogue when playing a digital game; hence the literature associated with dialogue in the primary classroom is now considered. The literature distinguishes dialogue from talk. In the classroom teachers talk all the time but not necessarily in a way that is conducive to effective learning (Luxford & Smart, 2009). As Alexander (2005) notes, all teaching is interactive, the interaction could be between teacher and student, student and student, student and text or student and computer. But the notion of *dialogue* stands in opposition to the kind of interaction revealed by many classroom observational studies which are found to be both one-sided and lacking in cognitive challenge (Alexander, 2005).

Studies of classrooms show that a substantial amount of learning-based interaction occurs during whole class teaching contexts (Cazden, 2001; Nystrand *et al.*, 1997; Galton, 1989; Smardon and Bewley, 2007). Cazden's (2001) research of first –third grade children in San Diego in 1972, found that classroom talk consisted mainly of teacher-based, relatively closed questions and offered students few opportunities for extended dialogue involving explanations, elaborations or other forms of high level talk. Nystrand *et al.*'s (1997) two-year study of 112 eighth and ninth grade language, arts and English classes formulated the largest ever study of classroom discourse in the USA to that date. The research found that most lessons were based on transmission and recitation models of communication where 'teachers talk and students listen' (Nystrand *et al.* 1997, p.xiv). Notably, Nystrand *et al.* (1997) lament the absence of 'authentic' questions, those questions for which the teacher had not implied a specific answer. Furthermore, uptake also emerged as an important factor, failing to engage with an answer provided to a question added to a situation that did not provoke learning. Nystrand *et al.*'s (1997) emphasis on the authenticity of voices in a dialogue is highlighted as an issue for analysis for this study.

Smardon and Bewley's (2007) New Zealand based research on learning conducted through 1,200 student interviews echoes the studies detailed above. They found,

in many classrooms students are not invited to talk about, let alone think about, the notion of learning in a manner that has any depth. Most of the dialogue appears to occur more by accident than in a deliberate, conscious and planned manner (Smardon and Bewley, 2007, p.2).

Research studies conducted in the UK presented similar findings. Sinclair and Coulthard's (1975) seminal work researching discourse in British secondary schools found that a typical language based exchange in a classroom was based on just three talk moves - the IRF exchange structure: Initiation by the teacher, Response by the student and Feedback by the Teacher (IRF). Mercer and Dawes (2008) argue that the IRF exchange is associated with the predominance of closed questions. Despite some research (Wells, 1999) showing that the IRF can be adapted to serve a more interactive form, the three-part exchange is largely accompanied by implicit rules that accentuate the unequal power balance between the teacher and the children. For instance, the IRF is usually associated with a teacher who might initiate a question and then nominate who speaks. Furthermore, only the teacher would evaluate that response before initiating another question with another child (Mercer and Dawes, 2008).

Galton's (1989) study of the primary classroom saw little of teachers using probing, questioning or guiding individual children – instead emphasis was placed on whole class teacher interactions; autonomous pupil-led discussions were a rarity. More recent empirical research suggests that the now defunct National Literacy Strategy of 1998 merely continued monologic speech patterns in the primary classroom. Hardman *et al.*'s (2003) research of 72 primary teachers working in a range of socio-economic settings across England, found that during the time of the Literacy Strategy traditional patterns of teacher/pupil exchange continued to be dominant. Most questions asked were intended to encourage a particular answer. Probing by the teacher to instigate extended dialogue occurred in just 11% of exchanges. Most exchanges were very short, with answers averaging five seconds and limited to three words or fewer 70% of the time' (Hardman *et al.*, 2003). Myhill's (2006) two-and-a-half-year study of talk in three clusters of primary schools, demonstrated that talk was constructed around the teacher's agenda. Speech patterns were more concerned with talk for teaching rather than talk for learning. Myhill (2006, p.38) determines that, 'the more questions teachers ask the less [children] say'. Rose's National Independent Review of the Primary Curriculum (DCSF, 2009), concluded that primary education had failed to realise the centrality of developing children's spoken communication and that children needed to talk confidently and intensively about their work. Finally, Howe and Abedin's (2013) systematic review of

classroom dialogue across four decades reported that, while more is now known about different types of talk in the classroom, IRF speech patterns were still prevalent.

2.3.1 Dialogic pedagogies

While the research presented above suggests that talk in the classroom in the UK is essentially monologic, other researchers have worked for the adoption of alternative formulas for classroom talk.

Barnes' research conducted in the 1970s documented in the seminal text *From Communication to Curriculum* (1976), suggested that the presence of exploratory talk was a form of discussion that contributed most to helping children understand new concepts. He argued that children needed to discuss their ideas in small groups so they could try them out, to hear how ideas sounded and to ascertain what others made of them. Talk of this nature would be hesitant, incomplete and exhibit changes in direction. Exploratory talk was different to presentational language that was well-shaped in content and primarily focused on meeting the needs of an audience; talk that might well occur in response to questions on a pre-taught topic (Barnes, 2008). Barnes asserts that discussion and explanation by pupils should be a central part of lessons. This is where pupils ask and answer questions as well as the teachers; they might raise problems and propose anomalies. Barnes' (2008) emphasis on group work is pertinent to this research. However, he does add a word of caution saying that it is important not to idealize group work. While it is a valuable resource, it should not become an all-encompassing strategy used at the expense of other methods. Importantly, he also adds that group work requires preparation, guidance, supervision and ground rules. This would be an important consideration in my own research design.

More recently, there has been renewed emphasis on creating alternative strategies for talk where the teachers engage and sustain children with language use, instead of merely talking at them (Alexander, 2010; Mercer and Littleton, 2007). As Luxford and Smart note (2009), after many years of neglect it would appear that talk has finally experienced a quiet renaissance in the classroom.

Resnick's (1999) 15 year-long research conducted in the USA from the University of Pittsburgh working within school systems across the country, explored talk in the classroom. She proposed the notion of accountable talk as a process that could potentially enrich dialogue. Drawing on Vygotskian theory that emphasises the social formation of the mind, Resnick

(1999, pp.38-40) stipulated that accountable talk should feature three criteria, which are summarised below as:

accountable knowledge – subject knowledge is an important feature of talk

accountability of reasoning – teachers and children challenge each other to justify their thoughts

accountability to the learning community – pupils listen carefully to each other.

Resnick *et al.* (2010) assert that these three aspects of accountable talk are essential for the full development of student capacities and dispositions for reasoned, civic participation. Of particular importance, however, is the presence of accountable knowledge. Resnick *et al.* (2010, p.184) note that,

Talk that is accountable to knowledge is based explicitly on facts, written texts, or other publicly accessible information. Speakers make an effort to get their facts right and make explicit the evidence behind their claims or explanations. They challenge each other when evidence is lacking or unavailable.

Ultimately, these authors assert that good reasoning depends on good knowledge. This idea is supported by Nystrand *et al.* (1997) who note that it is the ‘what’ of instruction, the content and subject matter which requires students to think rather than merely reporting on the thinking of others. Meanwhile, Alexander (2005) asserts that it is no good having a lively and extended discussion if it does not lead anywhere. Noting the incidence of accountable knowledge would therefore be an important theme to consider when analysing my own data set.

Echoing Barnes’ (1976) research, but also influenced by the work of Bakhtin (1981), Mercer’s exploration of classroom talk conducted in the 1980s was documented in his texts *Words and Minds* (2000) and *Interthinking* (Littleton and Mercer, 2013). Mercer (2000, p.164) advocates a dialogic approach, listing three distinct forms of talk:

Disputational talk – disagreement and individualised decision-making, with unconstructive criticism and short exchanges;

Cumulative talk – speakers positively but uncritically develop what others have said. With cumulative talk, common knowledge is accumulated by repetitions, confirmations and elaborations;

Exploratory talk – a group engages critically and constructively with each other’s ideas, statements and suggestions are raised for challenge and counterchallenge – comments are always justified by speakers and opinions always sought from everybody.

For Mercer (2000) exploratory talk is the most productive form of talk exhibited by children; this type of talk is more likely to lead to greater accountability and develop critical reasoning powers. For instance, children will offer ideas with reasons (they use the word ‘because’), they tentatively try out new ideas (the use of the word ‘but’ is common here), they accept changes of mind in other pupils and they readily admit they did not know something (Mercer and Dawes, 2008). Disputational talk, in contrast, is deemed too competitive and cumulative talk less productive as it tends to prioritise group identity over individual difference (Littleton and Mercer, 2013). In cumulative talk group members prefer not to challenge each other as this might result in the disruption of the harmony of the whole group; instead participants seek to agree (Littleton and Mercer, 2013). Exploratory talk is seen to hold the most possibilities for thinking but it is, however, found to be not just about reasoning but also about pupils’ understanding of social processes and inclusion of others (Littleton and Mercer, 2013). Therefore, the implementation of exploratory talk is more productive if it is implemented alongside a set of ‘ground’ rules.

The ground rules for exploratory talk are:

- all members of the group are invited to contribute;
- all relevant information is shared;
- everyone is asked to give reasons for their views;
- opinions and ideas are respected and considered;
- challenges and alternatives are made explicit and negotiated;
- the group seeks to reach agreement before taking a decision or acting
- the group takes responsibility for decisions;
- alternatives are discussed before a decision is taken;
- the group seeks to reach agreement

(Littleton and Mercer, 2013, p.72)

Wegerif *et al.* (2004), collaborators with Mercer, found that children who had learned about appropriate ground rules were more likely to encourage others to speak, listen carefully to what they articulated and then in turn respond constructively. Rules will therefore need to be an important consideration in the formulation of this research.

Alexander's national research of talk in over 40 schools in different areas of England, augmented by his earlier international research in five different countries, culminated in the text *Towards Classroom Thinking* (2004). Alexander drew on Bahktin's (1981) work to produce his own concept of dialogic teaching. Alexander (2010) proposes that interaction is pivotal to understanding and this should be achieved via collaboration between pupil and pupil and teacher and pupil. Pupils should be helped to learn that knowledge is not only transmitted, but negotiated and recreated via expression. For Alexander (2010) dialogue is so important that it constitutes one of his central aims for primary education. Talk that is 'dialogic' in nature, and therefore seen to be part of good teaching practice, is:

- Collective – teachers and children address learning tasks together;
- Reciprocal -teachers and children listen together and share ideas;
- Supportive -children are able to express themselves freely without fear of being wrong in order to reach common understandings;
- Cumulative- teachers and children build on their own and each other's ideas;
- Purposeful- teachers plan and steer classroom talk with specific goals in mind.

(Alexander, 2004, p.28)

Of particular relevance to this project, peer-to-peer interactions that are dialogic in nature are situations in which:

- Children listen carefully to each other;
- Encourage each other to share ideas;
- Build on their own and the contributions of others;
- Strive to reach agreed understandings
- Respect minority viewpoints

(Alexander, 2004, p.42)

Interestingly, the concept of cumulation appears in both Alexander's (2004) and Mercer's (2000) depiction of dialogic talk. While there are many similarities between both researcher's aims, there are slight nuanced differences that should not be overlooked. While cumulative speaking forms one of the five key principles of dialogic talk for Alexander, Mercer places cumulative talk in a hierarchy of talk that is set out beneath the more desirable exploratory talk. It appears, therefore, that dialogic pedagogy is a contested term and settling upon one definition of dialogic practice is a difficult aim.

Boyd and Markarian (2011) interpret Alexander's (2004; 2010) approach to dialogic teaching which they assert is grounded in effective teacher listening. They suggest that the crucial prerequisite for dialogue is the ability of the teacher to be disposed to listening, following, supporting ideas and to pursue lines of reasoning given by children. By harnessing real talk, they can then lead students from behind towards insightful, educational and educated discussion. Boyd and Markarian (2011) echo the Bakhtinian notion of the dialogic when they describe how some practitioners tend to adopt a 'monologic' stance as opposed to a dialogic approach. A teacher using a monologic stance might expect that the transference of ideas is just a matter of the student listening carefully to the teacher articulating school-based knowledge. Misunderstanding of this knowledge is the result of the student listening inappropriately. Conversely, a teacher who utilises a dialogic stance would assume that this lack of understanding was a result of poor connectivity between the two parties and the teacher would seek out more appropriate foreknowledge in their students in order to offer better outcomes (Boyd and Markarian, 2011).

Research suggests that using talk for reasoning in the classroom may not actually be the only key to educational success (Wegerif, 2010; Hennessy, 2011). Commenting on a series of UK-based case studies in schools on the use dialogue, Hennessy (2011) asserts that improved problem solving may also result from a dialogic silence. Wegerif (2010, p.119) advocates that as well as dialogue there needs to be additional 'dialogic space'. This is identified by a dialogic pause or a space of reflection that allows creative solutions to problems to spontaneously emerge (Wegerif, 2007; 2008). Wegerif *et al.* (2010) also suggest the notion that meaning arises in the context of a difference between voices opening up a space for dialogue, hence teaching and learning involves drawing students into spaces of dialogue across difference. Wegerif (2011) further develops this notion of the metaphor of dialogic space. He suggests that space should allow for reflection and the visualisation of an area that can open, close, widen and deepen which in turn promotes a dynamic and continuous emergence of meaning. The concept of a space is accompanied by the term 'dialogic gap' in which Wegerif (2007, p.7)

proposes that, 'dialogic space requires and presupposes a dialogic gap between irreducibly different perspectives held together in a relationship of proximity'.

Wegerif (2011) challenges the notion that reasoning should be seen as trying to reach an agreement or what is often coined as 'finding the common ground', as advocated in Alexander's notion of dialogic (2004), and that this is actually associated with monologic thinking patterns. Achieving a common ground is important but is not the only objective; the common ground acts as but one moment in a larger flow of tensions of perspectives, difference and meaning making in the dialogic gap (Wegerif, 2011). Out of this tension between viewpoints comes not only criticism and judgement but also insight and understanding (Wegerif, 2010). Howe *et al.*'s (2007) research recording the dialogue of 10-12 year olds working through an extended 3 week science programme, supports Wegerif's (2010; 2011) argument in advocating the power of difference between pupils when learning. Howe *et al.* (2007) continue with this theme by arguing that disagreement may create contexts where propositions and explanations are more likely and it is these features of talk that are associated with increased understanding particularly when teachers are nondirective in their stance. However, they also add that disagreements are most productive when it helps children to reach eventual resolution. The theme of difference in meaning would be an important feature in the analysis of my own data.

2.3.2 A dialogic pedagogy: theory and practice

While a dialogic approach is considered desirable, other educationalists realise the difficulties of implementing this approach (Galton, 2007; Mercer *et al.* 2010). Galton (2007) notes that policy can conflict with the effective implementation of a curriculum that values talk. An emphasis on rapid lesson pace and encouraging 'correct' answers, coupled with many teachers' lack of understanding of dialogic pedagogy, mean that a dialogic approach is commonly not realised (Galton, 2007). Mercer *et al.* (2010) develop this argument suggesting that the preconditions for dialogue include open-ended tasks and higher order questioning, yet the school inspection emphasis on rapid pace and obtaining the correct answer means that this is a strategy that is not often observed.

Lefstein (2010) conducted research in one London primary school to evaluate the practicalities of implementing a dialogic model. While noting that this research is small scale, Lefstein (2010) does make a number of interesting points that are relevant to this thesis. He speculates over the continued prevalence of IRF patterns of talk and argues that, 'the persistence of non-

dialogic teaching in the face of so much enthusiasm should give us pause to ask: Why hasn't dialogue become a common form of classroom discourse? (Lefstein, 2010, p.170).

Lefstein (2010) continues that the notion of dialogue is idealized and proponents of a dialogic pedagogy have not adequately dealt with concern of unequal power relations that are prevalent in a classroom. He postulates that any dialogue is an exercise of power that carries with it assumptions regarding teacher authority, legitimate forms of participation and privileged differences and identities. Leftsein (201) asserts that even the existence of the aforementioned predetermined ground rules do not adequately serve to resolve interpersonal issues. He suggests that it is not possible to separate interpersonal and ideation concerns, participants can give ideas to a discussion but simultaneously communicate their feelings, negotiate social positions, entertain others and exercise and resist power.

Leftsein (2008) highlights the problem of implementing a dialogic pedagogy with a large class of 30 plus children as well as questioning the practicality of framing curriculum content as a conversation that engages all children. Skidmore and Gallagher (2005) support this argument noting the impracticality of sustaining a dialogical pedagogy with many students when a typical secondary school teacher might see over 250 children per week. They argue that the constraints on practice implemented by school structural systems and an educational policy based on high stakes testing and recall of knowledge should not be underestimated. Finally, they conclude that the numerous indicators of a dialogic education make this too complicated a tool to be useful.

Maybin's (2006) ethnographic research of ten to twelve-year-old children's conversations both inside and outside the classroom in one school, suggests a different dialogic approach. She focussed on the moment-to-moment negotiations of meaning in children's dialogue and found the interpersonal and emotive functions of talk were centrally important in shaping meaning both in social conversations and in talk related to classroom content. For Maybin, meaning making was a complicated process but one which occurred differently to the dialogic pedagogies presented above. Here children who worked in groups produced meaning cumulatively across different contributions. Voices would overlap, words would be repeated and children would complete each other's sentences, this in turn would build up informalised knowledge. For Maybin (2006, p.59), in conveying shared knowledge about events, 'children's utterances may be so closely dialogically aligned that they may speak, as it were with one voice'. Dialogic talk was multi-voiced and intricate and where children addressed topics related to school knowledge it remained largely fragmented and incoherent. This finding is in contrast

with that of Resnick (1999) detailed above, who emphasised the importance of accountable knowledge in the form of use of accurate facts.

Haworth's (1999) small scale, five-month study of children's group talk in a primary school offers interesting insights into the challenge of dialogic practices. She proposes that a dialogic stance and engagement with others is more likely to be fostered in small groups than in teacher-pupil interactions, which are always threatened by the circumscribing effects of the authoritative genre of Whole Class Interaction. Relationships in collaborative work are reciprocal and voluntary in ways formal whole class talk can rarely be. For Haworth (1999), small group talk offers a bridging mechanism which opens the space for the rehearsal and testing of ideas which formal instruction closes – this finding is pertinent to my own research which would be conducted in small groups.

Researchers also argue that argumentation, a feature of exploratory talk, is more often associated with certain types of learning task (Rojas-Drummond *et al.* 2006; Rojas Drummond *et al.* 2008, Rojas-Drummond *et al.* 2010). These research studies, conducted in Mexican schools with children aged between 10 and 11 years, found that argumentation was a more common feature of talk when solving convergent learning tasks as opposed to open-ended, divergent tasks. In these instances, pupils used many of the features of exploratory talk but they did not need to use explicit reasoning to solve an open-ended, creative task. For this type of task meaning making was referred to as being co-constructed where children jointly negotiated solutions to problems. Vass *et al.*'s (2008) research of the creative writing process of primary aged children in middle schools in England, further supports the notion of difference in the processes required for writing opposed to the explicit reasoning required for tasks like mathematics, and they call for further research to be conducted in the area of collaborative creativity. These authors highlight two other important themes pertinent to this thesis. Firstly, they discuss the influence of the role of emotions when meaning making and stress that the teacher should act both as a cognitive guide and as an emotional facilitator, they state that the role of emotions has been an undervalued aspect of emotional research. Secondly, Vass *et al.* (2008), like Maybin (2006), reappraise the role of interruption when meaning making. Overlaps and interruption in conversations appeared frequently in this research and it was concluded that instead of this being a distraction to the learning it signposted the intense sharing, joint focus and content generation of the group. These authors support the work of Tannock (1998) who found that overlapping talk, playful and exuberant expression via 'noisy talk' was a productive environment. Meanwhile, Coates (1996) posits that

the use of a 'collaborative floor' – where speakers overlap – creates a shared space where a group can speak as one in a creative collaboration.

Middup, Coughlan and Johnson (2010) conducted research on two small groups of adults working together to produce a video to encourage recycling in a university. These researchers found that while reaching a conclusion to a problem was necessary, if it was done too early in a group's discussion it may prevent them from considering a wide range of relevant ideas and lead to less creative outcomes. This might be relevant to this research where time, or the lack of it, is a common problem in a school day and hurrying children to a solution can be a necessity due to conflicting pressures.

Dobson's (2012) study of 4 undergraduate creative art students, working together to compose a 10-minute film that included music and dance, is also pertinent to this thesis. The students needed to overcome communicative problems caused by them originating from different artistic disciplines, meaning they did not speak the same technical language. They overcame this through, 'dynamic common knowledge' (Dobson & Littleton, 2015, p.15), which was engendered by sharing ideas in an, 'open and uncritical way' (Littleton & Mercer, 2013, p.5), via cumulative talk as opposed to exploratory discussion. According to Littleton and Mercer (2013, p.61), as well as dynamic common knowledge, creative collaborations also require, 'background common knowledge'. This is a shared, specialized vocabulary which, 'any established member of a community of practice can take for granted as being shared with other members of that community' (Littleton & Mercer, 2013, p.61). In addition, Littleton and Mercer (2013) refer to Moran and John-Steiner's (2004) case studies of how to work together to achieve success across the arts and sciences; these authors support the maintenance of consensus, rather than arguing for multiple perspectives. The arguments presented above might therefore position cumulative talk in a prominent role as well as noting the centrality of exploratory dialogue.

The above discussion proposes that certain types of talk gain more successful learning outcomes than others. Therefore, consideration of the notion of dialogic talk, exploratory outcomes, the application of ground rules and the development of a dialogic space would be important themes to consider in this research when classifying talk episodes.

2. 4 The use of digital games

Another strand of empirical literature pertinent to this research is technology. In this study, I use a digital game to ascertain what sort of responses technology may trigger in children. Next, I explore why a computer game might be a good vehicle for this study. I also seek to outline the benefits and challenges of using technology based games in the classroom. Most importantly, I examine the literature that links technology with dialogue.

2.4.1 Computer games – a definition

Ulicsak and Williamson (2011) note the confusion over the definition of computer games and attempt to clarify the situation by providing the following categories. Games come in the varying forms of:

Digital Games – all games that have digital technology base

Electronic games –covers games consoles connected to a television, computer games on line, computer games on a PC or CD ROM

Video games – games for television and potable video game systems

Computer games – those played directly on a PC

Online games- internet based games that include massive-multi player online role - playing games (MMORPGS) and multi-user virtual environments (MUVES). A MUVE, usually described as a virtual world, is distinguished from MMORPGS by having a less prescribed structure, more freedoms and place more emphasises on the construction of an environment. Both are usually navigated using an avatar.

Mobile games – those played on a handheld device (including mobile phones, mobile consoles and table computers) (Ulicsak and Williamson, 2011, p.8)

In this research I use a MUVE and where possible I use the literature that relates to MUVES, although the empirical evidence for this is limited.

2.4.2 The benefits of computer games

Researchers make claims for positive learning outcomes when using digital games in the primary classroom (Ulicsak and Williamson, 2011; Buckingham; 2007; Gee, 2007; Prensky, 2006). Prensky (2006) and Gee (2007) are particularly well-known advocates of the potential of computer games for learning and some of their arguments are detailed below alongside other pertinent empirical research. However, as already noted, the research base for the use of digital games in schools, particularly MUVE's, is still in its infancy and lacks depth (Merchant, 2015)

Gee (2007) powerfully and emphatically articulates his own, as well as his son's, experience of using digital games in the text, '*What Computer Games have to Teach Us About Learning and Literacy*'. Academics (e.g. Merchant, 2015; Buckingham, 2007) have described this text as a major influence that inspired much interest in the world of gaming. While Buckingham (2007) challenges the anecdotal nature of this text, Gee's work has been too influential to omit it from this literature review.

Gee (2007) discusses the use of video games in learning. He argues that while video games are fairly long and ultimately challenging even for adults, children will step up to this challenge because they enjoy using them. Gee (2007, p.3) notes that his personal experience of game playing required him to think in ways that he was not used to but which he describes as both 'frustrating and life enhancing'. He continues that learning should contain both of these aforementioned characteristics; learning should therefore be pleasantly frustrating and therein lies the appeal of games. For Gee (2007 ,p.3), 'the key [to learning] is finding ways to make hard things enhancing so that people keep going and do not fall back on learning that is simple and easy'.

The qualities that Gee (2007) describes above could be alternatively named as intrinsic motivators. Deci and Ryan's (1980; 1985) seminal works on motivation that formulated 'self-determination theory' (SDT) included research that proposed three main intrinsic needs to produce self-determination; autonomy, competence and relatedness. Autonomy is achieved when activities are carried out for interest and personal value and when there is a high level of choice in the task. Competence includes a need for challenge and feelings of effectance that are acquired through mastering new skills and receiving positive feedback. Finally, relatedness involves the need to interact with others. Ryan *et al.*'s (2006) four research studies of American undergraduate university students playing computer games used Deci and Ryan's

(1980; 1985) theory of self-determination to test motivational factors when playing computer games. In one of their studies, where a group of students participated in a group game involving an on-line community, game enjoyment and intentions for future play were both significantly related to the SDT-derived measures of autonomy, competence and relatedness, suggesting the unique relevance of each within this type of gaming context. Furthermore, these authors argue that intrinsic motivation was further accentuated by a game playing feature called 'presence', where a player is immersed in a virtual world. Presence was associated with need satisfaction, in games where people felt greater autonomy to follow in-game goals and interests and were allowed competence to carry out effective actions, feelings of presence were amplified (Ryan *et al.* 2006). These intrinsic motivational factors may be relevant to my own study that involves playing in an immersive world.

Malone and Lepper (1987), commenting on the result of their own studies completed in over 65 elementary schools in America, also linked computer games with intrinsic motivation. They argue that the best games create a good level of intrinsic motivation through a combination of factors: challenge, the appeal of fantasy and curiosity as well as requiring cooperation, competition and the giving of recognition. Intrinsic motivation is argued to be desirable for learning (Cropley, 2001; Eade, 2011, Valerio, 2012). In particular, Malone and Lepper (1987, p.242) note the elements of cooperation, competition and the giving of recognition calling these 'interpersonal motivations' which depend on other people for their development. They postulate that recognition should also be visible to other people via engagement with the process of performing the activity or the visibility of the product of the activity. As the children in this study are working in a group, interpersonal motivations might be particularly pertinent to this research.

Connolly *et al.* (2006) who researched the use of games to teach database design to computing students at the University of Paisley, argue that students who are motivated by external reinforcements only (e.g. reward) retain interest in a learning object for short periods of time; learners who are intrinsically motivated demonstrate more persistence and have sustained learning experiences. Researchers (Connolly *et al.* 2006; Ryan *et al.*) also link motivation to Csikszentmihalyi's (1996) concept of flow. The conditions likely to induce the desired state of flow are:

- clear goals
- immediate feedback

- balance between challenges and skills
- merging of action and awareness
- elimination of distractions
- lack of fear of failure
- lack of self-consciousness
- distortion of sense of time
- autotelic activity (enjoyment for its own sake) (Csikszentmihalyi, 1996)

Many of the above characteristics are also features of a computer game. Finally, Howard-Jones and Demetriou (2009) conducted three studies comprising of primary children, secondary students and adult game players that linked the component of uncertainty in educational games as a factor that increased motivation. The evidence of motivation exhibited by pupils in my own research group would be an element I needed to consider.

Gee (2005) argues that designers of good games have actually discovered profoundly good methods of getting people to learn through creating enjoyable learning experiences. Good designers of video games have become practical theoreticians of learning and have created the right conditions for learning to be motivating and pleasurable; learning in school, in Gee's (2007) opinion would be better if educators paid more attention to the lessons provided by good commercial video games. Gee (2007) suggests games are such powerful agents in learning because they create three vital outcomes: empowered learning, problem solving and improved understanding.

Empowered learning is engendered by games as they allow children to be active. Pupils act as producers of knowledge via immersion in an environment through which they help to design their own learning (Gee, 2007; Mantovani 2003; Nicaise and Crane, 1999). Empowering children in their learning is a key educational outcome for primary children, an ideal discussed particularly by Alexander (2010). Empowered learning is further reinforced by video games as they require a commitment by the pupil to take on an identity via an avatar through which they make decisions to progress through the game. Gee (2007) notes that when learners act through immersion in an identity the understanding of facts becomes free, almost a by-product of learning, which happens as a result of being a certain sort of person needing to do

certain things. Immersion and empowered learning are themes developed in the analysis chapters of this thesis.

Gee (2007) sees problem solving as another educational outcome of games. Problems in good games are well ordered. In particular, early problems are designed to lead players to form good guesses about how to proceed when they face harder problems later on in the game. Gee (2007) notes that learning the order in which pupils confront problems is important. Games that evidence the right amount of challenge contain problems that build up in complexity and help children to put their thinking in order. Furthermore, Gee (2007) suggests that when problem solving children will also learn to make the most of textual instructions. Good games give verbal information on demand, or just in time, they teach children to make the most of the text given and apply it to a meaningful context. This makes using information purposeful rather than learning through reading a mass of information.

Finally, Gee (2007) links good video games to the acquisition of skills through a developed understanding of systems that fit into a larger complex whole. Good learners are able to make connections and spot relationships in learning and move from the position of learning facts in isolation. A good game demands that players see how the consequences of their actions impact on the world in which they inhabit, they have to consider the outcomes of moves carefully.

Prensky (2006) makes numerous claims for the potential of the computer game in learning. He argues that, 'whenever one plays a game, and whatever game one plays, learning is happening' (Prensky, 2006, p.64); benefits of game playing include improved hand-eye coordination, better problem-solving skills and increased performance in maths and language. To give weight to this argument Prensky (2006) points to various American studies that purports to test games' effectiveness. In particular, Prensky (2006) quotes the Lightspan Partnership (2000) who conducted studies in over 400 individual school districts and concludes that they definitively showed children learned from games. Lightspan (2000) found that game-playing children increased their vocabulary and language skills by almost 25% over the non-playing control groups, and by over 50% in maths problem solving.

Prensky (2006) also reports other perceived benefits of game playing which he terms 'five levels of learning' in video games – these levels are entitled how, what, why, where and whether. Prensky (2006) argues that game playing involves active learning and through different scenarios players learn 'how' to do something, whether it be how to build a virtual city or to train a creature to make it evolve. While learning 'how' to do something people are

required to practice something over and over and therefore get better at it. This argument is echoed by Gee (2008) who suggests that children cannot consolidate learning experiences unless they are able to practice what they are learning and that computer games require the repeated application of a myriad of skills.

Players learn 'what' to do in a game where they have to learn the rules. The players then ask themselves: are the rules of the game fair and accurate in terms of what I know about the world? Inaccurate rules result in dismissal of the game. Prensky (2006) argues that the rules of a game force the player to compare it to what they know about real life – this is what he calls real life learning.

According to Prensky (2006) the 'why' level of learning involves the strategies and tactics employed in a game. Game strategy are also full of lessons in learning about real life as it leads to knowledge about cause and effect, long term winning versus short term gains, order from chaos, consequences of actions, using obstacles as motivation, complex behaviour systems and the value of persistence.

Games also provide a mechanism to learn about cultural relativity and how to deal with different people and roles, this is called the 'where' level of learning (Prensky, 2006). For instance, children learn about accepted behaviours and the values of the game world they inhabit and therefore use them as a filter through which to understand society (Prensky 2006). Finally, Prensky claims (2006) that gamers decide 'whether' to carry out certain actions and to do this they have to draw on their own values and morals based on what is right and wrong; their decisions are ultimately reflected in the overall outcome of the game.

Prensky's (2006) many claims for the benefits of digital games are significant but need to be critiqued. Even scholars like Buckingham (2007), who have similar views about the benefits of computer games for learning, question the robustness of the evidence that Prensky uses to justify his claims which he describes as 'poorly supported', calling for further evidence to be produced (Buckingham, 2007, p.108). Buckingham (2007) critiques the theory that learning should be always pleasurable. Instead, he argues that some forms of learning might necessarily involve frustration, boredom and endless repetition. He also disputes the notion that skills learnt through game play – to do with collaboration or problem solving, for example – are immediately generalizable. He questions Prensky's (2006) suggestion that gamers who take prudent risks, or make decisions in games, are better at doing so in business situations.

Tuzun *et al.* (2008) have also explored the potential educational benefits of game. In particular, they have researched the evolution of a 3D multi-user virtual environment, which they argue not only increases the attractiveness of the computer game but provides multiple affordances for learning well suited to the constructive perspective. Their research was carried out in Turkey in one elementary school with a group of 24 pupils so the results, although interesting, do raise questions over generalizability. In their study of the use of game to develop geographical learning, the communication aspects of these games were particularly attractive for Tuzun *et al.* (2008). They argue that these environments embrace multiple communication channels such as real-time chat, asynchronous messaging and visuals that afford collaboration, competition, sharing and interaction supporting constructivist principles and this in turn allows for creativity. Ultimately, they conclude that computer games could be utilized in a formal learning environment to support student learning in that they showed statistically higher motivations in a direction desired by most educators and parents. Furthermore, students had a decreased focus on obtaining grades as the only outcome of the activity and were more independent while participating in game based activities. This was a result of using games that offered the potential for exploration, interaction and collaboration and that were anchored in meaningful real-world events (Tuzun *et al.*, 2008). It is the arguments expressed above, the collaborative potential in particular, which make games so suited to this study.

Another potential benefit of digital games is the emergence of a 'participatory culture', this is a culture where members believe their contributions matter and feel some degree of social connection (Jenkins, 2006). According to Lankshear and Knobel (2007), digital technologies are 'ontologically new in the sense that they entail "technical stuff" and "ethos stuff"' (Lankshear & Knobel, 2007, p. 7). By 'ethos stuff they mean the emergence of practices that are "'participatory', 'collaborative', and 'distributed' in nature, and can be contrasted with the "'published', 'author-centric', and 'individuated'" nature of traditional learning (Lankshear & Knobel, 2007, p. 9). Black's (2010) case study of her participant observation of the use of a virtual environment called Webkinz World aimed at preteen children, illustrates this theme through the potential opportunities for children to engage in highly networked, collaborative learning.

The above literature has made claims for the beneficial pedagogical practices offered by games, however there is emerging research that makes additional claims for improved literacy practices which are situated under the title 'new literacy practices'. These practices employ the increasing multiplicity and integration of significant modes of meaning making where textual

information is related to the visual, audio, multi-media and electronic hypermedia (Steinleuhler, 2007).

Merchant's (2010a) research using a MUVE to raise literacy achievement for boys in ten UK (Barnsley) primary schools suggested that it not only provided an immersive environment where boys engaged in collaborative thinking and problem solving, but that they also engaged in a variety of literacy practices. These included exploring multimodal texts where players had to read environmental signs and notices, sharing tool tips, navigating and reading hyperlinked texts and formulating written messages using interactive chat functions. Steinkuehler's (2007) research supports Merchant's work. His American research consisting of a two-year ethnography of participant observation of using a MMORG, led him to argue that games are a literacy activity in themselves. In what Steinkuehler (2007, p.299-300) terms as a 'constellation of literacy practices', players are required to read, comprehend, interpret and evaluate a range of texts. Furthermore, the games required players to author texts of their own and use their own spoken, written and visual language. Black (2010) also asserts that her research on Webkinz World offered children many occasions for involvement in literacy-rich contexts and academically-oriented practices that augmented those already encountered in their daily lives.

2.4.3 Barriers associated with digital games

While literature that discusses the educational benefits of game is on the increase, there are also those who express doubts. In particular, enthusiasm tends to be marred by the notion of violence in games and the consequences for the development of children. Plowman *et al.* (2010) outline the socio-cultural, cognitive and affective disadvantages that critics suggest are prevalent because of children's use of technology, such as obesity, language delay and social alienation. Similar concerns have been outlined in relation to notions of a 'toxic childhood' (Palmer, 2007). Merchant (2015) and Steinkuehler (2007) argue that there is little of no evidence to support these claims but that fears are built on isolated cases and feed into a more generalised panic about the dangers associated with the Internet and new technology. Merchant (2015) continues to argue that games are increasingly found to be highly social activities and that the suggestion that they are about banal and passive entertainment is now being challenged.

Buckingham (2007) argues that while games have great potential for the classroom there are significant obstacles when actually using them. He dismisses educational or 'edutainment' games, made particularly for educational learning, by stating that they are usually lacking in

quality, single player games that have unsophisticated graphics and limited interactivity. He is more positive about mainstream commercial games that are utilised in the classroom but acknowledges that these too are accompanied by some difficulties. Problems occur, he argues, from participants being so completely immersed in the game experience; encouraging students to step back from the immediate experience of the game and reflect on broader learning issues often proves difficult. In addition, Buckingham (2007) asserts that students may become so involved in the play that they resist teachers' questions and interventions and fail to connect their experience with potential educational concepts. These issues would have to be noted and analysed when using a computer game in this study.

Merchant (2010a) also discusses some of the professional realities of incorporating digital games into school structures. He argues that it is hard to convince teachers of the worth of games and how this sort of work can be justified in an environment that emphasises basic and traditional print literacy skills. He notes,

The very act of virtual world game playing in school clearly raises an important issue. The whole concept of game play and the notion that students might learn in a game like environment contrasts with dominant interpretations of the curriculum.

(Merchant 2010a, p.103)

Game play also allows for a different type of learner/teacher relationship to emerge, which could disrupt the control traditionally exerted by educators (Merchant, 2010a). In virtual worlds it is very difficult to control the actions of players and they offer new, potentially subversive, ways to act that may not have been experienced by the teacher; this has to be acknowledged as a potential problem.

Egenfeldt-Nielsen (2005) concurs with the arguments of Tuzun *et al.* (2008) and Gee (2005; 2007) by stating that there are grounds for claiming that the use of games can increase motivation. However, he argues that there is simply not enough evidence demonstrating that the use of game results in increases in the learning – this is due to the lack of research that systematically compares the use of game with other teaching approaches.

2.4.4 Technology and dialogue

This chapter now reviews the literature that connects technology with dialogue. Used incorrectly technology can act as a barrier for talk in the classroom; Beauchamp's (2011) two-year study based on interviewing Welsh primary and secondary teachers, found that

technology could be used in an entirely uncommunicative manner. Beauchamp (2011) argues that some teachers used technology to benefit themselves as opposed to the children. Here teachers used technology to present work in a more professional manner. Alternatively, practitioners might have used it to give a clearer clarification of a task by more explicitly modelling learning activities. In these instances, the passive use of technology encouraged minimal interactions (Beauchamp, 2011).

Smeets (2005) argues that tutorial based programs or 'drill and practice' software that requires one predetermined answer allows for limited expressive outcomes. Software such as multiplication and spelling programs are examples of instructional, didactic programs. These programs can provide a good alternative to processes that require much repetition in order to learn about them. What they do not promote is conversation or dialogue. In his study of 331 Dutch primary school practitioners, Smeets (2005) concluded that the use of ICT in general remained disappointing, the emphasis being on skill-based applications (or drill and practice scenarios) that fit into traditional views of teaching and learning. Smeets (2005) noted that only a minority of teachers used open-ended ICT applications to engage the pupils' information-processing skills and to support co-operative learning. Wegerif (2010) supports this by arguing that software that features a tutorial style approach, using a question and multiple answer response, often closes down dialogue. Mercer *et al.* (2003, p.3), in their research on ICT and talk, argue that:

Software design can strongly influence the quality of group discussion – and research suggests that not much software used in schools is well designed to support group work or discussion

Used in the right way, however, it is proposed that technology can encourage and potentially enhance talk in the classroom. Mercer and Littleton (2007) comment on research studies carried out in British schools over a period of sixteen years. They suggest that computers support collaborative learning dialogues because they allow ideas to be easily represented and adapted as discussion progresses; computers offer a useful midpoint between the transient nature of talk and the permanence of paper texts.

Wegerif (2010), drawing on the results of twenty years of research projects on dialogue, encourages the educationalist to think of technology as a medium for opening spaces for dialogue and playful expression. Wegerif (2010, p.109) argues that the Internet opens up a world that gives an almost 'concrete' form to the idea of a dialogic space. Wood (2012) who examined the concept of virtual liminal spaces through a small-scale action research project

with 14 UK trainee teachers, echoes this idea. Liminality is described as a threshold state, a 'between' space where views of the world can be altered as thinking is developed. Wood (2012) discusses how the use of the blog acts as a virtual 'middle space' that encourages expression. Alternatively, Craft (2011, p.58) called these virtual spaces 'living dialogic spaces' where virtual exploration encourages difference in meaning. These studies resonate with my own, in that the immersive digital game might provide a virtual dialogic space.

Wegerif (2010), commenting on research where three classes of ten-year-old children used a citizenship game called *Kate's Choice*, proposes that with the right use of technology Sinclair and Coulthard's (1975) IRF exchange structure is morphed into the more expressive IDRF (Initiate, Discuss, Response, Feedback). Here, the computer might pose the question and require a response, but the type of information posed by the technology requires the children to discuss in groups possible choices before selecting an outcome.

Mercer *et al.* (2003, p.3) explored the notion of 'exploratory talk and technology' and suggested that the computer provided support for 'collective interthinking'. They concluded that, under the right conditions,

children's engagement with ICT (a) increases their use of the productive and equitable type of discussion we have called Exploratory Talk; and (b) can focus their talk on aspects of reading and writing which are important for their literate development.

Similarly, Hennessy (2011) reports on research drawn from ten in-depth case studies of eight teachers using IWBs in a variety of subject areas carried out in (mainly secondary) schools in East Anglia (UK) between 2002 and 2009. Artefacts shown on an IWB were used as mediating agents to encourage dialogue. Hennessy (2011, p.484) asserts that artefacts acted as:

launching pads for evolving dialogues that are fluid and elastic as they continually leapfrog in new directions – sometime circular- from provisional reifications in the artefact. They afford progression in learning through cumulative development of new shared understandings – both of the curriculum content and the process of co-enquiry itself. Hence, constructing digital artefacts, usually in conjunction with co-constructive talk, can serve to both broaden and deepen classroom dialogue

Hennessy (2011) suggests that as well as dialogue that students think and learn through artefacts and these artefacts have particular affordances that help them to cognitively mediate between the individual and the world. The artefact produced on the IWB helped the students be drawn into new forms and spaces of dialogue. Hennessy (2011) continues that the IWB

possesses characteristics that are particularly supportive of dialogue; these include dynamic representation of processes, simultaneous display and comparison of different processes or objects, and meaningful feedback contingent on user input. Artefacts also allowed for direct manipulation in order to actively share and reformulate joint meaning that helped visualise a problem (Hennessy, 2011). Hennessy's (2011) research resonated with my own intentions and I aimed to ascertain if these outcomes would translate to the artefact used in this project.

Gillen *et al.*'s (2006) small scale study of four UK Key Stage Two teachers' use of the IWB, echo the studies of others (e.g. Hennessy, 2011; Mortimer & Scott, 2003) when they conclude that their study of the IWB demonstrates that the shared representation of content has the potential to encourage more interactive and non-authoritative dialogue. Children used the representation on the IWB as a mediating agent by which to challenge the teacher's and their peers' claims; this contributed to the development of a dialogic pedagogy.

Similar to the studies above, mediation was an important notion in Beauchamp's (2011) observation of 41 Welsh primary and secondary school teacher's interactions with learners with and without the use of ICT. Beauchamp (2011) used the term 'technology mediated interactions' in his descriptions of the use of ICT to engage children in talk. Beauchamp used Beauchamp and Kennewell's (2008) framework for the categorisation of the role of ICT for promoting interaction. This framework recorded ICT as:

- The object of the interaction: resources to interact with, where the teacher provides the structure for the interaction e.g. a video clip shown on an IWB
- A participant in interaction: a partner to interact with where the ICT provides the structure for interactions e.g. a quiz
- A tool for interaction: a mechanism to act through where learners are provided with the medium to interact through (email, chat, mind mapping)

Beauchamp (2011) concluded that the use of ICT as a mediating tool for interaction as the most dialogic use of ICT. He argues that this is where pupils took more ownership of the technology and that it moved from being an object that the children talked about to being a tool through which pupils interacted. Children used ICT to explore their ideas rather than just respond. Analysing how children interact through technology is an important theme for this research.

2.5 Creativity in education

Not only is creativity a theme that resonates with my own teaching philosophy for learning, it has also been a dominant feature for educationalists and curriculum policy. Craft (2011) argues that three cumulating drivers have propelled the desire for creativity: economic change, social factors and technological development. Changes in employment, together with the speed of economic development, means that both 'knowledge' and 'creativity' need to be combined for the future population to be able to adapt to these. Patterns in social engagement are now driven by an array of choice and preference; education needs to be creatively geared in order to help children make sense of these choices. Craft (2011) argues for the indisputable creative potential offered by new technological developments; children need to be educated in the right way in order to make the most of these new opportunities.

Similar thoughts providing impetus for the nurturing of creativity were echoed by the seminal 'All Our Futures' (NACCCE 1999) report. Because of this report, the government funded body 'Creative Partnerships' was established from 2002-2011 to work with schools in the UK to help them foster creativity. During this time it worked with over 1 million children and 90,000 teachers in more than 8,000 projects across the UK (Creative Partnerships, 2005). The DfES primary strategy Excellence and Enjoyment (2003) continued to carry the torch for creativity as it urged primary teachers to foster it as part of becoming an excellent practitioner. The QCA (2004) materials *Creativity: find it, promote it* offered additional guidance on the production of creative learning environments by providing a set of practical ideas for schools that augmented theoretical perspectives on creativity.

Since 2010 and the introduction of the Coalition/ Conservative government, the emphasis on creativity has been overshadowed by a political landscape that has advocated subject knowledge and the promotion of the core skills of literacy and mathematics. The consequences of this change in political direction for this piece research are explored in more detail in Chapter Five.

2.5.1 Creativity – a definition

Creativity is difficult to define; the term is widely used and its meaning has become diffuse and uncertain (Cropley, 2001). There is much discussion about what it is and how to spot it in the classroom. It may be that the definition of creativity in education changes as societal and

educational trends develop and change direction. What was considered creative practice in the 20th century may emerge in a different guise in the 21st century.

A growing body of research has emerged that examines the nature of creativity and makes an attempt to define it. Ausubel (1963, p.99) defined creativity as 'a rare and unique talent in a particular field of endeavour'. Alternatively, Gardner (1999) described creativity as a cognitive process in which several intelligences work in harmony. *All Our Futures* (NACCCE, 1999, p.29) proposed creativity as an, 'imaginative activity, fashioned so as to produce outcomes that are both original and of value'. For this committee creativity is product related and ideas should be best utilised by turning them into an outcome or goal. Cropley (2001, p.6) also discusses creativity in terms of a product related outcome. He defines the core elements of creativity in a similar way to NACCCE (1999) by stating that outcomes of this process should be both:

- Effective: the creative process achieves an outcome with some end product
- Novel: the outcome departs from the familiar.

Interestingly, however, Cropley (2001, p.6) adds the additional characteristic of ethicality where he argues that creativity is not usually used to describe selfish or destructive behaviour, crimes or warmongering. Finally, Loveless (2002) proposes creativity as a concept instead of a product. She defines creativity as an interaction between characteristics of people, communities, creative processes and wider social contexts.

It can be seen from the literature that, while the definition of creativity is a conundrum, there is no one 'magic ingredient' that leads to creativity on its own. Creativity is multifaceted.

2.5.2 Personal qualities of creative individuals

Personal qualities of creative individuals are described in Sternberg and Lubart's (1999) 'confluence model', in which six resources converge: intellectual abilities; knowledge; styles of thinking; personality; motivation and environment. Cooper (2013) defines creativity as a mix of 'possibility thinking', imagination, risk taking, making connections and collaboration. Craft (2000, 2011), Craft *et al.* (2008) and Jeffrey and Craft (2004) also champion the notion of possibility thinking which is described as the 'heart of creativity' (Craft, 2011, p.51) as a result of a four stage qualitative research project that spanned six years and six universities studying children aged between three and eighteen years. Findings suggest that possibility thinking requires direct engagement with problems which involve children posing multiple 'what if

questions' that might include 'what is this and what does it do' but also helps them to ask, 'what can I/we do with this?' This, in turn, encourages children to involve themselves in alternative routes to solving posed problems via investigation and experimentation. Characteristics of possibility thinking include posing questions, play over extended periods, immersion in a loving environment, innovation that enables children to make a strong connection between innovation and ideas, being imaginative as well as self-determination and risk taking (Craft *et al.*, 2008 p, 68). In this research I would aim to explore creative outcomes from the use of a digital game, the characteristics of possibility thinking as an indicator of creativity would be an important consideration.

Cropley (2001) also examines the multi-faceted nature of a creative personality. Cropley (2001) asserts that creative people present an amalgamation of psychological factors that may, but not necessarily, combine to present 'creative effects'. Cropley (2001) lists ability, knowledge, skills, motives, attitudes and values, openness and flexibility as critical features, also adding the 'feature' of courage. To make headway with new lines of thinking requires a certain amount of inner belief and courage. Meanwhile, Csikszentmihalyi (1996) identifies a common characteristic of creative people as 'flow'. Flow is signified by the automatic, effortless, yet focused state of consciousness when engaged in activities, often painful, risky or difficult, which stretch a person's capacity whilst involving an element of novelty or discovery. For the themes of courage and flow to be achieved it could be suggested that pupils need to be in a safe environment where they are imbued with a developing sense of self-esteem that is nurtured by a culture where success is recognised; this maybe an important element in this research project.

2.5.3 Promoting creative environments

As well as listing creative personality traits, literature suggests that an environment that engenders creative responses can be developed. Wegerif's (2013) notion of creative thinking involves the ability to have new ideas that pop up when you need them. Wegerif (2013) draws on the work of Langer and Moldoveanu (2000) who made a distinction between mindful and mindless teaching. Being mindful involves seeing all possibilities, this would involve a teaching approach that uses vocabulary like 'could be' and 'perhaps' or 'from one perspective'. Alternatively, 'mindless' teaching uses words like 'is' and 'can only be'; mindful teaching produces students that are more adaptable (Wegerif, 2013). Wegerif (2013) also stresses the importance of exploring moments of consciousness, creative thought is the result of the relationship between the foreground of consciousness and the interaction with background

thought. It is through the interaction between a central focus of attention and the background unconscious process, that over a period of time a new idea might emerge. For this research it would be important that the artefact produced would be one that allowed for multiple possibilities of thought and not a product which required one set solution. In addition, data that shows the use of words like 'could be' and 'perhaps' might suggest the presence of a creative environment.

Cooper (2013) notes that creativity is more easily come by when pupils are relaxed and not afraid of taking risks because the dorsolateral prefrontal cortex, which is concerned with self-control, is deactivated and this is associated with an uprising of spontaneous ideas. Conversely, the dorsolateral prefrontal cortex remains active when an activity requires memorisation. Similarly, NACCCE (1999) argue that freedom to experiment is essential for creativity; a playful approach to learning is a vital ingredient. My study design would involve the children playing a digital game and so they might feel more relaxed than in other learning environments. Play is an important theme in this literature review and I return to it in more detail in section 2.6

Jeffrey and Craft (2004) make the distinction between 'creative teaching' and 'teaching for creativity'. They particularly discuss the latter and stress that 'teaching for creativity' involves encouraging pupils to believe in their creative identity. This, they say, should be achieved by developing common capacities such as curiosity, becoming more knowledgeable about creative processes and providing opportunities to be hands on. For the purposes of this study, the digital artefact to be developed would therefore require the children to be 'doing' throughout.

2.5.4 Barriers to creativity

Despite arguments for the importance of creativity as evidenced above, creativity in educational settings can sometimes be difficult to realise when it comes to integrating it with all the other needs of the curriculum. Creativity in the classroom is an abstract objective and this can create a tension for educators who operate in an education system that advocates standardisation and testing (Craft *et al.* 2008). Creativity, while desirable, might be seen as an enjoyable but a poor relation to the more important stuff of preparation for tests; time for 'creativity' along with other curriculum pressures has been cited as an issue for teachers (Cowley, 2005). The new National Curriculum (DfE, 2013) further emphasises the importance of knowledge over creative pedagogical processes (Robinson, 2013). As a past practitioner, it

was easy for me to hold 'creativity' as a value to be had in the classroom; the day- to-day reality of achieving this was harder to resolve.

Craft *et al.* (2008) categorise 'barriers to creativity' into three groups. Statutory barriers, such as statutory tests with emphasis on literacy and numeracy that produce a system of an audit culture acts as the first barrier. Organisational barriers producing conflicting pressures on teachers and poor support from heads produces a second barrier. Pedagogical barriers also exist - teachers want to take risks but their sense of accountability combined with an entrenched way of delivering the curriculum prevents many of them from embracing new ways of teaching. This pedagogical barrier was potentially a particularly pertinent theme to consider for my study.

2.5.5 Technology and creativity

Wegerif and Loveless (2004) maintain that, used in the right way, technology can be at the creative, cutting edge and can support creative outcomes in children in oblique as well as direct ways. Indeed, such is the rich potential of ICT that, they say, there are certain characteristics of digital technologies that combine to offer a distinctive contribution to creative activities that cannot be achieved using other tools. As such, they maintain that technology and creative outcomes are natural partners. In this part of the literature review, therefore, I examine the potential relationship between technology and creative outcomes.

For Wegerif (2010), creativity has two central facets that consist of:

- Imaginative play
- The fashioning of a socially valued product.

Wegerif (2010) notes that technology acts as the enabler for creativity to occur. It is the provisional and correctable nature of technology that encourages playful risk taking, as well as allowing children to produce a high quality finished product. For Wegerif (2010) the key characteristics of technology that support creativity are:

Provisionality – technology enables users to make changes to products easily. This encourages them to try out alternatives and reduces the fear of making mistakes. This is a very freeing experience and in turn helps children become more creative in their responses. As a past practitioner it is easy to recall occasions where the provisional nature of ICT has helped children to pursue tasks in a motivated manner. For instance, children were able to write

freely using a word processor when they had been struggling to form words. Alternatively, the freedom to experiment with tools when using digital art packages resulted in an engagement and motivation that was not previously realised. This aligns with Ryan *et al.*'s (2006) theory that motivation is enhanced when the learner experiences a high level of choice in the software being used (see section 2.4.2). Furthermore, the availability of the 'undo' tool gave children even more impetus to 'try things out'.

Interactivity – technology is responsive and can engage users by providing feedback on actions. In a game feedback can give users a sense of validation as there can be consequences to actions taken in the form of well-done messages or giving of extra lives.

Collaborative – it is easy to share work when using technology. In my study design the children would use a game where they could collaborate in the immersive environment via their use of avatars.

Creation of quality products – children can more easily produce something to be proud of using technology.

Multimodal – pictures, words and sounds are combined in a seamless manner not offered by other tools. In a digital game this combination of features makes for a situation that can be evocative of real-life experiences.

Automatic – routine tasks are simplified in order that ideas can be more easily actualised – in an immersive world environment children can be ambitious with ideas and realise projects that might be too difficult to achieve elsewhere.

(Wegerif, 2010, p.109)

Loveless (2002), in the Futurelab initiated literature review on the empirical evidence that links technology with creativity, suggests that it is the interaction between the distinctive features of technology and the characteristics of creativity that makes technology such a good vehicle for encouraging creative outcomes in pupils. Loveless (2002) explored the links between technology and creativity using categories which are listed below, often connecting them to the NACCCE (1999) definition for creativity. While these theoretical sections may overlap and interleave in practice, Loveless (2002) argues that categorising these different areas can also help the practitioner to realise potential technological creativities. Characteristics and domains are listed as:

The importance of physical and virtual learning environments – the provision of open and flexible spaces that support creative responses. As well as using technology in fixed, physical spaces, the developments in the design of personal mobile and wearable technologies which can support learners in any location at any time are also important. Loveless (2002) argues that in thinking about how we might teach for creativity with digital technologies, a key factor is the development of learning environments which provide opportunities and promote an ethos which support creativity.

Developing ideas

This area is often associated with the use of digital technology to explore the question, 'what would happen if...'. The provisionality, interactivity and capacity of ICT allows children to experience digital resources that provide exploration through the trying out of ideas. This, in turn, encourages children to learn via problem solving, taking risks and making connections. Software that supports this type of learning includes simulations, spreadsheets, all control technologies as well as digital games. Moreover, it is suggested that environments that support creativity are those which, 'encourage the qualities of exploration, play, taking risks, reflection, flexibility, focus, commitment and sensitivity to valuing the endeavours of individuals and communities' (Loveless, 2002, p,15). This finding helps to justify why digital games might be a good vehicle to use in this project.

Making connections

This involves finding things out in order to support, challenge, inform and develop ideas, which are important elements in the processes of using imagination, fashioning and pursuing purpose. Technology facilitates children to enable them to search for information helping them to make these connections.

Creating and making meaning

The weaving of imagination, pursuing purpose and being original requires the learner to move beyond the use of tools just for their own sake, towards using them to make new and creative outcomes. For Loveless (2002), this involves an on ongoing 'dialogue' between the producer of the work and the work itself. These creative processes are aided by technology as it allows the work in question to be easily manipulated and gives the possibility of leaving a trail of the development of the progress of the work. In my study the digital game would be manipulated to realise the ideas of the group.

Collaboration

Loveless (2002) draws on the work of Lave and Wenger (1991) when she asserts that learning is social and that knowledge is constructed through collaboration and interaction. The speed and range of technology enables learners to collaborate in immediate and dynamic ways during the development of creative outcomes. In my study the children would be interacting as a group both in the physical and virtual worlds.

Communication and evaluation

The consideration of purpose and audience leads children to make detailed evaluations of the levels of originality and the critical consideration of the value of their work. Technology helps in this creative process as it provides easy access to audiences on a school, community and global scale.

Loveless *et al.* (2006) continue to pursue the theme technology and creativity. In a project undertaken with student teachers, a new model for creativity and ICT was produced that proposed creative practices were a result of an interaction between features of ICT, features of creativity as well as features of ICT capability as required by the National Curriculum ICT Programme of Study (DFEE and QCA 1999).

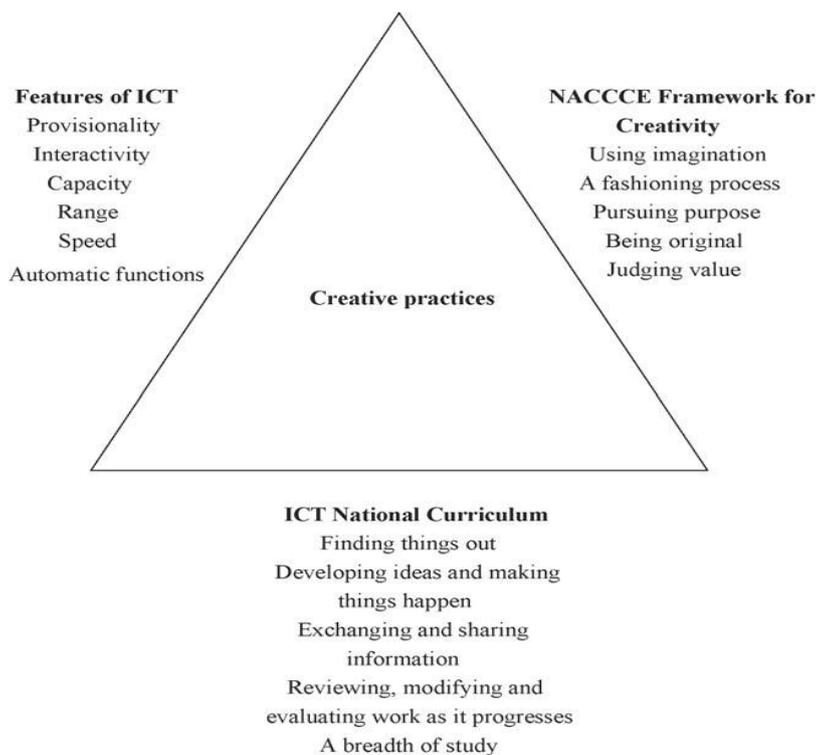


Figure 2.2 The interaction between ICT tools, creativity and ICT capability. From Loveless *et al.* (2006, p.5)

Figure 2.2 is helpful to this study as it supports the argument that technology possesses features that can be linked to creative processes that are applicable to the curriculum. Moreover, in later papers, Loveless (Loveless *et al* 2006; Loveless 2007) further develops her argument for technology and creativity by suggesting that there is a danger of locating the power of the features noted above in the technologies themselves rather than recognising how creativity emerges as a result of a wider interaction with human agency and purpose. Ultimately, she suggests that the framework for creative outcomes, via technology, depends on the, 'intersection between characteristics in people, creative processes, subject domains and wider social and cultural contexts' (Loveless, 2006, p.11).

Condie *et al.* (2007) echo the argument of Loveless (2007) when they discuss the potential for technology to help promote creativity. These authors contend that a creative outcome is only realised through a combination of a teacher's understanding of software, pedagogy and metacognition that ensures that children access higher order thinking skills when using ICT. BECTA (2004) also argue that it is only in a classroom that is conducive to creativity that technology can be used purposefully by pupils to express their ideas, to respond to tasks in unpredictable ways, to use a combination of intuition, logic, reason and spontaneity and to make connections and take risks.

Loveless *et al.* (2006) also acknowledge the importance of the creative potential of technology in their study of technology with prospective practitioners. Sixteen UK student teachers experimented with equipment that might provoke creative responses with children. The students were given 'digital media labs' of portable resources which included a laptop, digital video camera, digital camera, music keyboards and software for image and sound editing and manipulation. The students were given time to explore these resources before using them in the classroom with children. This prior learning had important consequences for their understanding of how to promote creative responses in children. For instance, the students were aware that they needed to allow children to try things out during open-ended activities and to understand the importance of using 'play as a starting point' during investigations of the use of new technology. They were also more able to help the children find a balance between stifling their ideas by overprescribing the activity, and providing an element of freedom that was described as a 'safe space' for exploration by giving the children some guidance via limited initial modelling (Loveless *et al.* 2006). This piece of research suggests the importance of producing an artefact in this study that is open-ended but not so devoid of structure that the participants feel they do not know what to do or how to go about the task.

Potter (2006) also explored student teachers' creative use of ICT through an analysis of a digital video editing project. Potter (2006) found that learner agency and engagement was an important feature of the creative process. Technology had an important role to play in this process as the personal agency was facilitated by tools which allowed the easy manipulation of multimodal resources that enabled the realisation of an expression or idea (Potter 2006). The learner agency was engendered through the fact that the technology enabled the students to be active learners letting them recombine and re-present video material in order to give it new meaning. Allowing children to be active would therefore be an important element in the artefact designed for my research.

The last few paragraphs demonstrate that there are many characteristics of technology associated with creative outcomes. This research would analyse the conversations generated as a result of using technology. Some conversations centred around computer use are more creative than others (Wegerif & Loveless, 2004). Next, I review how technology may encourage creative conversations and explore how they work.

2.5.6 Technology, creativity and dialogue

Wheeler *et al.*'s (2002) small scale study of six, year six, mixed ability children in a rural British primary school, linked technology, creativity and social interaction to produce a conceptual model that resonates with this study. Wheeler *et al.* (2002) value the development of creativity in young children, arguing that it is one of the most vital skills they might possess. They contend that without the means to operate in creative manner children remain unimaginative and lack critical transferable skills to be able to engage in personal and professional life. Wheeler *et al.* (2002) agree with Potter (2006) who suggests that the 'hands on' nature of technology enables children to be in control of their own learning and this enhances creative thinking. The multitask capacity offered by ICT, in the eyes of these authors, also facilitates creativity. Wheeler *et al.*'s (2002) conceptual model is presented in Figure 2.3

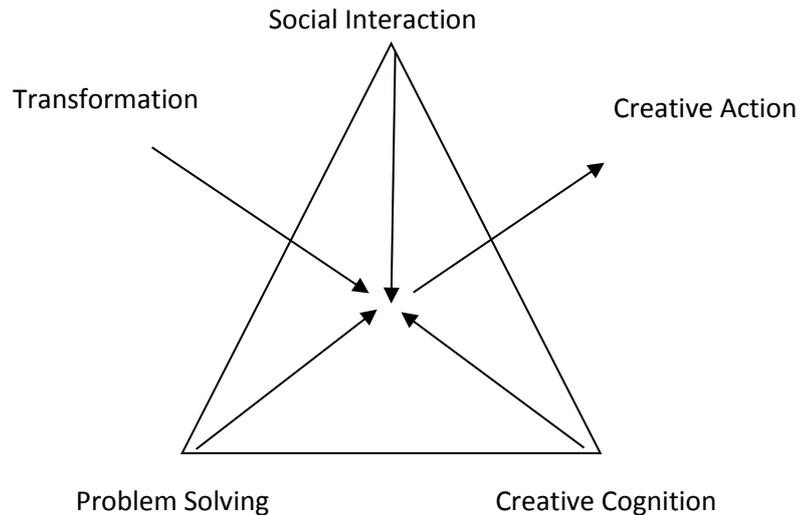


Figure 2.3 Wheeler *et al.*'s (2002, p.370) model of the creative use of ICT in learning

In Figure 2.3 it is the 'transformational thought' (Wheeler *et al.*, 2002, p.370 represented by Wheeler *et al.* in Figure 2.3 as transformation) found at nexus of three behaviours consisting of social interaction, problem solving and creative cognition that is fundamental for the development of creative action. Technology can offer a good environment for these three elements to develop. These authors (2002, p.370) argue that it is collaborative, problem-based, open-ended technological tasks that encourage divergent responses to tasks that helps to 'transform thinking'. Furthermore, Wheeler *et al.* (2002, p.370) posit that technology allows for a task to be left and returned to – the ensuing reflective period can further 'transform' thinking. Of importance, and pertinent to my own research, is the social cultural approach and the role of social interaction, which Wheeler *et al.* (2002) argue has been largely ignored by traditional accounts of creativity. Their model seeks to redress this balance by stating that electronic devices offer a means to facilitate self-expression in children. It will be interesting to look for instances where analysed data might resonate with Wheeler *et al.*'s (2002) model in terms of divergent, collaborative responses mediated by an open-ended task.

Potter (2006) echoes Wheeler *et al.*'s (2002) argument when he discusses his analysis of digital-video editing with student teachers. He suggests that as well as technology being a facilitator in the creative process, the success of the projects was dependent on the collaboration within the groups. Ultimately, Potter (2006) argues that in this project the creativity was a social practice rather than one which emphasised individual expression and originality. These studies are important for this research as group talk, as opposed to individual expression, would be an aspect that I particularly analysed in my study.

Wegerif *et al.* (2010) also explore the link between the three themes of creativity, dialogue and technology. They highlight researchers who have connected dialogue with creative outcomes and refer to the research of Sawyer (2006) and of Dunbar's (1997) study of group talk in three microbiology laboratories. These authors suggest that creative breakthroughs occur as a product of little sparks of insight that arise as people respond to each other in dialogue. Wegerif *et al.* (2010) also refer to Bakhtin (1986) who believed that real, open-ended dialogues were essentially creative or creative illuminations between different voices and perspectives; this dance of voices puts emphasis on the creative outcomes.

Wegerif (2010) has advocated the model of exploratory talk of Mercer (2000) but added another dimension to link creativity with dialogue. Evaluating examples of talk of primary pupils using technology, Wegerif (2010) argues that as well as conversations being used to elicit reason, the notion of playful talk should be added to the list of criteria that makes for a creative, dialogic model. He notes it was easy to relegate analysis of this type of talk as irrelevant and off-task but reflection had made him reconsider its value. He concludes that playfulness helps pupils to make word associations that then lead to alternative ways of seeing. This suggestion made by Wegerif (2010) resonates with the playful approach adopted in my own study. His re-evaluation of talk that he considered off-task talk is an issue I would need to be mindful of when analysing captured data.

Wegerif *et al.* (2010) explored how to measure creative thinking in Graphically Mediated Dialogues via a programme that could spot creative incidences from 14 mapped discussions of the dialogue of higher education students. Certain features of the dialogue construed determinants for the code when seeking to explore what a creative conversation might look like. The elements the conversation that prompted a creative outcome were:

- The offering of new perspectives
- The ability to listen to new perspectives
- Expressions of openness to others
- Changes of mind
- Statement of claims and counterclaims.
- Elicitations of the views of others
- Being able to see through the eyes of others
- New insights on a theme

Wegerif (2010) argues that the origin of creativity lies in dialogue, as dialogue can be a generator of new ideas. The greater the difference between people held together in dialogue, the greater potential for creativity. Technology can help this to occur by bringing together a number of different people from distances for discussion. Wegerif (2010) continues that this is emulated in the 'dialogue of games' where the Internet brings together a wide audience who can all discuss how to solve problems in a gaming scenario. Creative development occurs via the notion of the space of possibilities; widening and deepening the space of possibilities that opens up in dialogue is the key to creative thinking (Wegerif, 2013). Ultimately, Wegerif (2010) argues that, technology is beginning to give a heightened tangibility to a vision of universal dialogue.

2.6 Play as a vehicle for learning

The final theme discussed in this literature review is that of play. I have already touched upon play several times in relation to creativity, in the production of a creative dialogue and in relation to the use of computer games, and I now explore it in more detail.

Play is a key theme in this research project, which has the underpinning philosophy that play (and a playful attitude) is a worthy and productive vehicle through which to learn. Ortlieb (2010) notes that, while play has been traditionally recognized as an activity within early childhood education, it also has substantial importance for learners at all levels. This is relevant for this literature review in that if technology is to be used well in the classroom, the play based element of it, which so consumes children during their leisure time, might be effectively harnessed to help children to learn.

The play that this study addresses relates to games and technology. For some, this kind of activity might not be seen as 'real' play at all. There is little agreement amongst theorists and much ambiguity as to what play actually is. Anthropologist, Turner (1969) calls play liminal, meaning that it represents a threshold between reality and unreality. Spariosu (1989) suggests that play is 'amphibolous', meaning that it goes in two directions at once and is not clear. To add to the complexity of play there is a great diversity in the types of play that can be enacted. Caillois' (2001) hierarchical classification of play exemplifies this point. Caillois (2001) articulates a continuum of play that begins with a form called 'paidia', which features open-ended fantasy, role-play, free-form diversions and unscripted amusements. The opposite end of the continuum is labelled 'ludus', this is where play is regulated by conventions and is rule bound. Play characterised by 'ludus' has progressed from the turbulence of paidia to the application of rules provided through the conventions and techniques of rationalised games. A final complication of play is that, as well as different categories of play, there exist different demeanours towards play, in that you can have a 'playful' approach in your mindset, but not actually be engaged in a play activity. While it is not within the scope of this thesis to engage with wider debates about the definition of play, it will attempt to situate play in relation to good learning attributes, creativity and computer games.

Ortlieb (2010) reviews the literature on play and highlights a key theme for this project when he suggests why play is of such importance for learners of all ages. He defines play as 'a minimally-scripted, open-ended exploration in which the participant is absorbed in the spontaneity of the experience' (Ortlieb, 2010, p.242). In other words, humans can involve

themselves in play and place themselves in a state of mind where they do not think of anything else – the word ‘absorption’ is the key point here. Ortleib (2010) uses football to exemplify his point by noting that players will stretch themselves to the extreme in the pursuit of a winning goal. This example, can be applied to children playing a computer game where they can ‘block out’ all outside distractions and appear centred on achieving the goals of a game. As Ortleib (2010) notes, this concept is potentially extremely transformative for education. If students of all ages could use play to learn curriculum content they might try harder and make greater efforts to succeed and achieve to their highest ability. The potentially transformative power of play in relation to computer games is one reason why I selected play as an important theme in this study.

Ortleib (2010) also argues for the importance of group play, suggesting that it should be fostered in the classroom as students can then debate and co-create. He maintains that learning from peers often proves more substantial than learning from the teacher as when playing in groups children will share ideas and view them from multiple perspectives (Ortleib, 2010). Ortleib’s (2010) argument for group play can be connected to the earlier points made by Bakhtin (1981) who states that quality talk is produced from dialogues that are developed by multiple perspectives and that meaning is negotiated in the context of a difference between many voices. Ortleib (2010) makes the same point concerning multiple perspectives, but instead relates this to play via group activity.

Educational theorists often position play as beneficial due to the links it has with creativity (Bruner, 1975; Bruner *et al.* 1976; Brown 2003). A playful demeanour, with an indifference to extrinsic motivators, frees up the mind to make a more varied, creative list of responses in relation to set problems. The idea of combinational flexibility is important here (Bruner *et al.*, 1976). Objects seen as play artefacts encourage the development of creativity in that when things are seen as play objects they have their own inherent flexibility and allow a number of possible connections to be made between them (Bruner *et al.*, 1976). Brown (2003) argues that when there is flexibility in the play environment this has a knock-on effect in increased flexibility in the learner. Furthermore, Bruner (1975) postulates that a playful approach fosters creative responses as it is not chained to the strict rules of reality and is freed from social pressures. Play is less risky than ‘work’ and that means new situations can be entertained as there is less fear of failure. This theme is also connected to ‘playing’ a computer game. Silvern (2006, p.220-1) suggests that the advantages of play using a computer, ‘allows players to test the limits of their capabilities in a match between challenges and skill within a non-threatening environment, removed from the dangers of the real work’.

Literature, old and new, also links play to the theme of divergent thinking. Divergent thinking is the idea that a child can produce many different solutions to a set problem and that their thinking does not become 'stuck' between a limited number of tried and tested responses. Clark *et al.* (1989) found a relationship between divergent thinking and play in pre-schoolers that was predictive of divergent thinking over a 3-year period. Dansky and Silverman (1973) found that children who played with objects during a play period gave significantly more uses for those objects than did control subjects. Furthermore, Dansky (1980) contends that make-believe play was the mediator of the relationship between play and divergent thinking. Claxton (2002) suggests that play and playfulness are one of the essential learning dispositions that produce a resourceful, capable learner who may have the ability to produce many different answers to a set problem. These authors suggest that educationalists would want to try to promote the skills of divergent thinking; so playful environments should continue to be encouraged throughout a child's schooling. Russ (2003) concludes that it is crucial that children are helped to develop the resources of play and divergent thinking, so that both they and society benefit during their lifetime.

In this project while the children involved would be playing a game, this would be employed with a view to gaining a learning outcome. Empirical research has linked play to learning which is entitled 'deep learning' as opposed to less desirable outcome of 'surface learning' (Marton and Saljö 1976). Surface learning refers to cases where pupils try to memorise information detail by detail. Vos *et al.* (2011, p.128) explain students exhibit deep learning during,

the critical analysis of new ideas, linking them to already known concepts and principles, and leads to understanding and long-term retention of concepts so that they can be used for problem solving in unfamiliar contexts. Deep learning represents approaches that focus on integration, synthesis, and reflection

Oyen and Bebko (1996) investigated the effects of computer games on deep learning. When comparing learning using a computer game with a traditional lesson, games enhanced children's interest and engagement towards a learning task. They observed that the children in the game lesson did not want to stop playing, and therefore rehearsed the content more than the children in the traditional lesson. They proposed that this indicated deeper level of knowledge construction although it should also be noted that simply practicing something does not necessarily reveal a deep understanding

Other researchers have continued to associate playing games with higher attainment in learning. Kebritchi *et al.*'s (2010) study of 430 maths students in an urban high school in the

USA, found significant improvement in mathematic achievement of students who worked with a computer game, unlike the students who did not work with it. While these authors report that participants demonstrated increased engagement, they also found the mathematics concepts stayed with the students longer when they used them in the game. Additionally, Greene *et al.* (2010) assert that the use of a hypermedia learning environment in USA high schools engendered more declarative and conceptual historical knowledge, as well as historical thinking skills. Ryan *et al.* (2012) continue to develop this theme. Reviewing the literature in this area, they suggest that deep learning comes from games that offer meaningful models of real world systems, which allow students to learn through an experiential approach, as opposed to a didactic learning strategy. These games allow the students to learn through exploration, discovery and mastery and, as they control their learning, feel that they have ownership of the game as well. This allows pupils to make abstractions and to discover patterns that emerge intrinsically as a seamless part of the learning experience, instead of having them externally imposed (Ryan *et al.* 2012).

2.7 Summary of literature review

The literature review has shown that pupils demonstrating creative, language rich responses would exhibit the following elements:

Creative indicators

- Solve problems
- Make connections
- Collaborate
- Be 'mindful in their approach
- Show possibility thinking
- Take risks
- Show flow
- Playful

Dialogic indicators

- Collective
- Reciprocal
- Supportive
- Purposeful
- Exploratory
- Offers ideas with reasons
- Tries out tentative thoughts
- Accepts changes of points of view
- Pupils admit when they did not know
- Allows for the dialogic gap (difference between views)
- Able to see through the eyes of others
- May have an IDRF pattern

The ICT artefact used in this project would need to exhibit the following elements:

- Interactive
- Collaborative
- Multimodal
- Automatic
- Possess capacity and range
- Possess clear goals
- Give immediate feedback
- Give a balance between challenges and skills
- Show the merging of action and awareness
- Eliminate of fear of failure
- Encourage autotelic activity
- Have an online dimension in order for children to have access to multiple voices
- Encourage problem solving
- Encourage empowerment through immersion in a video world

From the literature review I learned that the definition of dialogic teaching differs as shown by the bulled list presented above and explained in detail in this chapter. Terms are used interchangeably, features of dialogic interaction also differ from researcher to researcher. As such, a methodological approach will have to consider whether to move forward with one definition of dialogic talk, or to consider the different definitions in the research design and subsequent analysis. Furthermore, when aiming for a dialogic approach it is not enough just to place people in groups, they need to be prepared for a dialogic approach beforehand. This can be facilitated by the application of ground rules (Mercer, 2000). Consideration will need to be given to the make-up of these rules and how and when they will be applied when working with different research groups. It will need to be clarified if these rules will be explained at the start of any lesson or if they will be reminded of them throughout –different applications may impact on the data collected.

Like the complexities surrounding dialogical talk, the definitions of creativity are diverse. When researchers consider how creativity might be evidenced in learning, features included are that of possibility thinking (Loveless, 2002), playfulness (Wegerif, 2010) mindfulness (Langer & Moldoveanu, 2000) and the importance of social processes (Wheeler *et.al*, 2002). These

features will help in producing a research design that tries to illustrate when this 'abstract' process might be present in discourse. How creativity is different or similar to definitions of dialogic talk will also need to be clarified in the research design. Wegerif (2013) introduces the notion that teaching for creativity focuses on allowing children to appropriate the dialogic space that is characterized by uncertainty and multiplicity and a tension between voices. That the link between creativity and dialogue is realised through the notion of voices occupying the dialogic space will be an important concept to note and discuss when analysing any collected data.

Technology can have a motivational influence on learning (Malone and Lepper, 1987; Ryan *et al.* 2006; Gee, 2007) but their design considerations need to include the elements of, amongst others, interaction, provisionally, collaboration, multimodality, automation and flow (Wegerif, 2010) and any artefact conceived for use in this thesis will need to cater for these. The literature also concluded that technology can help dialogue develop as it creates a learning trajectory (Mercer *et al.*, 2010, Hennessy, 2011). It promotes individual and collective thinking over time that can be purposefully manipulated, reformulated and revisited so that meaning is created cumulatively. Any artefact that is used with the children will need to have the capacity for children to leave and resume their work and discourse. Wegerif (2013) links technology, dialogue and creativity. He argues that technology gives the ability to listen to the voices of multiple perspectives and helps to expand the capacity to participate in dialogue. Hennessy (2011) and Wheeler (2002) assert that creative conversations are mediated through active, open-ended technological tasks. The artefact that is produced therefore needs to allow the children to work collectively in an open-ended, shared space so that they might jointly discuss their decisions taken within that work space.

Chapter 3: Methodology

This chapter outlines the methodological approach of this research project. It details the research methods employed and explains my reasons for their selection. It includes a survey of the key approaches that are common to the study of interactions between children and discusses the opportunities and the difficulties of investigating talk between learners.

3.1 Overall research strategy

The aim of the study was to investigate peer-to-peer talk during the use of an immersive, virtual world digital game. The key research questions were:

1. What are the features of children's group talk when using an immersive gaming environment?
2. How do children use talk to make meaning when using an immersive gaming environment?
3. How might an immersive gaming environment encourage creative responses from children?

The research design was influenced by the sociocultural stance to learning outlined in section 2.1 of the literature review. I started this research from the standpoint that meaning is not discovered but constructed (Crotty, 1998). Savin-Baden and Howell-Major (2013) summarise this perspective by stating that it is important to acknowledge that the world is shared and is understood through interchanges between people, shared objects (in the context of this research, a digital game) and their activities (the use of a digital game). This position means that I would emphasise the versions of reality produced by the research participants as they experienced the educational setting being investigated and on the fashioning of that reality through their renditions of it (Bryman, 2012). The goal of this research therefore was a quest to understand the shared and co-constructed realities of small groups of children when playing a digital game. I needed a research design that would allow me to try to understand the, 'lived realities, experiences, conventions and perspectives of ... learners which were treated as significant and relevant' (Nind *et.al*, 2016, p.11). This included the notion that as a researcher it was difficult to maintain a detached position and I would have an influence on its outcome. I also acknowledge the postmodernist view that knowledge is indeterminate and as a consequence I present a specific version of social reality rather than one that can be viewed as definitive (Savin-Baden & Howell Major, 2013; Bryman, 2012).

3.2 Research design

Although I could have framed the design of this research in several different ways, aspects of a case study were attractive to me and I incorporated these. Case studies are intensive, thus comprising detail, richness, completeness and variance (Denzin & Lincoln, 2011). Yin (2009) explains further that case studies include many variables of interest and multiple sources of evidence. I was aware that while employing some aspects of a case study design, this study would work with just one very detailed source of evidence: observing and analysing the talk of children (even though this would then be discussed from a multiple perspectives). This lack of multiple sources of evidence would therefore prevent me from wholly describing the study as a case study. However, the characteristics of a case study that I employed are listed below.

A case study is an empirical inquiry that investigates a particular phenomenon within its real-life context (Yin, 1994); it is used when there is a need to comprehend complex social phenomena (Yin, 2003). A case study allows the researcher to preserve the holistic and significant characteristics of real-life events (Yin, 2003) and this was a potentially useful approach to this particular thesis that analysed detailed learning episodes. Case study pioneers, Yin (1984) and Stake (1995), assert the importance of the subjective creation of meaning – a stance that was also important to consider in this research. Cohen *et al.* (2007) note that a case study provides an exemplar of real people in real situations and this allows for ideas to be understood more clearly as opposed to offering abstract theories and principles. Case studies seek to explore what it is like to be in a particular situation and to detail the close-up reality of an event (Geertz, 1973 cited in Cohen *et al.* 2007). This approach was therefore particularly attractive to this research project, as I aimed to explore ‘what talk was like’ when participating in a lesson using an immersive gaming environment.

A case study approach offered the opportunity to provide a narrative of events. It blended description with analysis, highlighting specific, relevant events in an attempt to portray the richness of the case when writing up the report (Hitchcock and Hughes, 1995 cited in Cohen *et al.* 2007). The fact that this research was particularistic instead of generalistic, in that it concentrates on analysing the specific detail of dialogue, is an additional feature that identifies with a ‘case study’ (Savin-Baden & Howell-Major, 2013). All these features were very pertinent to the way I wanted to carry out the research and the following analysis chapters demonstrate these attributes.

The research design involved an intervention: a computer game to investigate talk. While the game determined many features of the talk, I was aware that other factors contributed to the outcomes of the discussions – the physical and social context that the children operated in played a role. As such, because phenomenon and context cannot always be separated, a case study provided a useful approach (Yin, 2003) as it was descriptive and could combine subjective and objective data (Dyer, 2006; Savin-Baden & Howell-Major, 2013). Cohen *et al.* (2007) further support this argument by postulating that case studies help to observe effects in real contexts recognizing that context is both a powerful determinant of both cause and effect.

Criticisms of case studies include the idea that they contain insufficient precision, objectivity and rigour (Yin, 2003; Shaughnessy *et al.* 2003). Newby (2010) notes that, although case studies are excellent at providing a rich understanding of a situation, a researcher using a case study can get it ‘horribly wrong’ when they allow bias to influence results. As Dyer (2006) suggests, when creating a case study, a process of selection has taken place and they are, therefore, impressionistic, only the researcher is aware what has been selected to be included and what has been left out. In the case of this project, where findings are presented in the form of analysed extracts of talk, it might have been easy and convenient to present episodes where the talk featured the elements that I was looking for. Hence, it was important to provide evidence of multiple instances of different categories of talk and to make sure that the extracts that were selected were representative occurrences. However, while rigorous representation was important, Cohen *et al.* (2007) argue that infrequent, atypical events are also central as they may be crucial to the understanding of the case. For example, while an occurrence of talk may only have happened once, it should not automatically be ruled out as it might have provided a critical, new light into the use of the immersive game environment. The key here was to recognise the significant from the insignificant.

An additional criticism of case studies is that they are difficult to generalise as they reflect one particular instance of a case (Cohen *et al.*, 2007). Bassey (1999), in his discussion of case studies in educational settings, believes that teaching situations are so varied it is not possible to make completely certain statements. Instead, he argues for fuzzy generalisations. He reminds us of the many variables which determine whether learning took place and calls for the creation of general statements with built-in uncertainty that cater for the likelihood of a discovery of an exception to the statement. Those who believe that generalizations cannot arise from case studies may be more at ease with the concept of fuzzy generalisations as opposed to the researcher making absolute statements.

Alternatively, Yin (2003) defends the issue of generalisability by arguing that case studies are generalizable to theoretical propositions and not to populations of universes. Therefore, Yin (2003) asserts that the goal of a case study is to expand and generalize theories, or rather, the researcher needs do a generalising and not a particularizing analysis.

Frequently cited discussions on the issue of generalizability call on the work on Guba and Lincoln (1981, 1982). Guba and Lincoln (1981, 1982) argue for the concept of fittingness that emphasises analysing the degree to which a case may match other situations and this provides a more constructive method of thinking about generalizability. To achieve this, they call for the presentation of a substantial amount of information about the research focus and the setting so that an informed judgement is made; in this study care was taken to give a rich picture of the events. Additionally, to further consider the concept of fittingness, this study contains more than one instance, i.e. the computer game was used in more than one school as this might provide additional evidence to help a teacher to consider issues of fittingness to their own setting. To carry out the research in more than one setting, Yin (2003) advises the researcher to follow a 'replication logic' where the study is repeated to ascertain if it produces similar findings. Each individual study should indicate how and why a proposition was demonstrated and across cases the report should indicate the extent of the replication logic (Yin, 2003).

3.2.1 Framing the research: An exploratory approach

Yin's (1994; 2014) notion of an exploratory case was influential in my research design. He suggests that exploratory cases can be used as a preliminary to a full case approach which falls outside the scope of my research. However, I was interested in Yin's (2014) idea that a case study can be used to inform further investigation. He discusses the suitability of conducting an exploratory study when seeking to ascertain what can be learned from the study of a particular phenomenon (Yin, 2014). My aim for the study was to explore whether an immersive game promoted exploratory talk and creativity. I wanted to analyse this in the context of a specific intervention, but also understand whether this approach could be adopted in other educational contexts where settings similar to the ones I was working in are found.

3.3 Defining the units of study

Yin (1994) notes that an important part of the design of a case study is the definition of a unit of analysis. Yin (1994) postulates that defining what the case is can be problematic and gives the example of the case of an individual to be the classic case study. Bryman (2012), however, notes that the most common use of the term 'case' may connect the case study with a location such as a community or organisation with emphasis placed on intensive examination of the setting. Savin-Baden and Howell-Major (2013) assert that one of the essential features of a case study is that it tends to be 'bounded,' meaning that it has clearly defined limits. If the case is bounded then there should be a finite number of people involved. In this study, the 'cases' were two schools and the reasons for their selection are outlined below. In each school the study was 'bounded' by limiting the group size to six children.

3.4 Selecting the unit of study

A number of factors informed the selection of the schools used in this research. The two schools selected were primary schools. Both schools taught an age range of between four and eleven years. Primary schools were chosen to reflect my past experience of teaching and my current role as a lecturer in primary Initial Teacher Training. The schools were located in Hampshire and West Sussex in the south of England.

I selected the schools so that there was diversity in terms of the socio-economic makeup of their respective catchment areas. The aim for using different schools was to be able to populate my research groups with children from a range of backgrounds and experiences. In addition, there were planned multiple observations of the children at each school over time. The tool for analysis of the collected data was discourse analysis. Mercer (2010) notes that, for any sort of quality discourse analysis of talk to occur, research needs to be carried out over an extended period. This principle applies here as analysis of the talk episodes that emerged from just a single investigation may have produced an atypical, snap-shot picture.

The nature of the investigation (involving playing a digital game) meant it was important that the schools selected were willing and motivated by the theme of the project. Schools can be resistant to using technology in new ways (Jamieson-Proctor *et al.* 2006; BECTA, 2004) so it was necessary that the schools chosen felt enthused by the idea. Hambrook School (pseudonym) was recruited during a showcase exhibition, which presented the aims of new research projects to be undertaken within the department of education in which I worked.

Consequently, I was approached by the deputy head of the school who said they would be very willing to participate.

I selected Chester School to provide a contrast in catchment of pupils to Hambrook. I knew the school in my role as a teacher educator and was aware that Chester wanted to improve their use of technology and had expressed a desire to try out new ideas. This informed my decision to approach the head teacher and request permission to conduct my research there.

3.4.1 Selection of participants

In each school six children were involved in the research. These children were in Key Stage Two, in Year Six and aged between ten and eleven years. I used purposive sampling to select the participants of the study group for a number of reasons. Arthur *et al.* (2012) argue that purposive sampling is most suitable to those studies that aim to analyse a particular context in rich detail, an aim of this particular piece of research. Additionally, it was important that all the children were keen to participate in the study. To the children I was an unknown adult and I did not want them to feel uncomfortable when working with a stranger. It was for this reason I asked for willing volunteers. I selected the participants from the volunteers in collaboration with their class teacher. I used maximum variation sampling in order to gain a diverse range of learners from the class (Cohen *et al.*, 2007). I wished to conduct the research with children with a good range of communication abilities and of both genders. Consequently, their teacher chose children from different ability groups in literacy and particular care was taken to select a mix of genders who were confident when speaking and those who were reluctant to express themselves. I decided to concentrate on selecting children with differences in literacy as opposed to generic attainment as I particularly wish to focus on children who were different in their articulation and expression. Difference in ethnicity was less of a consideration in this research as both schools reflected little diversity of this nature and were largely typical of the monocultures found in schools situated in the south east of England. Variety in the chosen sample group was therefore achieved via literacy ability and gender. Maximum variation sampling based on literacy ability and gender helped to ensure strength and richness of the data (Cohen *et al.*, 2007). Selecting children who were of a similar ability, perhaps high-achievers, could have limited the findings in that these children might have had good articulation whatever the task given.

I considered several factors when determining the size of each group. I needed to achieve a balance between gaining enough data to make for a meaningful research study and being

overwhelmed by information. There needed to be enough children in the group for them to be able to have a dynamic conversation. However, as Cohen *et al.* (2007, p.390) note, a discourse analysis requires, 'careful reading and interpretation of textual material'. This previous point implies that this process is a time-consuming business, therefore analysing the spoken materials of a large number of students would be unrealistic for this research project. There was also the consideration of capturing the language itself – it is more difficult to capture the entire conversations of a large number of children. Additionally, the project was to be a detailed, fine-grained analysis of a small number of pupils, hence the decision to select six children from each school.

3.5 Data collection methods

This section of the methodology chapter addresses the most appropriate methods for the accurate collection of spoken language data. Different methods are considered and their strengths and limitations assessed in relation to the needs of this study.

My aim was to collect slices of conversation as they happened followed by the creation and analysis of transcripts of the talk. The types of conversations recorded were peer-to-peer transactions. I wanted to record the talk verbatim in order for an accurate and detailed analysis of talk episodes to occur. I needed to use a recording device *in-situ*, in order to obtain contextualised spoken data that occurred 'naturally'. However, the introduction of any recording equipment influences the behaviour of participants who may become unsettled and self-conscious when they know they are being monitored, and so it is difficult to say that the spoken data occurred in a truly 'natural' environment. For instance, they may become overly extrovert or they may refuse to speak at all. Lankshear and Knobel (2004) recommend that preparation for research of this nature includes making trial-run-recordings that enable participants to become familiar with the process. They add the caveat that participants soon become used to being recorded and very quickly start to ignore the equipment (Lankshear & Knobel, 2004; Bryman, 2004).

Video or audio recording were both options for data collection. Lankshear and Knobel (2004) assert that the use of a single microphone placed strategically in the room is the simplest and least intrusive way of collecting evidence. However, unless the chosen recording device is extremely sophisticated it would be unlikely to pick up all the talk occurring in the conversation. Digital video recording could also be problematic when picking up the talk of all children, however, it offered other notable advantages when capturing data simply not offered

by audio devices and this is why I opted to use this as my primary method. When using digital video it is easier to identify speakers and determine gestures that make it possible to interpret talk episodes that may otherwise remain ambiguous in an audio recording (Savin-Baden & Howell-Major, 2013). Newby (2010) notes that observed data should not be confined to just words, but that images, possessions and behaviours are all needed for a full analysis of talk. This is an important point, without observing the body language and gesture of children a researcher may wholly misinterpret the tone of a conversation (Norris, 2004; Jewitt, 2011; Rogers, 2011). Moreover, for a child who may not be participating verbally a video recording allows the researcher to note their behaviour. The child in question maybe in the role of a supportive listener, this would be indicated by nodding and looking at other participants, or they may have become entirely distracted but without visual images it would be impossible to determine their actions.

For the purposes of this study a single video camera on a tripod was used to film the children. While more cameras may have given a more detailed recording, the more there were the more intrusive they might have been (Lankshear & Knobel, 2004). The camera was supplemented by a single digital voice recorder, which acted as a back-up recording device in the event of a technical failure. To help the children get used to the equipment I initially recorded them and then shared it with them so they could see themselves on screen.

3.6 Data analysis tool

I selected discourse analysis as the principal data analysis tool. The following paragraphs seek to introduce this tool and justify the reasons for selection.

3.6.1 Definitions of discourse analysis

The categorisation and interpretation of language is referred to as *discourse analysis*.

Discourse analysis is a popular field of research but the literature defines it in many different ways (Vaughan, 2012; Gee, 2005). Vaughan (2012) details the difference in definitions when she cites Brown and Yule (1983, p.1) who declare that discourse analysis is, 'necessarily the analysis of language in use'. Meanwhile Fairclough (1992, p.28) suggests that this is about, 'more than just language use: it is language use, whether speech or writing, seen as a type of social practice.' Nikander (2006) notes the difficulties of identifying discourse analysis and states that it straddles academic disciplines and boundaries. Nikander (2006) argues that the

term discourse analysis is variously used to describe a methodology, a theoretical perspective or a general epistemological perspective on social life.

Gee *et al.* (1992, p.228) provide a useful definition of discourse analysis that draws on the two quotes given above and extends them, arguing that discourse analysis:

usually focuses first on the purpose and meaning of the overall text prior to employing more 'micro' forms of analysis of the kinds traditionally used in socio-linguistics. In this way discourse analysis focuses on discourse - meaningful stretches of language - in relation to social, cultural and cognitive processes and outcomes

Nikander (2008, p.413) notes that while discourse analysis can be diverse in meaning and application what all the different approaches share, and a key theme which serves to unite them, is,

a strong social constructionist epistemology--the idea of language as much more than a mere mirror of the world and phenomena 'out-there', and the conviction that discourse is of central importance in constructing the ideas, social processes, and phenomena that make up our social world.

This identified common ground is useful as it shows that a discourse analysis is well-matched to the overall research design, which is situated in the belief on the construction of meaning.

Wegerif and Mercer (1997) couch discourse analysis under the theoretical perspective of sociocultural research, which treats the process of thinking as one intimately linked to the processes of communication. Using the work of Vygotsky (1978) as its basis, a sociocultural perspective develops the link between language and thinking. Sociocultural research proposes the idea that educational achievement is related to the quality of educational dialogue instead of the intellectual capacity of pupils or the motivations and expertise of the teacher (Mercer, 2004). Again, this argument supports the decision for discourse analysis being the tool of choice for this research.

Commenting on the range of perspectives concerning discourse analysis, Gee (2005, p.5), helpfully declares that, 'no one approach to discourse analysis is uniquely right'. This could be due to the variety in the nature of the discourses that could be analysed. Gee (2005), citing Hicks (1995), goes on to note that the word 'discourse' refers to both linguistic forms and social communication practices. Furthermore, discourse analysis is not only carried out on oral

episodes, but also on written texts. However, for the purpose of this study I opted to apply discourse analysis to transcribed talk episodes only.

Gee (2005) discusses the notion of *Discourse* (spelt with a capital D) and *discourse* (uncapitalised). Gee (2005) suggests that certain types of languages are used for certain social situations. For instance, he notes that a member of a 'street gang' might speak in a certain type of way and is accompanied by a particular set of distinctive actions. This would be noticeably different to those characteristics of the language used at a formal dinner party. Moreover, one person could use different types of speech according to the 'role' they are currently enacting. For instance, a mother may have a certain type of speech and language that is distinct from that which she uses in her place of work. Gee (2005) discusses the '*whos* and *whats*' of Discourse, where 'who' is associated with identity and the 'what' identifies how the language is socially situated. During this research, it was important to consider Gee's (2005) 'Discourse'. The language I captured was socially situated and the product of a small group situation. The type of language used might have been wholly different to that which might have been produced during a whole class situation.

3.6.2 Approaches to discourse analysis

Deciding how I should conduct a discourse analysis in this research was a complex process. I needed to be able to cater for the following learning characteristics to answer the research questions. The following bulleted lists give a synopsis of themes taken from the literature review that indicate creative and dialogic talk

Creative indicators

- Solve problems
- Make connections
- Collaborate
- Be mindful in their approach
- Show possibility thinking
- Take risks
- Show 'flow'
- Be playful

Dialogic indicators

- Collective
- Reciprocal
- Supportive
- Purposeful
- Exploratory
- Offers ideas with reasons
- Tries out tentative thoughts
- Accepts changes of points of view
- Pupils admit when they did not know
- Allows for the dialogic gap (difference between views)

- Able to see through the eyes of others
- May have an IDRF pattern
- Allows for the emergence of a new perspective

This chapter now examines some of the different categories of discourse analysis. Some of the researchers who have produced methodological frameworks in this area are considered and their work discussed.

3.6.3 Quantitative discourse analysis methods

Quantitative discourse analysis concerns methods that use coding schemes to measure the incidence of occurrence of specific words or patterns of language use in dialogue.

An example of this type of analysis is The Flanders Interaction Analysis (1970), which consists of ten categories of communication, seven of which were centred upon the teacher and pupils conversing and two on pupil-to-pupil interactions. The methods employed by the researcher under this system involved making timed observations of classroom interaction and then categorising the talk produced. In an alternative example, Underwood and Underwood (1999) used the characteristics of co-operative and collaborative working to explore if this could predict performance. Statements observed in dialogue were categorised according to the Bales Interaction Analysis schedule (1950). This classified discussion into twelve possible categories as follows:

Positive socio-emotional comments:

A1 show solidarity (e.g. offers a reward)

A2 shows tension release (e.g. jokes)

A3 agrees (concur, complies)

Task specific help;

B4 gives a suggestion (e.g. a direction)

B5 gives an opinion (e.g. evaluates)

B6 gives orientation (e.g. clarifies or repeats)

Task specific requests

C7 asks for orientation (e.g. requests information)

C8 asks for an opinion (e.g. requests and evaluation)

C9 asks for a suggestion (e.g. requests possible ways of acting)

Negative socio-emotional comments

D10 disagrees (e.g. withholds helps; shows passive rejection)

D11 shows tension (e.g. withdraws)

D12 shows antagonism (e.g. deflates other's status) (Underwood and Underwood, 1999, p.6)

Categories like those listed above could have been useful aids when scrutinising talk episodes. Underwood and Underwood (1999), however, note certain limitations associated with using this framework as some of the categories were deemed to be too narrow for some dialogues to be accurately classified. For instance, they cite the category B4 (where a proposal is offered) as requiring further division in order to give more focus to the type of suggestion being made.

Mercer (2010) notes that the use of coding systems to classify the talk episodes of children can enable the researcher to categorise fairly large amounts of information in a short amount of time. However, this advantage has to be balanced against some distinct limitations when using this method for discourse analysis. The main limitation centres on the ambiguity of language; such coding does not allow for differences in interpretations of language. Mercer (2010) maintains that, due to the ambiguity of language, the use of methods that only code language are actually deemed unsuitable for those who wish to explore collaboration as a vehicle to track the formulation of shared understandings among groups of learners. Nind *et al.* (2016) develop this argument by recognizing that this type of analysis does not acknowledge the context from which the interaction emerges. Learning is an activity that is context dependent and to ignore this would make for a reductive and overly-simplistic approach (Nind *et al.*, 2016). To employ a quantitative approach only would also be contrary to a socio-cultural perspective, which is concerned with enactment and context specific realities.

3.6.4 Qualitative research methods and discourse analysis

Qualitative research methods rely on a careful and detailed explanation of transcribed episodes of different types of talk. Unlike coded discourse analysis methods, the actual talk data is not reduced and the detail of the talk episode does not disappear.

A notable and well-known example of researchers who explored language from a qualitative, sociolinguistic stance (Mercer, 2010) is Sinclair and Coulthard's (1975) pioneering work on classroom, discourse structures which were linked to educational outcomes. As noted in Chapter 2, these authors suggested that talk in class could be identified as 'exchanges', 'moves' and 'acts'. These different categories of talk would build cumulatively to produce speech segments. For instance, acts combine to form moves, which in turn combine to form exchanges. Sinclair and Coulthard (1975) observed the question-answer-feedback sequences typical of classroom talk and named these as exchanges. Sinclair and Coulthard (1975) saw the exchange as the centre of educational discourse. Vaughan (2012) notes that although Sinclair and Coulthard's (1975) model has now been shown to be too rigid for modern classroom discourse, it still has resonance for discourse analysis. Vaughan (2012, p.35) goes on to argue that, 'the theorising of components of exchange has been highly influential, particularly as it relates to education discourse analysis and no discussion of discourse analysis would be complete without it'.

Sociolinguist Halliday (1993) is another exemplar of a seminal researcher studying classroom talk. Halliday (1993) derived the term systematic functional grammar, which compared special educational functions of classroom language and categorised how this related to grammatical structure and textual organization.

Mercer (2004) notes the lack of researchers who have analysed the quality of dialogue and matched it to meaning making and educational outcomes. He asserts (2010, p.9), however, that it is crucial that this process is carried out and argues for a sociocultural approach to discourse analysis which,

differs from 'linguistic' discourse analysis in being less concerned with the organizational structure of spoken language, and more with its content, function, and the ways shared understanding is developed, in social context, over time (Mercer, 2010, p.9.)

Mercer (2004) maintains that this type of discourse analysis incorporates a concern with the lexical content and the cohesive structure of talk, especially across the contributions of individual speakers. Word choices and cohesive patterning represent ways that knowledge is jointly constructed but crucially it also includes the social and cultural context of talk.

Useful to this methodology is Mercer's (2004) framework for analysing dialogic conversation, as outlined in Chapter 2, he notes the following typology of talk:

- Disputational talk, which is characterised by disagreement and individualised decision making.
- Cumulative talk, in which speakers build positively but uncritically on what the others have said. Partners use talk to construct a common knowledge by accumulation. Cumulative discourse is characterised by repetitions, confirmations and elaborations.
- Exploratory talk, in which partners engage critically but constructively with ideas of others. Statements and suggestions are offered for joint consideration. These may be challenged and counter-challenged, but challenges are justified and alternative hypotheses are offered. (Mercer, 2004.p,146)

Using transcripts of talk, a commentary style of analysis is employed to explain how features of pupil talk might fall into each of these categories. Mercer (2004) describes this typology as a useful framework through which to analyse whether pupils are engaged in cooperative or competitive activities, if they are being critically reflective or merely accepting ideas. Moreover, this qualitative analysis of conversation allows for the historical and dynamic aspects of talk to be considered. Speakers engaged in talk have a shared history and will invoke common knowledge from joint past experience (Mercer, 2004). Conversations are also dynamic in that shared common knowledge will be further developed over time (Littleton and Mercer, 2013). Mercer (2004) notes the challenge for a researcher is that they must acknowledge the contextual foundations of talk and that this must be considered through a qualitative form of discourse analysis on transcripts that are complete, showing the speech fully and as it happened.

I opted to employ Mercer's (2004) typology, but adapted and extended it in the following fashion. Using Wegerif's (2010) emphasis on the creative potential of dialogue talk as outlined in Chapter 2, I decided to add an additional element to acknowledge the 'creative' features of pupil conversation. This is described as: 'Creative talk, defined by the emergence of a new perspective out of the tension of holding multiple perspectives together' (Wegerif *et al.*, 2010, p.614). This might take the form of children working together to produce a new point of view on a problem or seeing a problem in a new way. Wegerif (2010) helped to further inform this decision as he distinguishes the difference between creative and exploratory talk. In particular, he discusses the 'educational significance of playful talk' (Wegerif, 2010, p.37). He postulates that talk is more than that which shows explicit reasoning and concludes of his previous research studies conducted on talk that, 'with hindsight we were wrong to understand thinking only as reasoning rather than creativity' (Wegerif, 2010, p.38). Wegerif (2010) asserts that explicit reasoning is, at times, not the most appropriate line of discourse,

instead of challenging ideas the participants must try to make the best sense they can of a line of thought. As such, in a supportive space where ideas are listened to, played with and jointly reflected upon, new ideas can then emerge. As discussed in chapter 2, section 2.5.2, Wegerif (2010) also draws on Craft's (2011) possibility talk which emphasises that creativity is enabled when students come up with new ideas to solve problems. Craft (2011) argues that activities need to promote the askance of 'what if' questions to help children move towards new insights and build links between new ideas. Furthermore, Langer and Moldoveanu's (2000) mindfulness involves seeing all possibilities, and uses vocabulary like 'could be' and 'perhaps' or 'from one perspective' which could also lead to creative thinking and divergent thought. Ultimately, the argument detailed above determined that 'creative' talk is characterized by different features, and maintains a different emphasis, to exploratory talk and therefore needed to be considered separately.

I deconstructed Mercer's (2004) types of talk and aligned them with the particulars of dialogic talk that were specified in section 3.6.2 to show how this approach caters for the specifics of this research project. I also added creative talk and allied this with themes identified in the literature review and section 3.6.2. This is expressed in table 3.1.

Table 3.1 Themes from the literature review aligned with Mercer's (2004) language classification

The children disagree	This will show disputational talk
The children make their own decisions	
The talk needs to be collective	These terms will show features characterised as 'cumulative talk'
The talk needs to be reciprocal	
The talk needs to be supportive	
Purposeful	
Offers ideas with reasons	These terms will show features characterised as 'exploratory' talk
Tries out tentative thoughts	
Accepts changes of points of view	
Pupils admit when they did not know	

Allows for the dialogic gap (difference between views)	
Able to see through the eyes of others	
Children need to solve problems	These terms will show features characterised as 'creative talk'
Children need to make connections	
Be 'mindful in their approach (they employ language like 'could be' 'perhaps' and see different options)	
Children need to show possibility thinking (children pose their own questions and take risks)	
Talk is playful	

The phrase, 'May have an IDRF (initiate, discuss response, feedback) pattern' was also included in the list of requirements for a dialogic approach as listed in section 3.6.2. However, due to the open-ended nature of the game scenario provided to the pupils involved - which avoids the need for a question/answer response as provided by a typical teacher/student interaction - this element has been omitted on this occasion.

Another requirement at the beginning of this chapter lists 'flow' as a creative indicator. However, as noted in the literature review, Cskszentmihalyi (1996) identifies flow as a 'state of mind' as opposed to an element of talk. For instance, learners who show aspects of flow demonstrate a high degree of concentration on a narrow field of activity and show a loss of the feeling of self-consciousness through the merging of action and awareness (Cskszentmihalyi, 1996). I concluded that trying to analyse a 'state of mind' was beyond the realms of this study and was therefore not included.

3.6.5 Mixed methods discourse analysis

Mercer's (2004: 2010) approach to discourse analysis methodology also combines a qualitative approach with a quantitative strategy. Mercer (2010) acknowledges that different methods may embody different conceptions of the nature of talk and what stands to make a valid

analysis; he continues that some might be ideologically opposed to this type of research. Nevertheless, he argues that a choice of methods,

depends on research being underpinned by a sensitive, flexible theoretical framework for understanding the complexity of real-life events. Given such a framework, I believe there are ways of combining at least some methods which will satisfy most reasonable concerns about validity and methodological consistency (Mercer, 2010, p .9).

Mercer (2010) postulates that these different types of methods help the researcher to pursue most effectively a sociocultural discourse analysis. As such, he includes a quantitative aspect to his socio-cultural discourse analysis through counting certain instances of key words or phrases pertinent to the features of exploratory talk. Examples of words counted include:

I think

I agree

because

Mercer's (2004) suggestion of including quantitative and qualitative methods caused me to consider my own position. I am naturally inclined to an interpretive stance, which allows for a detailed analysis of data helping me to express the complexities and intricacies of the phenomenon being studied. However, Teddlie and Tashakkori (2011) argue that these two methodological approaches are compatible and can be usefully employed in conjunction with one another. They discuss the notion of methodological eclecticism, which involves,

selecting and then synergistically integrating the most appropriate techniques from a myriad of QUAL, QUAN, and mixed methods in order to more thoroughly investigate a phenomenon of interest (Teddlie and Tashakkori, 2011, p.286)

Reading Creswell's (2009) study of mixed methods approaches helped to unpick this methodological conundrum. This enabled me to determine that this study would remain weighted towards qualitative data collection using an interpretative approach with the primary focus being to explore a phenomenon. I would then adopt a very basic strategy of using simple quantitative data to assist in the interpretation of my qualitative findings (Creswell, 2009). Creswell (2009) argues that this is most useful to a researcher who wants to expand on qualitative findings and that through using this approach we can learn more about our topic. Creswell (2009) might call this a QUAL + quant piece of research, where the greater weighting is placed on the qualitative aspects. Teddlie and Tasakkori (2011, p. 286) note that,

QUAL + quant studies emphasizing the detailed impressionistic perceptions of human data gathering instruments and their interpretations of their outcomes are the most valuable of all extant MMR [mixed methods research] literature

I decided, therefore, to employ Mercer's (2004) model that includes quantitative strands. However, due to the nature of the research questions, which focus on how children make meaning, the key words being counted would be broadened to those which indicate children using words that reveal how they are trying to problem solve/make meaning. The selected words include:

could, would, should, might, shall, maybe, why, but, think, because, if

Once the spoken data was collected by the methods described above, it was prepared and organised for analysis. The data was converted into transcripts and then analysed for the identification of key features.

3.7 Trustworthiness

This section examines the strategies used to ensure the quality of the research undertaken.

This thesis is an in-depth study of the talk of small groups of children. My intention for this work had always been to give a detailed analysis of the dialogue of a small number of children as opposed to dedicating less attention to a larger number of students. In this endeavour a large part of the work of this thesis was dedicated to the transcription of the talk to present it verbatim and to try and give a complete picture of the dialogue. The outcome of this was that I gained a detailed understanding of the data, which helps to ensure the trustworthiness of the thesis.

As I went through this process of transcription, I came to realise that to give a holistic account of the dialogue I needed to make choices as to what I transcribed. Buchholtz (2000) discusses these choices as differentiating between transcription as an interpretive process and transcription as a representational process. Buchholtz (2000, p.1441) maintains,

At the interpretive level, the central issue is what is transcribed; at the representational level the central issue is how it is transcribed. Thus, transcription involves both decisions about content (What does the transcriber hear on the recording and include in the transcript?) and decisions about form (How does the transcriber write down what she or he hears).

I commenced the process by choosing to transcribe speech only and consequently made the decision as to how to record it using a simple coding framework as seen in Appendix A. However, Bucholtz (2000) reminds the researcher that all transcriptions take sides enabling particular interpretations, advising interests and favouring certain speakers. I was increasingly aware of this issue and to further assure the trustworthiness of the transcripts I became interested in the non-verbal action that appeared in the digital recordings collected (the choices made in deciding to collect non-verbal data are set out in Chapter Five section 5.2). This decision required further review of the digital data and further additions to be made to the transcriptions. As such, the process became an iterative cycle of checking and rechecking with the resulting emergence of later additions to the transcriptions. As such, while the transcriptions produced are extremely lengthy, they are very much my own and stand as evidence that contribute to the trustworthiness of the thesis. One complete transcript showing the action from one whole lesson has been presented in Appendix G.

On the other hand, the possibility of bias is a threat to the trustworthiness of this research. I know that my choice of topic (digital games) is something that interests and motivates me; that language is central to learning is another important belief and this indicates that bias is something that could have influenced this project right from the outset. This is aptly summed up by Coles and McGrath (2010, p.70) who note, 'it is not possible for the researcher to come to the research with an empty mind. The best they can hope for is an open mind.' This point demonstrates that my thinking contained an element of bias and I needed to be aware of this as a limitation when drawing conclusions from my data analysis.

3.7.1 Participation

Another possible limitation of the research was my role in the process of data collection. At the outset of this study I intended that I should be non-participant in the interventions carried out with the groups of children in both schools. This study is about dialogue and by interacting in the conversation I knew I could influence the direction of it. However, as my understanding of the research process developed, I started to question this decision. I came to realise that being non-participant would be opposed to my overall approach to this research. Cohen *et al.* (2007) note that participant observation is particularly suitable when working with small groups of children and is useful to help researchers find out about interactions and relationships – an important aim for this project which could not easily be ignored. Bryman (2012) supports this by arguing that participant observation allows a researcher to see through others' eyes, an objective that is central to research that has a qualitative aspect. Furthermore,

as I started the pilot study it immediately became apparent that this non-participatory stance would not have been realistic. It was clear from the reactions of the children that they naturally wanted me to answer questions and engage with them (see pilot study analysis in Chapter five).

Consequently, I opted to be participant in the study and I had to be aware that I could influence events. Cohen *et al.* (2007, p.158) warn against the perils of participant observers 'going native' and losing perspective. As I got to know the children was likely that I would become a supporter of the group (Yin, 2014). Moreover, as I became more aware of the research process I increasingly understood that being involved in the group would give me just one perspective on events, I would not be able to stand back and view the groups from different perspectives as a good observer might (Yin, 2014). To try to preclude this I made some deliberate decisions about my role within the research. I was aware of the extent to which I intervened in the dialogue making sure that I always tried to hand the conversation over to the children and give them as much control and choice as possible. I kept my interjections brief and to the point. I also intervened to direct behaviour management issues. I avoided offering my opinions and always positioned myself so that I allowed the children to express their thoughts. All the children involved in the study were briefed that I was researching talk and that I was there to hear their voices and not too much of mine.

3.7.2 Conflict of interest

Both the participating schools were known to me as in my role as a link tutor to Initial Teacher Training students as I spend much time in schools in the area mentoring student teachers. I particularly knew Chester School as I live in close proximity to it. I had to think carefully about using this school. The schools had, however, both expressed a keen desire to be involved. Living and working in the area has resulted in me knowing my community well and learning to conduct myself as a professional, resident and parent. It was quite likely that although the class teachers ultimately decided which children I would work with, I would recognise at least one of the children chosen. I have become used to maintaining confidentiality as part of my role. As a link tutor the large number of children I know and who come across me in different guises understand my different roles and know that when I am in school I assume a different role to that of parent/ community resident. This stance has been imperative for me to uphold my job within the university in which I work and continued into my role as a researcher.

3.7.3 Data collection and analysis

Triangulation of more than one research method is often used to ensure credibility (Sharp, 2012). Observation of the children and the subsequent discourse analysis of talk were the only methods used and this could present a threat to the overall quality of the research. My aim was to conduct a detailed examination of a theme, using discourse analysis in order to gain this detailed scrutiny of dialogue. As a result, strategies used to ensure the quality of this research included the provision of a dense description of my findings. In the analysis chapters I used multiple 'strings of data', in this case extracts of talk (Savin-Baden & Howell-Major, 2013). Teamed with this dense presentation of the data I conducted a detailed, fine-grained analysis to ensure depth. This included not just those interpretations that confirmed my own views but also negative case analysis, or the presentation of data that did not support the majority of data, to help develop the credibility of this study (Coles and McGrath, 2010).

As I used limited methods to collect data I used different interpretative lenses during the analysis stage to explore the data from different perspectives. While qualitative discourse analysis was the main method utilised I also employed some simple quantitative analysis to further explore the data and to help to give a complete picture of the talk that took place. My aim was to view the data from different angles to help expose any assumptions I made during analysis. As I analysed my pilot data, my concern about assumption became an increasingly dominant theme and I tried more and more to look at it from different perspectives. This led me to imposing additional techniques during the analysis stage – these are more fully explored more fully in Chapter Five.

3.8 Ethics

Punch (2009) argues that empirical research in education will always need to consider ethical issues as it involves collecting data from people, and about people. This section reviews some of the ethical considerations that were pertinent to this research.

3.8.1 Informed consent

The children in this study were all volunteers and gave their assent for participation. As the children were minors, consent was needed from the parents/ legal guardians (Johnson & Christensen, 2008; BERA, 2004). Active consent, where adults had to sign and return a consent form, was sought instead of passive consent (Johnson and Christensen, 2008). Due to

differences in the power balance between the adult and the child it can be difficult to ascertain whether a child truly does wish to be part of a project. They may participate because they perceive that is what is expected of them and they do not wish to upset the adults involved (Punch 2009). I attempted to overcome this issue by writing information sheets in child-friendly language as well as giving the children time to talk about this project with their parents/guardians. I also gave the children a verbal explanation to ensure good understanding. The children met with me before the research started so that they could start to feel comfortable with a new adult. I provided them with an opportunity to withdraw from the activity each time I visited the schools.

I sought additional consent from the teachers of the children involved and from the head teachers. I provided documentation explaining the project to both of these groups as well as giving opportunities to ask questions. I gained verbal consent from both these parties but looking back it might have been useful to employ more formal procedures, as the goodwill, cooperation and full understanding of these parties was vital to the success of the research project. I agree with Johnson and Christensen (2008) when they note that in successful studies the researcher must not underemphasize the importance of this cooperation.

3.8.2 Confidentiality, anonymity and privacy

To provide anonymity I changed the names of the schools and gave only their approximate geographical location. I also avoided giving specific dates and times. I gave pseudonyms to all the individuals referred to in transcripts and the thesis itself. Gender was referred to as this was considered an influential factor in the analysis of the captured data. While I attempted to protect identity, removing all identifiers may not have been sufficient to maintain anonymity as careful examination of participants' responses may still allow the audience to deduce identity (Johnson & Christensen 2008).

It is for the above reasons, and because the children were being filmed, that privacy needed to be an important consideration (Savin-Baden and Howell- Major 2013). In the videos real names were used and children could be identified. As a consequence, digital videos, transcripts and other documents were stored electronically and password protected. The digital video was watched by only myself but was made available to project supervisors if they wished to view any sections.

3.8.3 Harm and risk

Opie (2004) encourages the researcher to think through all eventualities so that they are confident that their research avoids doing any harm. This is particularly important when working with children. Working with an adult (me) that was unfamiliar to the children may have caused some anxiety. Hence, the children always worked in a group situation so that the presence of a peer group gave security and confidence. Conversely, Burton *et al.* (2008) are of the opinion that actually working in a group may be a potential threat as some of the children may have established themselves as leaders while others may be intimidated by the more dominant members or inappropriate behaviours. One of the actions I took to counter this was to set clear ground rules for behaviour within the group at the start of each lesson. I made the children aware that I would send them back to their teacher should they not observe the rules.

Adults who work with children in the UK are checked by the Disclosure and Barring Service to ensure adequately safeguarding. I act in the capacity of a link tutor with many partnership schools in the area and as such, appropriate safe guarding checks had been conducted. This authorisation allowed me to visit the schools involved.

The children worked on a commercially produced game (Minecraft) – this game did contain a potentially unsuitable aspect. It ‘spawns’ monsters called skeletons, creepers and spiders which occur when the immersive world that comprises Minecraft turns from day to night. Therefore, the settings on Minecraft were set to the mode of ‘EASY’ as this prevented any monsters being spawned in the game thus eliminating any unsuitable content. The children also used a broadband connection so that they could communicate with other avatars in the game – the use of the internet posed another potential risk. As a consequence, the game was played as a closed world that was only available to the small group of children participating, this meant that any possibility of meeting unknown, virtual strangers was eliminated.

Chapter 4: The Minecraft scenario

The objective of this chapter is to describe and explain the formulation of the Minecraft scenario, the digital game used in this research. It justifies the decisions taken during the production of the game environment. The scenario is depicted, with additional screenshots inserted, to help with the visualisation of the game. Links are made to the literature review.

When selecting a game environment to use with the children I was keen to pick an application that was appealing to them. According to Selwyn *et al.* (2009), a survey of 612 primary aged pupils in the UK cited their favourite out-of-school applications as video games as well as computer and mediated communication applications such as MSN and email. Within school, pupils cited their favourite applications as presentation editors and art programs. In terms of applications at home, pupils cited their least favourite applications as writing, databases and spreadsheets. In school, respondents cited a similar range of least favourite applications—i.e., writing/word, school work, databases and spreadsheets, even though these were the programmes they used ‘the most’ in their school time. As a result of their research, Selwyn *et al.* (2009, p.928) have proclaimed that, in school time, a child’s actual engagement with technology is, ‘often perfunctory and unspectacular’. Moreover, they suggest that, ‘ICTs were felt to be most engaging and favoured when used for games’ (Selwyn *et al.* p.929). For this research, I needed children to be engaged. Influenced by Selwyn’s research (2009), I took the decision to use a popular, leisure-orientated game instead of an ‘edugame’ that is typically used in school; Minecraft appeared to be a good choice.

Markus Persson developed Minecraft in Sweden. At the time of writing the game had sold in the region of 14,163,000 copies, designed to be played on a range of different gaming platforms (Mojang, 2009). An additional appealing factor for selecting Minecraft was the potential educational opportunities offered by the game. Already teachers have started to harness the Minecraft world to facilitate educational outcomes in the classroom. New York teacher Joel Levin (2016) created ‘Minecraftedu’. He provides ideas for playing Minecraft in different curriculum subjects. Most of the ideas are aimed at middle school aged children; however, the ‘Minecraftedu’ site also suggests activities for a younger audience. Ward (2013) recommends that Minecraft is most appealing to children in the age range of 9-15 years. As the research involved children at the upper end of Key Stage Two (10-11years), the game was pitched at the appropriate level. This provided another reason for its selection.

Minecraft is based on the premise of giving a player an opportunity to explore a virtual world. Twining (2010, p.117) defines virtual worlds as, ‘environments within which users are

represented by and operate through an avatar and can interact with others over the internet or local area network'. Walker (2012, p.1) espouses the educational potential of the virtual world for, 'improving learner performance' as a result of his small scale study of a virtual world game environment used by American secondary school pupils. Coffman and Klinger (2007.p.3) support this noting:

Virtual environments have the potential to fully engage students and enhance teaching and learning. They also have the potential to enhance a constructivist learning approach by providing learning opportunities for students that challenge them to learn by experiencing through applied activities, rather than by direct instruction and passive involvement.

Mantovani (2003) notes that virtual worlds demand that children engage with an activity and do not allow them to be passengers in their learning. Moreover, Walker (2012) links the virtual world of Minecraft with creative outcomes for pupils and is therefore most suitable for the creative ambitions of this research.

There are, however, some potential disadvantages to using a virtual world. One of these is the open-ended nature of a virtual world game, of which Minecraft is typical. Minecraft is so open ended that, on first use, the point of the game is hard to determine. Children are left to explore a seemingly never-ending world and spend their time mining materials and constructing objects. If played in 'survival' mode, one key point of the game is to escape from monster-like creatures that include 'creepers', 'spiders' and 'skeletons', by building shelters that are created from materials that have been discovered via mining. If, however, an individual plays the game in 'creative' mode there are no creepers or other threatening entities present and all building materials are available to the player. The aim of the game, therefore, is simply to create an imagined world according to the wants and desires of the player.

Mantovani (2003, p.220) states that the open-ended nature inherent to VLEs can present a risk when assuming educational activities will necessarily take place:

The basic assumption that the learning process will take place naturally through the simple exploration and discovery of the Virtual Environment should be reviewed. Despite the un-doubtful value of the exploratory learning provided by VR [virtual reality], when the knowledge context is too unstructured, the learning process can become very difficult. This is especially true for younger students.

To remedy the problem described above, Coffman and Klinger (2007, p.30) note that:

the instructor must provide learners with compelling problems that engage students not only in the adventure of the virtual world itself but additionally into a deep inquiry and analysis of a meaningful and authentic problem that students can relate to and that meets the lesson objectives.

As a result of the above discussion, I deliberately scaffolded the Minecraft game so that the learner would be engaged with pre-set challenges. I generated features in Minecraft to help structure the children's learning. I present these decisions in the next few paragraphs.

4.1 The scenario

I created a world where the player is located on an 'island' on which they have been shipwrecked. Creating the scenario required no specialist knowledge, just an understanding of the game. Classroom teachers could easily and quickly create an equivalent kind of scenario; this was important as I wanted the game that I used to be accessible to practitioners.

One of the curious features of this game is that when a player is placed into a world there is no guarantee as to where they will emerge. 'Spawning' does not necessarily take place in the same place on each game play. This can be somewhat confusing to the player and can result in disorientation. To remedy this the boundaries of this scenario were deliberately confined. The children playing the game would be doing so with a limited amount of time available and they therefore did not have time to navigate around a huge virtual world. By keeping the players 'island bound' the confines of the virtual world remained relatively narrow and this prevented the possibility of the players becoming lost and therefore accidentally wasting time.

The creation of the definable boundaries of the Minecraft world was also influential when deciding which version of Minecraft to use for this research project. Minecraft is available across different platforms; it can be purchased for the PC, Xbox, PlayStation and Apple devices. The Pocket Edition of Minecraft used in this research project was selected for the reason that it was limited in the scope of the world it offered, whereas other versions of the game offered a seemingly infinite world. While for dedicated Minecraft players, the limitations of the Pocket Edition of the virtual world may seem a hindrance, indeed the 'big skies' of the PC version of Minecraft are an impressive feature of the game, the narrower confines of the game version being used here actually solved the potential problem of a never-ending landscape. Figure 4.1 below shows an aerial view of the game scenario.



Figure 4. 1: A screenshot of the Minecraft World used with the children

After an initial exploration of the island, I designed the game so that the players navigate to a shipwreck situated just off the coastline. I encouraged the children to do this by two signs pointed in the direction of the ship. In addition, the shipwreck was equipped with torches that helped to indicate its presence to a player. Stepping-stones were also created to encourage children to go in the direction of the shipwreck. On arrival at the ship, players found further instructions informing them that they had been shipwrecked and that they needed to find a shelter. Figure 4.2 below shows an image of the shipwreck and of the instructions. The instructions were kept deliberately brief and to the point.



Figure 4.2: Screenshots of the first destination in the game

On leaving the shipwreck, the children are directed to a very basic shelter placed a short distance away at the top of a small hill. Again, torches are placed in the shelter to indicate its presence. The children could take refuge in the shelter if the daytime ran out in the Minecraft World (at night is it is too dark to achieve anything constructive). It is at this point that the players were presented with their first challenge.

The challenge in this scenario was based on the theme of settlement. The children were asked to explore the island, and decide on the best location to create a settlement in order to survive. The children had to work out where to locate and build houses. They had to justify their choices regarding the location of their settlements by explaining their geographical understanding of 'place'. The educational aims of the scenario are detailed further in section 4.2.

To aid the children in the creation of their settlements, chests were situated in several locations around the world, giving them different tools needed in the building process. Other features on the island were created to encourage the children to think carefully about their settlement choices. In particular, three buildings were partially created in different locations around the island to help the pupils select a settlement location. The location of the buildings all had advantages and disadvantages that the children needed to evaluate.

4.1.1 Settlement one

I expected the children to view settlement one as the most decrepit of all the buildings on the island. It consisted of just one wall containing a window and a torch. The building was made of wood, a material that might look less durable than the other two buildings, which were of stone and brick. The building did, however, contain a chest of tools and a crafting table, which gave children the ability to make further tools. This building also had the added attraction of the beginnings of a farm, situated next to it. Trenches were created which children could fill with water, allowing crops to grow. A bucket could be found there and used for this purpose. Fences were established, in which children could pen the animals roaming around the world. The farm provided the children with a wide range of tools and ingredients. There remained lots for them to do, in terms of working out how to combine and apply these 'provisions', but there was scope to create a sustainable community. While this settlement looked the least promising, initially at least, it actually offered the most potential for a sustainable settlement. Only those children who understood the principles of sustainability would be tempted to choose this location to develop. Figure 4.3 below shows a screen shot of settlement 1.



Figure 4.3: A screen shot of settlement one

4.1.2 Settlement two

Settlement two consisted of one building that was much more substantial in construction. It was made of brick instead of the wood used in settlement one. It had four walls with windows in them and a front door that could be shut. The area around the building was made to look more attractive by the use of additional floor paving located outside the front door. A chest of materials was also placed inside the house. The building was located near water, which may be deemed to be useful by players, but its immediate environs were made to be rather 'awkward'. Water surrounded the building in a moat like fashion, making access to it a challenge. In addition to this, the land surrounding the building was stepped and this made it more difficult to farm. The players would have had to do much preparation of the land to make this settlement sustainable. Figure 4.4 shows the building described above:



Figure 4.4: A screen shot of settlement two

4.1.3 Settlement three

This settlement consisted of a two-story building made of stone situated on a wide expanse of open land near sources of water. A chest of materials was located on the second level of the building. Again, the land around this area would be good for farming and so this location could hold potential promise for the pupils. However, a farm would have needed to be built from scratch and there was not an abundance of resources like wood or stone in the area. Figure 4.5 shows this settlement.

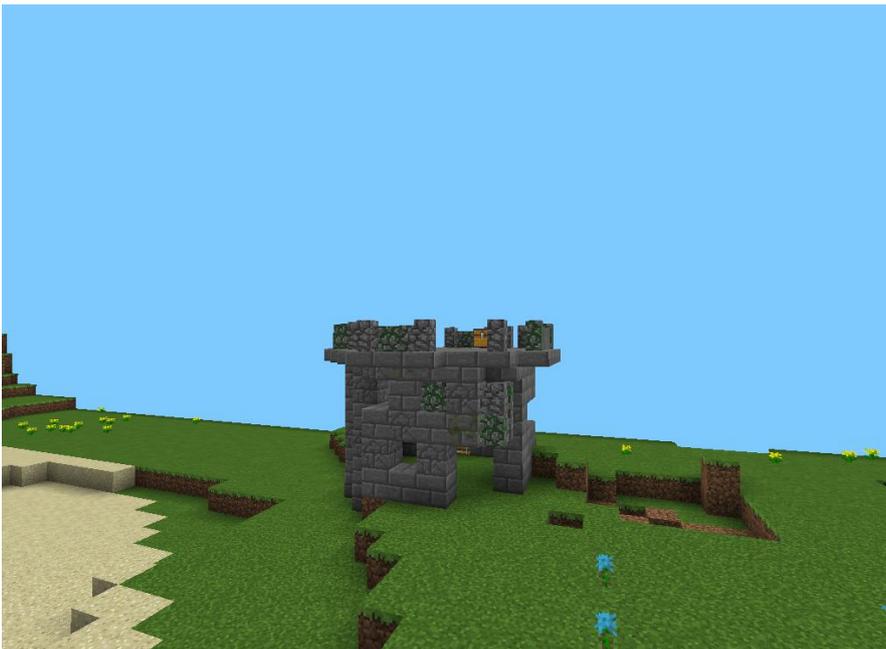


Figure 4.5: A screen shot of settlement three

In addition to these settlement sites, the island was created so that some locations would be better for development. Many places on the island consisted of a steep, hilly landscape making it unsuitable for settlement – the children who had good knowledge of settlement would understand this and avoid these areas.

4.2. Curriculum links

Before the children entered the scenario, they undertook a prior learning activity to prepare them to complete the challenges presented in the Minecraft world to the best of their ability. My aim was to develop participants' knowledge and understanding of the locational features associated with settlements and to apply this knowledge to the Minecraft scenario. To begin with, I provided the children with geographical texts on settlement to give background knowledge of 'place'. In addition, a discussion was planned as to 'why' the town they live in had been built in its specified location. The texts remained available for children to access if required whilst participating in the game.

The learning scenario was linked to the National Curriculum (DfE, 2013, p.4) Key Stage Three Programme of Study for Geography. As the children were in the final stages of Year Six, I selected Key Stage Three objectives to provide a good opportunity for challenge. In particular, it contributed towards the objective:

children should describe and understand key aspects of human geography including: types of settlement and land use, economic activity including trade links, and the distribution of natural resources including energy, food, minerals and water (DfE, 2013, p.4).

Using the broad aim above I created the following learning objective:

Children will begin to understand where and why different settlements are located. They will evaluate what settlements need to make them sustainable.

I developed this learning objective over a number of weeks during which the children took part in a number of sequenced challenges.

Challenge 1: Working in two teams the children explored the island to work out the best place to locate a settlement. The children had to justify their choices based on the research they had

conducted into the placement of towns and villages and then apply this knowledge to the decisions made in the Minecraft scenario. As detailed above, the scenario contained the start of three separate settlements. The children could decide to use these settlements as the basis for their own developments or they could choose to make their own settlement from scratch.

Challenge 2: on this occasion, the children needed to build a durable shelter/ settlement. They needed to consider what materials would make for a stable, permanent building, how to ensure ease of access and the ability to locate the building.

Challenge 3: The next stage of the learning activity centred on the children evaluating what would make their settlement sustainable. This involved the children making decisions about how to grow food and keep animals.

When completing the challenges pupils worked in pairs using tablet computers. However, when immersed in the game there was no specification as to whether the pairs chose to work separately on discrete settlements or whether they chose to unite and work as one complete team.

4.3 Design considerations

To make computer games motivating they need to feature certain design elements as outlined in the literature review. I now consider these issues in more detail in relation to the scenario used with the children.

For Wegerif (2010), games said to engender creative responses in children should possess the features of: interaction, provisionality, collaboration, multimodality, automation and flow. In terms of interactivity, the whole premise of Minecraft involves children engaging with artefacts during the game. Players can also engage in an on-line dialogue. Indeed, the use of an immersive environment, over other forms of computer games, takes this interactivity a step further. Mantovani (2003) discusses the motivational power of an environment like Minecraft, where the participant feels that they have been 'immersed' in a virtual world. Mantovani (2003, p.209) refers to immersion as, 'intense feelings of "self-location" within the computer reality in which the user interacts'. This theme can be linked to Ryan *et al.*'s (2006, p.4) research on immersive environments where they also refer to the motivational feature of immersion which they name as player 'presence' in the game (see section 2.4.2). The immersion factor is said to complement interactivity within the environment, by making it feel more natural for the participant when they navigate, select, pick, move and manipulate

objects. Nicaise and Crane (1999) link the themes of immersion and interactivity with a constructivist approach to learning. They point out that from a constructionist learning perspective physical engagement and interaction with materials is preferred over learning through instruction of pre-structured content from an external source. Constructivism proposes that object manipulation is the process by which pupils reach new understandings and Minecraft's central premise is about object manipulation via building with virtual blocks. Nicaise and Crane (1999) suggest that immersion in the virtual world allows for the same kind of natural interaction with objects and this offers a very appealing and rich form of learning. The subject of immersion also contributes to the definition by Connolly *et al.* (2006) of well-designed computer games. Connolly *et al.* (2006) used Csikszentmihalyi's (1990) theory of 'flow' in defining an appealing game, another area that was discussed in the literature review. One characteristic of flow is identified via the merging of 'action and awareness' when playing a game. Immersive qualities, where the player increasingly becomes oblivious to external influences, would meet this aim.

Provisionality is where actions can be easily changed. Although there is no obvious 'undo' button in the game, a feature of Minecraft is that it is very easy to build objects. If undesirable objects are created the player can just as easily knock down and rebuild over objects that are no longer wanted. Provisionality is therefore a key feature of the Minecraft game. As with interactivity, provisionality can also be linked to Connolly *et al.*'s (2006) notion of good games possessing 'flow'. Another feature of 'flow' is the elimination of the fear of failure. Minecraft's provisionality helps to reduce the feeling that children can make irreversible mistakes and therefore creates a climate where children are more likely to take risks and try new approaches when problem solving.

For the collaborative feature I planned the game so that children would work in teams as they moved through the Minecraft world. The whole scenario was designed so that children would collaborate either verbally or through on-line text.

A multimodal program is where text, pictures and sound (though this is not a prominent feature of the game) are all combined. One of the criticisms of Minecraft is that the graphics are not sophisticated and that this is a disappointing feature of the game. This does not, however, seem to have limited its appeal as shown by the sales figures quoted at the start of this chapter. The creative potential of the game appears to compensate for the poor graphics selection.

Automation allows for the simplification of routine tasks so that ideas are more easily realized. The premise of Minecraft is about mining and building. Once the players have adopted simple techniques, it becomes very easy to build objects and large-scale creations.

As already noted, when designing a motivational computer game the notion of flow is important (Ryan et al. 2006; Connolly *et al.* 2006). While two attributing characteristics of flow have been discussed, others should not be overlooked when detailing the decisions made in the creation of the scenario. Flow is heightened when a game possesses clear goals (Connolly *et al.* 2006). As already discussed in at the start of this chapter, clear goals are not an obvious feature of Minecraft. This is why the pupils involved were presented with a set of clearly defined challenges to help scaffold the direction of the learning.

Flow is identified by activity that encourages autotelic activity (Wegerif, 2010) - doing things just because we like to. Activities that absorb us and make us feel good show autotelic characteristics. These are the types of activities that are immediately and intrinsically rewarding to us (Millard, 2009). To encourage autotelic activity is one of the reasons why I decided to select a playful environment, as absorption is indeed a characteristic of play (Ortleib, 2010). That playing Minecraft has proved to be an enjoyable experience as is shown by the 14,163,000 copies of the game that have been sold at the time of writing this chapter in 2013-14. The final feature of 'flow' as referred to by (Connolly *et al.* 2006) is when a game gives immediate feedback. This is actually not an obvious feature of Minecraft, but the game offers so many other strengths that they may lessen the effects of this one disadvantage.

Chapter 5: The pilot study analysis

In this chapter I discuss the pilot study, which was initially planned to be a 'trial' run for this research. I intended to use it to see if the Minecraft scenario worked well, to ascertain any difficulties with accessing broadband connections in school, and to check voice and image recording equipment. The pilot, however, turned into much more. The children involved were so enthused by the idea that they requested that I carry out a lesson with them and that they undertake the planned work during the pilot. While subsequently completing the activity the talk they produced was so absorbing that I wanted to analyse it. Therefore, this chapter deals with two themes:

- The research process where I reflect on changes I made to my research design and the coding tool used for my analysis
- Analysis of the talk produced by the children in response to the learning scenario.

The chapter investigates the pilot study in relation to the following research questions:

- What are the features of children's group talk when using an immersive gaming environment?
- How do children use talk to make meaning when using an immersive gaming environment?
- How might an immersive gaming environment encourage creative responses from children?

The pilot study took place with three children, ten-eleven years in age. The children were studying in Year Six of primary Key Stage Two. I selected the children from one of the case study schools (Chester School) but they did not form part of the eventual case study group. The children volunteered for the pilot study and I sought permissions from their parents to participate. The children had been in the same class for two consecutive years and enjoyed a good friendship. They were therefore very comfortable in each other's company and this needs consideration when drawing conclusions from the data in this pilot. Researchers who have investigated how friendships have influenced joint activity found that closeness was associated with the sharing of ideas, exchanging points of view and a collective approach to tasks (Youniss, 1999; Vass, 2003). Van Oers and Hannikainen (2001, p.105) support this when they argue that,

The main reason why discourses in collaborative learning processes ever lead to improved understandings is that the participants in the process are willing to share their understandings and keep on doing so despite their disagreements and conflicts.

The children worked on a pre-prepared Minecraft scenario over two sessions that lasted for a period of between 60 and 90 minutes. Each session followed a pattern in which children would spend time playing Minecraft and then pause to talk about what they had discovered. Before the intervention, I told the children that talk was permitted and that I was interested in their thinking. Mindful of Wegerif *et al.*'s (2004) finding that children who had learned about appropriate ground rules were more likely to encourage others to speak, listen carefully and then in turn respond constructively, I gave the children a set of instructions to adhere to. The following rules were applied to all the research groups with which I worked:

- all members of the group were invited to contribute
- the children were asked to avoid speaking over each other
- to listen carefully to all contributions and to discuss decisions
- the children did not have to put up their hand to speak and were encouraged to talk freely.

All the children in the pilot group were familiar with Minecraft, having played it on multiple platforms (ipad, games console and pc) and they told me that they would meet online to play it socially. They also read books and watched 'YouTube' clips, that explained how to go further in the game, and might therefore be considered 'expert' players. For the pilot study, it was useful to have participants that were well versed in their understanding of the game as it avoided the need for procedural explanations. However, I did not wish to replicate this requirement and the future research groups contained children who were new to the game so that I could understand if the challenge was accessible to both novice and expert players.

During this pilot study I was mindful of the tension in my effort to capture action in a naturalistic setting, described as,

attempts to present 'slice of life' episodes documented through natural language and representing as closely as possible how people feel, what they know, and what their concerns, beliefs, perceptions and understandings are (Wolf and Tymitz, 1977, p7-9)

when I was conducting a learning episode that was somewhat experimental in nature in that the children had never used Minecraft for school work. Cohen, Manion and Morrison (2013, p.469) deal with this issue by using the term 'fuzziness' when describing the degree of structure that the research imposes on a 'naturalistic' setting, concluding that they will need to be guided by the notion of 'fitness for purpose' in the type of setting and the amount of structure imposed. Ultimately, I needed to remind myself that I was implementing a learning task on an educational setting and had to avoid creating a contrived situation. As such, it was important to provide work that was correctly pitched to the age group of the children and to conduct the lessons adhering to the normal routines and rhythms of school life.

I was also aware of the potential problem of my position throughout this journey and my ability to control the whole research process. While researching within the place she worked Mercer (2007) explored of the challenges of conducting 'insider research'. Unlike Mercer (2007) I did not work within either of the two schools from which I obtained data, but I worked within teacher education and the schools used already maintained a partnership with my own university; I therefore found my position a conundrum as to whether I was an insider practitioner or not. Helpfully, Mercer (2007) rejects the notion of a strict insider/outsider dichotomy in favour of a continuum and states researchers inhabit multiple insider and outsider positions. Indeed, in this research though I stood outside of the school communities, I had insider and privileged knowledge of how the educational system worked. While this could help me to make better sense of the data collected, I was aware that I might take things for granted, miss significant information or develop 'myopia' (Mercer, 2007, p.6). Moreover, I could also potentially create conditions that would enable more talk to occur and due to the age gap and power differential the children might say what they thought I wanted to hear. As Mercer (2007) suggests, I will never know precisely how I influenced the data set, I can only declare that I was always mindful as to how I could manipulate the situation.

5.1 The first experience of playing Minecraft - technical issues

The first session of the pilot study did not go entirely according to plan. Much of the data was rendered unusable due to a technical problem with joining the tablet computers to the wireless broadband connection and time was spent with the children and I making suggestions as to how to fix this. Once connected the children would experience 'lag' within the Minecraft world and the game moved very slowly – it took quite a while to work out the cause of this problem. Once the problem was resolved the children started to explore the game.

5.1.1 Initial anxieties

The research depended on the children talking and just before I started the pilot I became slightly apprehensive that the children might not talk at all. Although I had anecdotal evidence that would have suggested the contrary, I thought that the children might become very absorbed in the Minecraft world and forget to talk about it. Assuming they did talk, I feared that the conversation might become intermittent, punctuating the game rather than becoming an aspect of it. What I actually found out was entirely the opposite: the children did not stop talking throughout the whole episode and the defining memory of the experience was that the talk was continuous, excited, loud and flowed throughout.

5.1.2 The change in the researcher role

The initial plan for the Minecraft intervention had been for me to say as little as possible, the intention being for the focus of the research to be purely on the dialogue of the children. However, it quickly emerged that the children wanted me to participate and found it very difficult to receive no feedback about their actions. The children needed acknowledgement from me that they were doing the right thing with regard to their work and wished to hear my views on several issues arising from their interactions mediated by the game. My reluctance to respond clearly challenged them and was becoming an obstacle to their engagement and this led me to question my decision. I reflected on the fact that that the majority of educational situations are characterised by a teacher who is an active participant in dialogue. As Nystrand *et al.* (1997) note, the experience of children in classrooms is overwhelmingly monologic, with the teacher carrying out most of the talking. In this situation, it certainly appeared that the presence of an adult with whom they could not communicate fully might create an unfamiliar, potentially stressful situation, which I needed to rectify. I therefore decided that it was necessary for me to become involved in the dialogue to some extent. As detailed in the methodology chapter my participation in the dialogue followed certain ground rules I set for myself:

- I was aware of the extent to which I intervened in the dialogue, making sure that I always tried to hand the conversation over to the children;
- Interjections were supportive, but brief and to the point;
- I intervened to direct behaviour management issues;
- I avoided offering my opinions and always positioned myself so that I allowed the children to express their thoughts;

- I reminded the children about listening to each other and not interrupting the talk before the lesson started.

5.1.3 Recording and transcription choices

As outlined in the methodology chapter, I captured the dialogue of the children using both video equipment and audio capture recorders. The video recording provided the main source for transcription, with the audio recording being used as a backup if large parts of the dialogue were inaudible. I then studied the captured data in its entirety and transcribed almost all of it. The only exception to this entire transcription process was when:

- I was talking about some technical issues with the children;
- one period of instruction of the children that was given at the beginning of the whole process, although my interaction with the children throughout the duration of the lessons has been included;
- when I was talking about behavioural issues.

In these instances, I omitted these types of talk. For example, there were times when it was necessary to help the children connect to the broadband or change settings in the scenario. There were also times when the children went off task for minutes at a time. They were, after all, working 'on-screen' for more than an hour at a time and it would have been very unusual if the talk had not occasionally lost focus on the task in hand.

The decision to transcribe the talk so comprehensively needed careful consideration. As Cohen *et al.* (2007) point out, one of the disadvantages of a qualitative discourse analysis is the amount of time the researcher has to invest in transcribing data; typically, five minutes of talk might take about one hour to transcribe. However, submitting to this process - laborious though it was - ensured that I became immersed in the data and acquired a thorough understanding of all aspects of the children's conversation. This allowed me to be able to discuss the different features of the talk with detail and conviction. The transcribed conversations could be viewed in their entirety and, as an electronic text, could be manipulated and interrogated in a number of ways, allowing me to reassure myself that the themes I was generating from the talk were not isolated incidents. The samples of talk discussed below are a typical reflection of the huge amount dialogue that took place. Codes to the transcription conventions used in this research are recorded in Appendix A.

5.2 Analysis – re-evaluation

The aim of this research was to analyse talk using discourse analysis. Mercer's (2004) framework for dialogic talk provided the tool for the analysis. I hoped that this tool would allow me to explore the different features (research question one) of talk and place them into the categories of disputational, cumulative and exploratory talk. As shown in the methodology, this original framework was extended with the addition of another category, namely Wegerif's (2010) creative talk. The last two categories of talk - exploratory and creative - would be particularly valuable in answering research questions two and three, where the focus switches to how the children use talk to make meaning and creative outcomes. Researchers (Mercer, 2004; Mercer and Littleton, 2007; Wegerif, 2010) note that the typology being described supports the view that not all types of talk are of equal educational value, with exploratory and creative talk being the features of talk where children 'make meaning' via reasoned statements that give justification to their actions.

The process by which a discourse analysis is applied using this typology takes the form of extracts of talk being accompanied by a descriptive and evaluative passage, detailing how the particular piece of talk might fit a particular group. Mercer and Littleton (2007) describe this framework as a very useful reference for making sense of research questions related to talk. These authors recognise this framework as 'crude', but add that they have found it a useful heuristic tool in helping educationalists gain an insight into the function of children's talk. Employing this process was useful in that the incident described was viewed in its entirety; the contextualised, dynamic and changing patterns of the talk could be freely observed. However, the process left me feeling a little unsure of the validity of the statements I was making. I was concerned that the tool I was using was not giving me enough detail, or that I was contriving the talk to ensure that it fitted into certain types. While I was conducting the research with the children I had a strong feeling that some of what I was hearing could be called exploratory and I was aware that I could be making decisions that colluded with this initial feeling.

While Mercer and Littleton (2007) argue against further refining the typology described above, for fear that the elegant simplicity of the framework might be lost – other researchers are beginning to produce a more detailed framework that allows for a greater categorisation of the talk. For instance, Hennessy *et al.* (2014) have developed an analytical coding scheme for interpreting dialogic talk using 33 categories of talk. Consequently, I finally decided to break

down Mercer's (2004) and Wegerif's (2010) definitions of the different typologies of talk. I also included Alexander's (2004) and Hennessey *et al.*'s (2014) definition of dialogism. I eventually produced an instrument that breaks down the different types of talk into distinct areas grouped under a classifying name. The outcome of this helped me to validate my initial assessment of the talk extracts by allowing me to gain an alternative insight into the selected data. The coding instrument that emerged is placed in Appendix B.

As I proceeded with my analysis of talk multimodality, which I described in the methodology section, became increasingly more important. Initially resistant to taking a multimodal stance as this seemed a huge, unmanageable task, as I commenced my analysis of the digital data I could not ignore the wealth of non-verbal action. I realised that an appreciation of this could provide an invaluable additional lens through which to understand the action. Rogers (2011) sums up the significance of communication being a multimodal activity by stating that reducing a spoken utterance into a written transcription massively diminishes its impact as nothing remains of the tone of voice, pace, rhythm, gender features, gaze or gesture. She continues to note that, 'a multimodal social semiotic approach is inherently and inevitably an instance of discourse analysis' (Rogers, 2011, p.228). Norris (2011) supports this by arguing that in traditional discourse analysis, the non-verbal action is blended out but as new video data capture techniques have emerged all modes of interaction should be considered.

In addition to the arguments above, I was aware that I was trying to conduct a sociocultural discourse analysis. As such, I needed to consider the argument presented by Nind *et al.* (2016, p.11), that a sociocultural stance is one where learning cannot, 'be separated from social identities, power relations, interests, purposes, [and] agenda of participants.....'. I needed to ascertain how the digital games were experienced by the participants and how they were affected, positioned and transformed by the enactment of the set task (Nind *et al.* 2016). I came to understand that analysing non-verbal gesture could help satisfy this aim. As a result, I gave more attention to recording the non-verbal gestures as well as the gaze of the children during transcription processes to give further information as to how they were experiencing the learning activity. Ultimately, the analysis of the captured data went through four stages as

expressed in Figure 5.1.

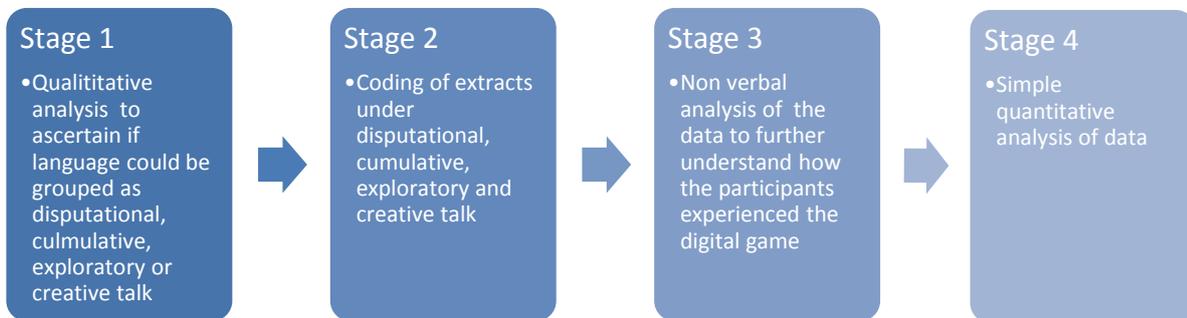


Figure 5.1: Explanation of different stages of analysis:

The samples of talk now analysed follow my description of my research strategies. I present extracts of talk followed with evaluative, analytical paragraphs with additional multimodal information. Coded tables of information are also available. The following extracts identify the participating children as Holly, Tom and Julia (names changed). The extracts relate initially to answering the first two research questions and then address the third question in the final part of the chapter.

5.3 Disputational talk

The first episode that I have included in this analysis shows an example of talk with disputational characteristics (Mercer, 2004). Mercer (2004) and Wegerif (2010) would suggest that this type of talk shows the least amount of cognitive development as it possesses elements not conducive to learning. Disputational talk is competitive in nature, where children try to compete as opposed to learning from each other (Mercer and Littleton 2007). Mercer and Littleton (2007) also note that this type of talk maybe judgmental in nature— comments such as ‘you are stupid’ might be heard and it might be characterised by competitive elements like ‘yes it is’, or ‘no, it isn’t’. Talk of this kind would not be reasoned but more argumentative in nature and is not a feature that I would equate with productive learning. I had hoped that there would be no instances of this type of talk in the data set, but it was present in the pilot study so it would be misleading to omit talking about it. Being able to recognise this type of talk is useful to the educationalist so that they might try to avoid

reproducing it. Although, there were instances of a disputational stance in the transcribed text they did not dominate. However, extract 5.3 is one that I classified as disputational.

- 40.49 TOM HOLLY, I need more supplies for your house
- 40.49 HOLLY ok *[does not look up at TOM]*
- 40.52 JULIA we have an infinite water sources *[staring at screen]*
- 40.52 HOLLY yeah *[staring at screen]*
- 40.52 JULIA HOLLY, I'm carrying on with yours (house) *[staring at screen]*
- 40.53 TOM why are you making it out of wood?
- 40.55 JULIA Cos
- 40.56 TOM I asked for stone *[looks at Julia, gestures]*
- 40.57 JULIA yeh...well you asked for stone after I started *[staring at screen]*
- 40.57 HOLLY *[laughter looking at TOM]*
- 41.00 TOM ok *[shrugs with resignation and looks at HOLLY and JULIA for possible support in his cause but they both do not return his gaze, he then looks at me and smiles while shrugging and I smile back]*

At this point in the lesson the children had explored the Minecraft island and had decided where they were going to locate their settlement. They were starting to build a basic community. The children were focused on the task and the talk could be described as 'on task', meaning that the children were using dialogue that relates to the task set by the teacher. The extract shows that there is an element of cooperation (an indicator of cumulative talk) involved, as Tom and Julia are taking on the responsibility of building a house for Holly. However, the talk here is characterised by children talking for their own purposes. For instance, talk move one and two (40.49) is then followed by the next child talking about an issue that is not related to the last statement, this is individualized talk and a characteristic of Mercer's (2004) disputational type of talk. Ultimately, the children are not listening to each other. The talk is also characterized by individualised decision-making. For instance, when Tom asks Julie why wood has been chosen as a building material, Julia replies with a one word answer and then gives no justification for the reason why that decision was made. When Tom suggests that stone was a more desirable material the response given is that Tom's request came after the decision had already been made. This gives further confirmation of an

individualised decision-making process. The talk shows another element of a disputational nature as the exchanges are very short - a dialogic stance would typically result in longer exchanges.

The non-verbal gestures also emphasise that the children were very much operating as individuals and not as a team. The talk occurred while the children were using the tablets so it would have been natural for them to have their gaze directed towards the screen. But throughout the interaction the children do not look at each other, perhaps indicating that they are pursuing their own lines of enquiry. When Tom questions Julia about her choice of building material Julia still does not acknowledge him by looking at him even though he looks at her, stops playing and starts to make gestures in order to create further emphasis. Julia carries on regardless and continues making her building with her own choice of materials, not looking at Tom gives a further indication that she does not wish to discuss the matter. When Tom looks at me and smiles he communicates his intent by indicating that he does not really mind that his actions have not been adhered too. The smile is an ironic in nature suggesting that he is used to this kind of response.

Table 5.1 now breaks down extract 5.3 into a coded form and is shown below as an example of the analytical process I pursued for each talk extract presented in the thesis. The tables do, however, become lengthy and so all further examples are found in Appendix C.

Table 5.1 codes extract 5.3

Time on video	Child	Statement	Disputation	Cumulative	Exploratory	Creative
40.49	TOM	HOLLY, I need more supplies for your house				
40.49	HOLLY	Ok		Cu5		
40.52	JULIA	We have an infinite water source	D4			
40.52	HOLLY	Yeah		Cu5		
40.52	JULIA	I'm carrying on with yours				
40.53	TOM	Why are you making it out of wood			E2	
40.55	JULIA	Cos	D3			
40.56	TOM	Yeah well, I asked for stone				
40.57	JULIA	Yeah, well you asked for stone after I started	D2			
41.00	TOM	Ok		Cu5		

Breaking down the talk further and using the predefined codes gives a more detailed indication of what was happening in this part of the dialogue. Table 5.1 shows that there are several different features of a disputational exchange listed by the classification tool and three elements of cumulative speak that are given in the form of confirmations. One question was

asked, but the reply given by a child was a one word answer with no accompanying justifying reasons.

5.4. The talk starts to develop.

Extract 5.4 presented below is from the same lesson as extract 5.3. Here the children continue to talk about making their settlement. In this extract, the children are playing and talking at the same time.

- 41.01 HOLLY guys what do you need? *[looking at screen]*
- 41.01 TOM I'm making the farm....
- 41.02 HOLLY Oh I was making a farm
- 41.05 TOM oh were you
- 41.05 HOLLY oh look all my little trees have grown
- 41.07 TOM I'm clearing land for you
- 41.09 HOLLY thank you
- 41.10 TOM that's totally what I was doing
- 41.10 HOLLY thank you
- 41.17 HOLLY I'm getting a tree farm
- 41.20 TOM I'm also digging the holes for the water and I'm also digging the land right by it *[looks at HOLLY briefly]*
- 41.20 JULIA == please can you get more wood
- 41.21 HOLLY I'm making a tree farm
- 41.33 TOM oh I'm making a wheat farm
- 41.36 HOLLY oh do you want some seeds then, I'm making a wheat farm
- 41.41 JULIA I'll be the luxuries person *[JULIA and TOM look at HOLLY]*
- 41.41 TOM == luxuries?
- 41.41 JULIA yeah I'll get some luxuries
- 41.43 HOLLY == look at my little house
- 41.49 TOM so you are the luxury person

- 41.50 HOLLY TOM can you make the farms like the tree farms and things and I will help JULIA with the house
- 41.57 HOLLY I'll make my house JULIA and you make your house. Ok . Deal?
- 41.58 TOM but she is making my house [*rubs head*]
- 42.00 HOLLY oh yes

This extract has a cumulative nature about it. Unlike extract 5.3, there is a sense of the group working together to get their settlement built quickly, as indicated by the first line of the dialogue: 'guys what do you need?' Additional evidence of this is shown at 41.36 'do you want some seed then?' indicating that this child is offering to share resources. A team approach is also shown at 41.07 when Tom says, 'I'm clearing land for you' and Holly replies, 'thank you'. There is also a sense of working together in order to get tasks completed. This is shown at line 41.50 where Holly asks, 'can you make the farms like the tree farms and things and I will help Julia with the house.'

As noted in the literature review, Mercer (2000) maintains that cumulative talk is typified by the use of repetitions, confirmations and elaborations. In this extract the children use confirmations and repetition to agree labour division, this can be seen at lines:

- 41.41 JULIA I'll be the luxuries person [*I JULIA and TOM look at HOLLY*]
- 41.41 TOM == luxuries?
- 41.41 JULIA yeah I'll get some luxuries
- 41.43 HOLLY == look at my little house
- 41.49 TOM so you are the luxury person

Here it is easy to see the use confirmations to show the agreement of the children and also repetition of the role of the luxuries person to reveal shared thought processes.

In the whole of extract 5.4 there is evidence of a team united and in agreement, there is no sense that the children wish to challenge each other. The children are also very polite to each other as shown by the use of courteous, confirmational talk moves. For instance, the children confirm their cooperation by thanking each other. Furthermore, when the children request something of each other, they might precede their request with the term 'please'.

While the extract is not exploratory and is therefore not the most dialogic in nature according to Mercer's (2004) typology, the talk did serve a useful purpose and represented a valuable

contribution to the overall data set. The talk shows the joint focus, collective engagement, thought processes and endeavour of the group. Their shared understandings are demonstrated through the way they build on each other's contributions and this gives them a united sense of purpose, a shared history and a shared 'common knowledge' (Dobson, 2012; Littleton and Mercer, 2013). Without this kind of talk, and this sense of shared purpose, the children might not have been able to express themselves so freely or move on to conduct exploratory talk.

In this extract the multimodal information shows the children mostly looking at the screen. The children show they are concentrating on the task, but the flow of the conversation demonstrates they are listening to each other while simultaneously playing. However, when the children do look up both Julia and Tom look at Holly (at 41.41); this could indicate that they want her confirmation of their actions. This can be combined with the fact that Holly made the most contributions to the dialogue in this extract. Furthermore, Holly was the child that made the most directional requests of the others. For example,

41.50 HOLLY TOM can you make the farms like the tree farms and things and I will help JULIA with the house

41.57 HOLLY I'll make my house, JULIA and you make your house. Ok. Deal?

This suggests that in this extract Holly is taking a leadership role in the action.

Breaking down the talk further using the coding tool indicates that most of the interactions can be categorised into the cumulative category with just two disputational elements and one exploratory element. Table 5.2 codes extract 5.4 and is found in Appendix C.

5.5. A dialogic moment?

At this point in the lesson the children are exploring how best to build their settlement and are having a detailed discussion about it. As this extract shows elements of exploratory talk it will be discussed in more detail.

30.23. TOM let's make our main house first [*HOLLY looks at teacher as if to ascertain if I think this is a good idea*]

30.25 JULIA no, cos if it is a settlement then we need lots more places to make a village

- 30.29 HOLLY guys, I have good news [*HOLLY laughs*]
- 30.30 T what do we think, are we going to make a settlement in the way JULIA has said or.... [*HOLLY looks at JULIA*]
- 30.47 TOM cos that saves materials cos they will be smaller and only have one person in them
- 30.55 JULIA we would use just as many making small ones as we would one big one [*JULIA looks at me*]
- 31.00 JULIA I just think we should do that, cos it's more about surviving and not about looking good and three small ones will get done quicker [*looks at HOLLY then TOM*]
- 31.05 TOM well, not necessarily
- 31.06 JULIA in the real world TOM would you build a castle? [*stops playing and looks at TOM*]
- 31.13 TOM yes, but we are not trying to make a castle just one main house [*does not look at JULIA, does not stop playing*]
- 31.16 JULIA would you build a mansion?
- 31.20 JULIA would you build a massive house or would you build a small house?
- 31.27 TOM well, if there is three people living in it I would have to as big for three people to live in it
- 31.29 JULIA or you can make small ones for three people
- 31.31 TOM yes, but it would take just as long
- 31.35 TOM well, that is what I think anyway why don't we make ...
(unintelligible)
- 31.41 JULIA no, cos otherwise it is going to take forever
- 31.44 HOLLY I think there should be more houses just in case we were invaded [*looks at TOM*]
- 31.49 TOM they would still be right next to each other though [*stops playing to look at HOLLY*]
- 31.55 HOLLY I know but then if we scatter them about== [*gestures to give emphasis*]
- 31.55 JULIA == people would be less likely to invade, they would just think...if we had like more in those houses they would probably think oh there is no point, it's just three little houses and a small farm but if it was a

big house people would like go there as they would think they were more powerful [*raises voice for emphasis and looks at me for confirmation, gestures to show a movement that denotes a big house*]

- 32.25 TOM well, I don't know
- 32.31 JULIA I think they should be small houses
- 32.34 HOLLY I think small houses
32. 36 TOM we won't look very powerful though [*puts hand on head to show this is troubling him*]
- 32.38 JULIA no that's the point cos otherwise.... would you rather be powerful or safe or==
- 32.46 HOLLY ==we could build a big wall, I don't really mind what material it would be out of and then we could have more shelter [*looks at me for confirmation*]
- 33.02 TOM guys if you had it like this big you could have a bed
- 33.10 T ok you haven't got long so you need to decide what to do
- 33.17 JULIA guys, I think we should just build three small houses as it is going to have to be done straight away
- 33.20 TOM Ok

Using Mercer's (2004) definitions, this conversation shows elements of exploratory talk. In extract 5.5 the talk is entirely purposeful and curriculum related. The children are discussing their settlement location and the form of the house to be built in relation to the theme of 'protection', which was one of the locational site factors the children needed to consider. The talk is well focussed throughout this exchange. The conversation is concerned with the pros and cons of building a large or small house for their settlement. Resnick (1999) discusses the term accountable talk, which Mercer and Littleton (2007) state shows strong similarities with exploratory talk. Resnick (1999, p.5) argues that for talk to be labelled accountable it must show 'relevance to the issue under discussion [and] uses evidence appropriate to the discipline'. The talk, in this instance, was entirely related to the task in hand, but could have been strengthened by the application of a more specialised vocabulary around issues concerning protection regarding settlement. The children did not draw on any knowledge of settlement from prior historical or geographical lessons. It is at this point that a conflicting interest as a teacher and that of a researcher came to the fore. I naturally wanted to intervene in the conversation to, 'sharpen the focus' (Resnick, 1999, p.5) of the thinking by reinforcing

their ability to use knowledge properly but stopped myself from doing so for fear of deliberately skewing the data.

Exploratory talk is evidenced when children make meaning by justifying their ideas (Mercer, 2004; Mercer and Littleton, 2007). There were many instances of this in the pilot study, this extract serves as an exemplar. The children are involved in asking a series of questions of each other to which they are replying. For instance, Julia issues a series of challenges in the form of three consecutive questions at 31.06, 31.16 and 31.20 interspersed with a justification by Tom. Challenge and counter challenge are evidence of exploratory talk (Mercer, 2004; Mercer & Littleton 2007) and of Alexander's (2004, p.44) dialogic stance when he states that during pupil-to-pupil talk moves they should 'argue, reason and justify'. Importantly, the replies of the children are accompanied by reasons for their thinking. This is seen with Julia at 31.55, which is a long utterance that gives a series of reasons as to why the children should build small houses.

The notion that dialogue is characterised by exchanges that offer challenge and counter challenge suggests that thoughts are not necessarily just accepted by the children; the conversation requires the children to defend their point of view and the pro and cons of the situation are considered. This can be seen at 32.36 to 32.38 where the children are assessing how big their proposed house should be in terms of status and power. There appear to be two contradictory concerns: that a small house might not make a sufficiently powerful statement to deter potential invaders and that a larger house might project affluence and promote unwanted interest. Interestingly, at 32.46, Holly is able to offer an alternative solution to the problem, which shows that the children are willing to explore different options and not just accept one solution. This suggestion of an alternative point of view is another important element of exploratory talk (Mercer, 2004). This is resonant of Bakhtin's (1981) notion of dialogic speech where he asserts that dialogues are developed by different perspectives and that meaning arises in the context of a difference between voices.

The suggestion of the alternative point of view referred to above is couched in an interesting manner. The children cannot agree whether it would be best to build a large or small house so Holly states:

32.46 HOLLY ==we could build a big wall, I don't really mind what material it would be out of and then we could have more shelter

Here, it seems that the child is sensing a difference of opinion and, by suggesting an alternative viewpoint, is offering a way for the other two children to resolve their difference. She is also showing her flexibility in the statement 'I don't really mind'. It appears that she may find the difference in opinion unsettling and this need to make people agree might not be exploratory in nature but might be evidence of Mercer's (2004) cumulative talk. Differences between the conversational styles of both genders also need to be considered here. As Coates (2004) suggests, girls are more inclined than boys to seek to conversational consensus and solidarity by adopting a mediating role in dialogues and the statement, 'I don't really mind' certainly shows a flexibility of approach aimed at maintaining relationships. However, offering a solution and helping people reach agreement is also evidence of the child showing quite a sophisticated understanding of how to move forward from a dilemma. Mercer and Littleton (2007, p. 66) state that exploratory talk represents a distinctive social mode of thinking that is essential for successful participation in educated communities of discourse, 'children need to know how to use language to get things done'. The way this sentence was phrased could indicate that this child knows how to move the conversation forward in a productive manner when a dilemma cannot be resolved.

As the conversation proceeds the children still cannot decide how to build their houses, with one child (Tom) resisting the arguments of the other two; he does, however, eventually accept the arguments and agree to compromise, allowing the group to reach a decision. This provides evidence that the child was persuaded to see through the eyes of others, another feature of exploratory talk (Mercer, 2004). This has to be a tentative suggestion as it could be that the child was simply feeling outnumbered in this situation and decided to compromise - not that he had changed his viewpoint.

The language used in this extract also shows signs of exploratory characteristics with conjunctions and meaning-making words evident. For instance, the conjunction 'because' is frequently used and this usually indicates that children will follow this word with reasons for their thinking, explanations that usually involve a series of linked clauses (Mercer and Littleton, 2007). The language is also populated by verbs that show the children considering the situation they are discussing; the children use words like 'I think' followed by giving reasons for their actions (e.g. at 31.00 and 31.44).

The gestures used by the children confirm their involvement in the discussion. The children used arm movements to accentuate points they considered important and to give them further emphasis. At one point Tom rubs his head, emphasising his concern over protection

issues, and this further indicates his involvement and the seriousness with which he is considering the problem. Intonation and louder voices were also used at certain instances to put a point across, this can be seen by Julia at 31.55. Body position and gaze also give further indication of their complete focus throughout.

While there is evidence in terms of reasoning that extract 5.5 could be classed as dialogic, the length and balance of the conversation gives less convincing results. Both Mercer (2004) and Alexander (2010) agree that exploratory/dialogic talk is characterised by longer utterances and by children participating in an equal manner. This extract has 16 sentences over the length of 10 words and 14 sentences under this figure. The longest sentence was 53 words long, but this did not typify the dialogue and many of the sentences were only just over 10 words in length. Here it is interesting to refer to the findings of Hardman *et al.* (2008), who propose that 70% of pupil talk uses three words or less. While it is clear that the children in this extract are doing much better than this, it is still difficult to conclude that the talk moves are particularly long and this could indicate that it is not truly dialogic. Alexander (2004, p.23) does, however, note that while longer talk turns are a positive development, extended talk does not necessarily denote a dialogic outcome and that what matters most is the 'quality, dynamics and the content of talk'.

The children also tended to interrupt each other and this suggests that they were not listening to each other. During the experience of the conducting the research I felt as though the children could not wait to talk and that it was this eagerness that caused the frequent interruptions. Additionally, the level of contribution made by the children was unbalanced. Out of 32 talk moves, twelve were taken by Julia, Tom also contributed twelve moves but Holly only contributed five talk moves, two talk moves were generated by the researcher. Mercer and Littleton (2007) argue that for talk to be classed as exploratory all partners must all actively participate which was not the case in this extract where Holly's contribution was less than half of the other two children.

Table 5.3 breaks down extract 5.5 into coded information and is found in Appendix C. Table 5.3 indicates that most of the exchanges can be considered to be exploratory in nature, with some talk moves showing more than one element of exploratory talk according to my classification scheme. There were no talk moves that I considered to be disputational in this extract.

5.6 The talk continues

Extract 5.6 analyses another example of talk that I consider to demonstrate dialogic elements. The talk starts with the children justifying their location; this was initiated by a question that I had posed to them on this theme.

- 24.50 HOLLY cos it is in a high place, it is on flat land, it's got loads of resources for us, to use and it hasn't been built on already
- 25.00 JULIA it is also quite near the other islands so we could go over to there if we need (the sentence goes on but it unintelligible)
- Conversation is diverted by unexpected interruption
- 26.08 T have we got anything missing? (from the site chosen for settlement) [*all the children look at their tablets and a picture given depicting different settlements to help them with their task*]
- 26.10 HOLLY we have got wood, we have got protection
- 26.10 JULIA err, we have got building materials, I think the only thing is the slope [*half stands up and leans across the table, looks at HOLLY and me*]
- 26.16 HOLLY ==we could build shelter which is what we are going to do [*looks at JULIA and me*]
- 26.20 JULIA == the only thing we don't have is the slope
- 26.20 T why do you need the slope?
- 26.21 JULIA and TOM to protect us from the wind [*TOM looks at me*]
- 26.23 T Ok
- 26.24 TOM err we do have water cos there is a massive sea right there [*looks at me*]

In extract 5.6 the talk is entirely on task and relates to the learning objective set at the start of the lesson. The children are discussing the geographical site factors they need to consider in relation to locating a basic settlement. They contemplate the nature of the landscape and available resources. This is particularly noticeable in the statement offered by Holly at 24.50 where several different features are listed as reasons to why the children might locate a settlement on a particular site. The answers supplied show their knowledge, understanding of

basic locational factors relating to settlement, and that they are applying this to the creation of their own virtual settlement. There is one misconception presented by Tom at the end of this extract – more details about how this was resolved can be found in extract 5.7.

Exploratory talk is evident when the children give reasons for their choices (Mercer, 2004). In this extract, justification of actions is evident through the use of words like ‘because/cos’ as shown by Holly at 24.50. The children are also engaged in building on ideas and jointly moving the discussion forward as shown at 25.00 and 26.10 by Julia and Holly; this is also a feature of an exploratory discussion (Alexander, 2010). There is evidence (at 25.00) of children making suggestions for the group to consider. At 26.10 and 26.20 Julia offers a challenge to the rest of the group by asking if they need to consider the fact that certain terrains (a slope) might offer shelter from different weather types; challenge and counter challenge are listed as features of exploratory talk (Mercer, 2004; Mercer and Littleton 2007). The last statement offered by Tom is on task and related to the learning objective, but does not really develop the previous comment. It therefore shows a disputational element of the discussion as specified by Mercer (2004).

Non-verbal information gives further support of the focus and enthusiasm of the group. The gaze of all the children reveals that they were on task throughout as they were either looking at each other when talking or at their work. Gaze was used to include other participants in the conversations. Actions also helped show enthusiasm for the task with Julia standing up at one point (26.10) to give further emphasis to the point she was making. The non-verbal information and the talk moves show the children really considering the problem and their contemplation of different elements that could be included in a solution.

In extract 5.6 there is a largely even balance of contributions, an element of the talk that may help to determine a dialogic categorisation (Mercer, 2004; Alexander, 2010). Out of eight contributions offered by the children, Holly and Julia make three statements and Tom makes two. Out of those eight statements the length of the dialogue is still limited, a feature that would count against the it being classified as exploratory (Mercer, 2004; Alexander, 2010). The longest statement offered by Holly is 28 words long, the shortest is just six words long (made by Tom and Julia). Out of eight statements three were less than ten words in length.

Table 5.4 codes extract 5.6, it shows that most of the talk exchanges have been classified as exploratory. This table is located in appendix C.

5.7 A creative lens

It has been absorbing to analyse the talk of children to look for signs of meaning making. Yet to leave the analysis at this point would be to ignore much of what happened during the playing of the game; it would have also resulted in ignoring the analysis of other potential learning outcomes. I set out to explore talk in several forms, one of those being to ascertain the creative possibilities that an immersive gaming environment may or may not engender.

Aligning talk with the concept of creativity was not a notion that I settled upon easily. As the literature review demonstrates, creativity is difficult to define and is a rather subjective theme to analyse. Moreover, as this research study progressed it became increasingly evident that creativity had 'fallen out of fashion' from educational policy in Britain. Gove's revamped National Curriculum (DfE, 2013) that emphasises facts and content with a focus on the 'traditional subjects' is said to threaten the importance of creativity in the curriculum (Mavity, 2013; Robinson, 2013). Ultimately, creativity is a difficult subject to tackle. It is ambiguous and hard to measure with any sort of certainty and as such it was tempting to avoid this aspect of learning in favour of an area that could be discussed with more conviction.

However, as analysis of the pilot study data continued, it became increasingly difficult to ignore many of the features of learning that were associated with the concept of creativity. The analysis still did not seem to have got to the heart of all the learning opportunities that were offered by an immersive game environment. Indeed, it became increasingly difficult to discuss dialogic outcomes without including creativity. Wegerif (2010) notes how creativity is rooted in dialogue, although he states that this aspect of dialogic talk has often been overlooked in favour of explicit reasoning. Wegerif (2010) further supports this notion by asserting that the everyday talk of children is creative and full of imaginative links, the greater the difference between people held together in the creative tension of a dialogue, the greater the potential for creativity. Furthermore, Craft (2011, p.56) in a study of *Creativity and Educational Futures* supports the notion that creative outcomes are closely associated with collaboration that involves sharing and negotiating meaning together in what she describes as a 'dialogic approach'. It is also suggested that evidence of a playful approach and playful talk stimulates creative responses (Craft, 2011; Wegerif, 2010; Loveless *et al.*, 2006; Cropley, 2001). Wegerif (2010) actually views playful talk, in terms of producing a creative output, as so

important that he suggests that he would wish to add this term to Mercer's (2004) disputational, cumulative and exploratory talk as an additional typology.

In addition, the role of technology in encouraging creative outputs from children is well documented as outlined at length in the literature review (Condie *et al.*, 2007; Loveless *et al.*, 2006; Loveless, 2007; Wheeler *et al.*, 2002). While the new National Curriculum (DfE 2013) stresses the importance subject knowledge, content and traditional subjects, as noted above, the first line of the opening statement for the new Programme of Study for Computing still states the case for the importance of creativity when using technology. It notes that, 'a high-quality computing education equips pupils to use computational thinking and creativity to understand and change the world' (DfE, 2013, p1). I therefore decided that it would be difficult to leave out creativity from the research and to try to tackle research question three:

How might an immersive gaming environment encourage creative responses from children?

As with the previous elements of talk, analysing the talk in the pilot study and beyond for creative indicators could not be neatly categorised in to one definite indicator. As such, I used the literature review as a tool by which to summarise some common features that were frequently found in a creative learning environment and that could help to answer this third research question. These features are listed in the coding tool found in Appendix B and are called 'Creative Indicators'. As with the previous two research questions, pertinent extracts of the text have been copied into this analysis chapter and then discussed in connection to creativity.

5.8 Creative talk: learning by doing and problem solving

In the following extract the children are discussing the problem of maintaining a water supply for their settlement.

- | | | |
|-------|-------|---|
| 26.24 | TOM | eerr we do have water cos there is a massive sea right there |
| 26.26 | JULIA | ==we have got lots of little pools and things [<i>leaning across the table looking at me</i>] |
| 26.30 | TOM | ==I could make a well |
| 26.33 | T | so the sea, is the sea a good source of water? |
| 26.35 | JULIA | Yes |
| 26.36 | TOM | ==err no it is saltwater |

- 26.37 JULIA but there are like loads of lakes
- 26.38 TOM == we could boil it over a fire [*making dismissive gesture showing that this task is considered easy*]
- 24.44 T is that the most practical thing?
- 26.45 JULIA No
- 26.48 JULIA there are ponds and things dotted around the island [*looking at me*]
- 26.38 TOM ==we could fish [*looking at me*]
- 26.49 HOLLY Yes
- 26.51 TOM but we have no water but we could boil it
- 26.54 JULIA == we do have water TOM cos I have seen it
- 26.55 TOM found some [*shows me the ipad image*]
- 26.57 JULIA I told you it was there
- 26.57 T Ok
- 27.00 JULIA there's lot of water
- 27.01 T but that is right at the bottom of a mountain
- 27.03 HOLLY but we can bring it up in buckets
- 27.04 TOM == yeah we can
- 27.04 JULIA yes [*all the children look at me*]
- 27.05 TOM we could make a well [*gesture made to signal a well*]
- 27.06 HOLLY Yes
- 27.07 T oh, right ok but you know is that a really practical thing for a settlement?
- 27.14 TOM not necessarily no
- 27.14 JULIA No
- 27.15 T cos who is going to get the water every night
- 27.16 TOM me [*signals to himself*]
- 27.25 JULIA if we ---if we wait and we have to go up and down there and as soon as we get the materials to make a bucket, if we bring it up

- we could bring it up and make a never ending water sources
[points up and down]
- 27.32 TOM == could we build now
- 27.33 T well I want you to decide if you are happy
- 27.38 TOM yes, we can boil it
- 27.40 T have you resolved this water issue, if you were settlers would you really want to boil your water
- 27.44 TOM no but there is a lake right there
- 27.44 JULIA ==there is a lake or two
- 27.48 HOLLY we could build a well
- 27.50 TOM == I can make steps and then it will be really easy
- 27.57 T in the real world would that be the answer
- 27.57 TOM ==no not really
- 27.58 T so, you are going to have to think round that aren't you
- 28.01 JULIA ==there is another one here which is more sheltered so we would be able to get down to the water
- 28.01 TOM ==we could make a well
- 28.07 TOM guys why don't we just make a well
- 28.15 JULIA I'm stuck
- 28.18 TOM all in favour of making a well say I
- 28.18 HOLLY I *[raises hand smiling]*
- 28.24 JULIA nose.... *[laughs]* sorry.... I *[HOLLY laughs, TOM smiles]*

I selected extract 5.8 for discussion as it shows several features of different types of talk. There are signs of an exploratory level of talk that are indicated by the children making assertions and counter assertions. There are also signs of a democratic decision-making process in action, this is shown when the children vote to indicate if they are in favour of building a well. There are also several features that align with creative talk and these will now be discussed.

In this extract the children have decided that a good location for their settlement might be at the top of a large incline – this area had been selected due to the protective features that the hill offered. The children then moved on to discussing where to find possible water sources for their settlement. They had previously been discussing the fact that the sea provided a large water source but with some questioning from myself, they concluded that this would not be an appropriate source. Tom made a suggestion as to how to overcome this by making the water viable through the boiling process. The children then suggested various other water sources that were situated at the bottom of the hill, but then they faced the problem of how to get the water from the bottom to the top of the hill. Various solutions were offered which included using a bucket to transport the water up the hill (Holly 27.03), building a well (Holly 27.48) and building a sequence of steps (Tom 27.50). This dialogue shows the children having to problem solve in a divergent manner and use their imagination; these features could be considered to show the children working ‘creatively’ (Cropley, 2001; Craft 2011). Furthermore, this passage creates a picture of an informal, intricate, collaborative discussion. Their informal language allows them to express lots of ideas quickly without having to make considered vocabulary choices. The children are jointly sharing ideas, negotiating and listening to multiple perspectives to try to co-construct a solution; this resonates with the work of researchers who have investigated the notion of collaborative creativity (Rojas-Drummond *et al.*, 2006; Rojas-Drummond *et al.*, 2008; Rojas-Drummond *et al.*, 2010, Vass *et al.*, 2008; Dobson, 2010).

A significant feature of Craft’s (2011) definition of creative thought, which she names possibility thinking, is the importance of letting children ‘learn by doing’. Craft (2011) suggests that a virtual world provides a space where projects and ideas can be generated and developed and that children are able to demonstrate their understanding through their performance in that space. The children, in this instance, have to think about how they are going to obtain water and they have to implement solutions to this problem in their virtual world. It could be argued that had the children been presented with the same problem in a different way (e.g. via written work) they may not have had to think through the problem so methodically or attempt to enact a solution.

The virtual reality of the immersive world demands that the children more thoroughly address problems. Mantovani (2001) supports this potential of immersive learning environments by stating that creativity stems from the children’s engagement in active learning as opposed to being passive recipients of content and this is what aligns virtual worlds to constructivist learning environments. In addition, the open ended nature of the task that needs to be realised in a virtual world, where the learner has agency and choice, is the reason why there

might be a creative outcome according to Loveless *et al.*'s (2006) theory for creative outcomes using technology. In this instance there was no one answer to the water problem encountered by the children but the Minecraft world provided freedom, in a safe space, through which they could explore their ideas without over prescription or emphasis on just one correct answer. This environment provided an enabling area where creative solutions could emerge. The Minecraft world also supported an easy manipulation of resources that allowed for the realisation of ideas, which for Potter (2006) is the reason why technology produces creative outcomes. Furthermore, this extract might provide a good example of Wheeler *et al.*'s (2002) theory on creativity, that is, the combination of social interaction, problem solving and technology that allows the creative thought process to evolve. In this case, the children discuss a potential problem and then enact a solution in the virtual space offered by the digital game.

The fact that Minecraft provided a space where children could provide multiple solutions to a problem also had another outcome. Deci and Ryan's (1980;1985) theory of self-determination suggests that persistence to complete a task is provided through the intrinsic motivator of autonomy. Autonomy is encouraged when students are given choice via a flexible learning task (Deci and Ryan 1980; 1985). The design of Minecraft offers much choice afforded within the game itself and does not dictate the decisions of the children, this may have encouraged the persistence and on-task behaviours shown by the children as well as the creative outcomes.

Finally, it is worthwhile signposting the last three lines of this extract:

28.18	TOM	all in favour of making a well say I
28.18	HOLLY	I [<i>raises hand smiling</i>]
28.24	JULIA	nose.... [<i>laughs</i>] sorry.... I [<i>HOLLY laughs, TOM smiles</i>]

This is an example of talk that shows that the children are confident and secure enough in their learning space, and with their relationships with each other, that they can play with words. It is in this sort of safe space that children, according to Wegerif (2010), are most likely to be creative and playful and therefore take risks.

Table 5.5 codes extract 5.8. This table shows that the talk contained many exploratory features but also creative outcomes, particularly around problem solving. The table is found in Appendix C.

5.9 Creativity and play

I selected extract 5.9 as it gives an exemplar of some more of the playful talk produced by the children. At this point the children are still discussing the location of their settlement.

21.07	JULIA	yes, this is perfect cos it has got flat land, trees and it is pretty near the other islands as well
21.15	HOLLY	and it is pretty <i>[smiling]</i>
21.18	TOM	HOLLY this is about early settlers and you are on about how pretty it is, should I plant some flowers or something! <i>[said loudly with irony, HOLLY giggles in response]</i>
21.24	HOLLY	whenever I go and look for land...
21.24	TOM	==wow there is actually flowers there
21.27	HOLLY	I thought some poppies

Loveless (2006) argues that creative environments are those that seek to induce playful expression. Wegerif (2010) states that it is very easy to dismiss playful talk as off task and of little worth, (and indeed I originally overlooked this extract); playful talk can exhibit creativity. He continues that it is often littered with the use of imagery and ideas and without these imaginative analogies the talk in the classroom would be of a lesser quality. While the talk extract above is not full of imaginative words, I have included it for its sense of playfulness and fun. When discussing settlement locations Holly (21.15) suggests that one particular area would be a popular choice due to it being 'pretty'. Her facial expression shows that she is actually playing and that she does not consider this as a real determining factor – she is testing out what sort of response she might get. However, the group respond equally playfully in their reply and they cheerfully correct Holly. The subsequent giggling and smiling of Holly shows that she is thoroughly enjoying being reprimanded by her peers and there is a sense that we have all participated in a humorous moment. Perhaps this extract shows that the children feel safe enough in their learning to be playful, but also that this playful, fun environment will allow for creative ideas to flow with more ease than in a very prescribed, high pressured challenge.

Table 5.6 codes extract 5.9 and is found in Appendix C

5.10 A blurring of boundaries

I selected the last extract for discussion due to the confusion the play aspect of this challenge could sometimes present to the group. This talk has not been coded as it does not fit the traditional concept of exploratory/ creative outcomes but is worth noting for several reasons discussed below.

- 4.24 JULIA oh, I've got an idea, you would need like a mining kind of place so you get like coal and stone
- 4.28 TOM and diamonds
- 4.28 T ok remember we are in a lesson we are not thinking about Minecraft play at the moment we are using Minecraft to do the lesson

A feature of the pilot study was a pattern of, 'Minecraft speak' that was distinctive to playing the game. This talk determined that at times the parameters of the game became confused with the learning objectives of the task. In this extract, when the children are discussing the location of their settlement, Tom indicates it would be a good idea to locate it in a place where the children could mine for diamonds. This is a definite confusion with ordinary Minecraft play – diamonds being a high value material that are useful to find as it allows the player to produce stronger and more inventive resources. This extract is typical of other examples of dialogue that occurred. Indeed, at the start of the session there was a time when the dialogue was particularly centred around the language of Minecraft and at this point it felt as if the children were showing off their expertise of the game to each other. I originally dismissed this part of the dialogue as unhelpful towards the aims of this project, talk of this nature was flagged up to me as an issue to be aware of when carrying out this intervention in the future. The amount of Minecraft speak that the children produced initially made me worried about the viability of my original aims of the project as I deemed it unhelpful and confusing. However, further reading encouraged me to reconsider this dismissive action. Re-engaging with the literature made me reconsider one of Littleton and Mercer's (2013) criteria for language for collective thinking – '*background common knowledge*'. Background common knowledge is a common language which any member of an established community of practice can take for granted as being shared with other members and therefore does not need to be explained. Littleton and Mercer (2013) give the examples of a shared language being established between people who have grown up in the same town or the skilled language that

takes place between two physicists. I therefore postulated that the Minecraft speak was the shared language of the players, the background common knowledge. While I viewed this kind of speak as a barrier and an interruption to the learning, for the children it actually provided a uniting tool around which they felt a sense of team cohesion as they worked together to seek answers to the set challenge.

The Minecraft language and '*background common knowledge*' also allowed the children to articulate their skill and competence when playing the game – they could verbally 'show off' their mastery and expertise through this. That Minecraft can be challenging and therefore has its own language could be linked to Deci and Ryan's (1980; 1985) motivational theory of self-determination. Only through persistence do the children achieve more complex procedures in Minecraft, and through this journey they acquire a vocabulary associated with the game.

5.11 Numerical data

So far, this chapter has focussed on qualitative methods to analyse the talk that occurred in this pilot study in relation to the first two research questions. I now turn to consider how I employed simple quantitative methods to give another view of the captured data. Littleton and Mercer (2013) propose that sociocultural discourse analysis is strengthened by the additional use of quantitative methods. They suggest that exploratory talk is associated with the increased use of meaning making words. As such, I have searched my own data for meaning making words used by the children in the pilot study and presented them in the table below.

Table 5.7 Incidence of meaning making words used in the pilot study.

Meaning making words	might	could	should	would	shall	Maybe	why	but	think	because /cos	if
No. of incidences	4	30	10	26	9	0	12	50	17	38	30

While this quantitative technique is simple in nature, Table 5.7 does show that the children were using meaning making language. Of particular interest was the number of occasions that the children used the words 'but' and 'because'. The word 'because' shows that children were involved in explaining decisions made (Mercer 2004; Littleton & Mercer, 2013). Furthermore,

the word 'but' suggests that the children were involved in challenging and counter challenging ideas, this is another feature of exploratory talk (Mercer 2004; Littleton & Mercer, 2013). The fact that because/cos is used on so many occasions indicates how the children were engaged in a dialogic manner. The presence of words like 'could' and 'if' also shows how the children were offering suggestions to the group.

I also searched the data for the times in the lesson when these types of words occurred. I wanted to see if there was a point in the task when the children were more likely to use words associated with exploratory talk. The group alternated between playing the game and points when they were discussing the challenge. While the group were playing, they talked and offered suggestions and the conversation flowed throughout. However, in this group of children the meaning making words were particularly used each time the group stopped to consider their work when the children moved into discussion with ease. In the group there was no hesitation about entering the discussion or nervousness about offering suggestions, each time the children paused to think about their work their discussion was very engaging.

Dialogic/exploratory talk is also characterised by the equal contribution of the group members involved (Mercer, 2004; Alexander, 2004). As such, I decided to review the number of contributions of the three children in the pilot study. The total number of contributions for each group member is as follows:

HOLLY 140 contributions

TOM 165 contributions

JULIA 133 contributions

What surprised me about the number of contributions is just the amount of them. The children talked a great deal throughout when using the digital game. In addition, the transcription shows that most of the talk was also on task – this gives evidence that the children demonstrated good motivation to talk about the activity. While the contributions of the two girls was fairly equal (Holly, Julia), it was the male member of the group (Tom) who talked the most. The research on conversational dominance, which shows that boys are likely to say more than girls, has to be considered here as an influential factor (Coates, 2004).

5.12 Conclusion

To recap, the pilot study indicated that a few changes needed to be made to the learning scenario. Some technical problems revolving around the children being able to move smoothly through the Minecraft world were solved so that the game did not experience 'lag'. The biggest change to the research design quickly emerged at the start of the pilot as it became evident that I needed to participate in the talk within the group. The children wanted acknowledgment for their actions and found it alien that I should be sitting with them and not talking.

The talk of the children was more or less continuous during the pilot study work, the talk mostly remained on task throughout. The talk demonstrated elements of disputational and cumulative talk. However, there were also extracts that featured exploratory and creative talk. In these extracts many, but not all, areas of exploratory and creative talk were demonstrated. Participating in the game gave the children plenty of experiences to talk *about* and this helped them to give a justification for their actions thereby promoting exploratory talk.

The pilot study analysis also highlighted some potential issues to be aware of when analysing the data from the next research school:

- As discussed in different extracts above I learned I needed to review the length and balance of the contributions made by the children.
- Furthermore, as noted in section 5.5, there was a lack of subject specific language used by the children. I would therefore need to investigate the amount geographical language used in the next group studied.

Chapter 6: Analysis of talk in Hambrook school

This chapter moves on to analyse the talk of the next group of children who participated in this research. The research took place in Hambrook School (pseudonym), a larger than average urban junior school with approximately 500 hundred children on roll. The school was a Church of England School in Hampshire. Most of the children at Hambrook were White British; the school had a stable population with few children leaving to move to another location. A lower than average number of children spoke English as an Additional Language. An average number of children had special needs and a smaller than average number of children had a statement. The proportion of children eligible for free school meals was below average.

Six children from Year Six were selected for the study – they were aged between ten and eleven years. The children took part in the learning activity on four occasions, each incident of learning lasted between 75 and 90 minutes. The same children took part in the learning in each instance. The learning activity was cumulative, that is, the children developed and deepened the same learning activity on each occasion. The children who participated in the research were from the same class, picked to create a study group that comprised of a range of different literacy abilities and different genders, as explained in the methodology chapter, section 3.4 and not because of differences in ethnicity or generic attainment. The three girls and three boys involved ranged from those exceeding national expectations to those attaining below national expectations for literacy. The group included a child (Gracie) who demonstrated features of dyslexia and was reported by the teacher to have confidence issues. There was also a child who had a quiet disposition and who found it difficult to speak out in class. Table 6.1 provides some background information for each participant.

Table 6. 1. Contextual information about participants

Ryan: boy	Met national expectations for literacy. Ryan was reported by the class teacher to be of a quiet disposition and reluctant to participate in class discussion.
Shiv: boy	Below national expectations for literacy
Annie: girl	Exceeding national expectations for literacy – confident personality
Mia: girl	Exceeding national expectations for literacy – confident personality
Adam: boy	Met national expectations for literacy
Gracie: girl	Below national expectations for literacy unconfident – possibly dyslexic

The research took place in the same location in the school on each visit and at the same time of day. It was conducted in the deputy head teacher's office, away from the children's normal classroom. As detailed earlier, the children were from the same class and therefore familiar to each other, but they were not necessarily friends with each other. This was different to the make-up of the pilot group, who had established long-term friendships, and is a potentially influencing factor on the outcome of the talk. As Mercer and Hodgkinson (2008) argue, engaging in exploratory talk is a brave thing to do and tends not to happen unless there is a degree of trust in the group.

All the children had played Minecraft before and could be considered expert players, but this was not a condition of their selection. The group were extremely enthused by the idea of playing Minecraft to learn in school and therefore came to the task keen to participate and happy that they had been selected. The lessons at the school followed a similar pattern on each occasion I visited. They would begin with an introduction from myself and, in the second, third and fourth lessons, I made a link back to the learning that had occurred in each prior

lesson. The lesson would involve the children working for 15-20 minute periods on the tablet computers, followed by a period in which the children would pause and discuss the task at hand, considering what they had achieved in the previous part of the lesson.

This chapter now turns to the analysis of the data generated in this school in relation to the first two research questions:

1. What are the features of children's group talk when using an immersive gaming environment?
2. How do children use talk to make meaning when using an immersive gaming environment?

6.1 Initial thoughts

While working with the children it became evident that there were several different types of talk of note. As with the pilot study, the children talked constantly from the outset. The children did not stop talking from the first to the last occurrence of working with them. I had expected they might be hesitant to begin with as they were working with an adult that they had only previously met once for a 20 minute introductory session. I was also an adult who was not part of the school's community and therefore something of a mystery to them (before and after working with the children they would usually quiz me about where I was going and what was I doing next). Ultimately, my presence did not appear to unduly affect the children who quickly found their confidence as evidenced by the pace, speed and freedom of their talk.

In addition, this scenario removed the children from their accustomed whole-class situation, where they would normally spend a significant portion of their time in structured tasks or listening to the teacher, and freed them from the normal classroom conventions. They were not asked to raise their hands to obtain permission to speak and were rarely ever asked to stop talking. The talk that took place consisted of paired talk when working on a tablet and whole group talk at other times. The talk that occurred was often very fluid, fragmented and overlapping and so it was often very difficult to transcribe.

The children were given the following ground rules to observe:

- all members of the group were invited to contribute

- the children were asked to avoid speaking over each other
- to listen carefully to all contributions and to discuss decisions
- the children did not have to put up their hand to speak and were encouraged to talk freely.

The transcriptions of the children's talk show that not all of it could be neatly labelled exploratory or creative. Disputational and cumulative speech also featured and while several features characteristic of exploratory and creative discussion were captured, some were absent or only occurred intermittently. In addition, there were several occasions when the children went off-task in their conversation, straying into what might be characterised as 'Minecraft speak', where the focus shifted away from the learning and onto the mechanics and environment of the game. At other times the talk might lead into what I have termed as a 'digression'; verbal exchanges that remained loosely relevant to the task, but were not strictly focused on the objectives set at the start of the intervention. I was conscious that, had I been in the role of a teacher in a normal classroom situation, I might have stopped the conversation. This aspect of the talk is discussed as the chapter progresses.

One feature of this project was the enormous amount of data that there was to consider and it was very difficult to know where to start with the analysis. As with the pilot I have tried to pick out typical examples that represent the different types of talk and pertinent features that are worthy of note.

6.2 Disputational talk

Extract 6.2 occurred in lesson one. It is evident that some of the talk shows characteristics of being disputational in nature as discussed below.

- | | | |
|------|-------|---|
| 7.22 | ADAM | we are just checking in the shipwreck for things .."oh, you are shipwrecked [reading sign in game]) your task is to build the best settlement possible" <i>[looking at screen, all others look at ADAM]</i> |
| 7.31 | ADAM | we need to do the best kind of settlement to survive <i>[looks at me for conformation]</i> |
| 7.34 | MIA | ==sheep in the house <i>[looking at screen]</i> |
| 7.35 | ANNIE | let's get the sheep so we can pen them <i>[looking at screen]</i> |
| 7.40 | MIA | a brown sheep is heading into the brick house |

- 7.41 GRACIE yes, so if we explore over there, I don't think anyone has been there before [*looking at screen*]
- 7.41 ANNIE ==I think we should head off that way [*this is said to MIA speaking over GRACIE*]
- 7.45 RYAN glow stone on the floor [*looks at screen*]
- 7.46 ANNIE oh, collect that [*looks at screen*]
- 7.40 ADAM we've got two bits [*MIA and ANNIE look at ADAM and nod*]

This extract typifies some of the talk that occurred in the four lessons. The extract is taken from the start of lesson one. The children had been asked to explore the island they were on, to think about where they might build a settlement and to ascertain the relevant characteristics of its geography. As outlined above, I had given the children some simple rules for talking to each other in groups, which highlighted the importance of listening to each other. In this extract, the rules do not appear to have been heeded very conscientiously.

The talk in this extract started on-task. The children were exploring a shipwreck that they had found on the island and Adam (7.31) announced to the group that they needed to build a good settlement in order to survive. However, it is evident that Mia was quickly distracted by other events that were occurring in the game (a sheep appeared) and Mia and Annie completely ignored the statement made by Adam. Ryan (7.45) was also distracted by the find of a particular stone type that holds value in the Minecraft game world. This talk could not be seen as productive to the development of the task at hand and indeed it felt that, on this occasion, the game was a distraction from the learning. The talk here showed that the children were not listening closely to each other or particularly valuing the ideas of other pupils. Multimodal information gives further evidence of this. The children tended to be staring at the screen and not acknowledging each other with their gaze. Furthermore, at 7.41 Annie could be seen talking at the same time as Gracie. Annie's head was inclined towards Mia to show she is addressing her while at the same time ignoring Gracie's suggestion.

At the start of the research I was worried that the children might become involved in debate about how to operate the game or who was in control of the tablet computer. I thought that they might find it difficult to share, with one child in each pair dominating the hardware. I thought that perhaps much of the talk at the start of the lesson might be lost to these sorts of issues. However, at Hambrook this did not happen at all. The children were not engaged in

conflict or managerial disputes over who used the computer. However, the extract given above is typical of the talk that occurred at the start of the lesson, the children were involved in the game but they were not particularly 'on task' or productive. This is an example of Mercer's (2004) disputational talk. Mercer and Hodgkinson (2008) note the tendency for pupil-to-pupil talk to digress on to topics other than the educational task in hand and this appears to have happened in the above extract. These authors do add the caveat, however, that this transgression might be considered more acceptable in group talk than in teacher/pupil talk.

Table 6.2 codes extract 6.2 and is found in appendix D. This classifies several of the statements under disputational category 4 showing that children are following their own line of thinking.

6.3 Confusion

Extract 6.3 also occurred in the first lesson with the children. I selected it to show another type of dialogue that was not productive to the group. This extract has not been coded as it does not adhere to the usual characteristics of disputational talk.

11.18	T	where are you?
11.19	ADAM	we are at the edge of the world <i>[looking at T]</i>
11.22	T	can you just show me
11.25	MIA	we are next to them <i>[looking at screen]</i>
11.21	SHIV	never build a settlement next to the edge of the world <i>[looking at T, rest of the group listening to SHIV]</i>
11.24	T	why is that?
11.28	SHIV	cos it messes up your settlement, say you wanted to build a block, it would just go into the edge of the world and you can't get any animals <i>[looking at T]</i>

The problem in this extract is confusion between the gaming scenario and the lesson that was taking place. In this extract Shiv explains how he has decided against locating a settlement at a particular site because it is situated on the 'edge of the world'. Here constraints imposed by the game, specifically limitations in terms of the navigable area available to the players, produced some unexpected consequences. When the children tried to build at a point close to the 'edge of the world', as defined by the game, virtual building blocks actually disappeared

when they were placed by the player. As the comment by Shiv shows, the children did not find it easy to differentiate between the constraints imposed by the game and the geographical features that the children needed to consider to achieve the learning objectives. The locational factors for this child were determined by the game and not by the scenario.

While confusion between the outcomes of the game and the lesson focus has to be acknowledged as a potential disadvantage of the learning scenario, there is other evidence that the children also had in their mind that this game was a vehicle to enable them to consider 'real world contexts'. The extract below shows the typical thinking of a child related to this point. This is taken from a larger section of conversation where the children were discussing their site location possibly being in a forest.

7.53 MIA it is weird in real life would you really create a settlement in a forest where there are animals that could kill you ... wolves?

6.4: The children make a plan

Extract 6.4 occurred in lesson two. I selected it as it shows how the group are starting to work as a team.

6.19 SHIV what we are going to do here is make more rooms and then make a landing so you can still see down and then will make fences around it
[makes downward pointing action, rest of group are looking at SHIV indicating that they are paying attention]

6.21 RYAN I think we should have a guard post up top so we can see for miles

6.24 GRACIE yes, so you can see everything that is going on *[looks at me while speaking, other children indicate they are listening as they are looking at GRACIE, MIA nods head in agreement]*

6.24 RYAN a 360-degree guard post

6.27 GRACIE so you can keep an eye on the farm while you are in your house basically and make sure nothing is being destroyed *[SHIV tablet falls over, he quietly remedies the problem but his actions and nodding of his head shows he is still listening]*

6.27 T a good idea?

6.28 RYAN Yes

6.30 MIA yes [*nods head, SHIV nods head too*]

This is a good example of talk that could be classified as cumulative (Mercer, 2004). At this point in the lesson the children are considering protection as a locational factor which had been listed in the additional information given to them as one of the elements they had to consider when making early settlements. The talk is firmly on-task as opposed to the previous extracts 6.2. and 6.3. At the start of the exchange, Shiv proposes a plan of action to the group, Ryan shows agreement with Shiv by developing the original idea and extending it, Gracie then extends the idea still further by elaborating and therein also shows confirmation and agreement, these are both features of cumulative talk (Mercer, 2004). The exchange culminates with the researcher (T) asking if this is a good idea with Mia and Ryan offering a confirming 'yes' response. The conversation flows from pupil to pupil and there is a sense of an agreed plan. This is further evidenced by the non-verbal gesture of the children, which shows their gaze firmly directed upon each other and nods of agreement. While there is a clear direction to the discussion there is no evidence of challenge or counter challenge as would be demonstrated in talk that might be considered to be exploratory (Mercer and Littleton, 2007).

While this extract might not be deemed exploratory, it gives another good example of the important role of cumulative talk. Researchers (Rojas-Drummond *et al.*, 2006; Rojas-Drummond *et al.*, 2008; Rojas-Drummond *et al.*, 2010) note how open-ended tasks like the one in which the children were participating, require collaboration and co-construction more than explicit reasoning. In this extract the children could discuss a situation and jointly negotiate a solution to a problem, moving through the learning scenario together. This passage shows the children really listening to each with the conversation flowing so that each contribution augments and then builds on the last. This open and uncritical exchange of ideas also reminded me of the way Dobson (2012) describes the cumulative talk in her research of undergraduate creative art students.

Table 6.3 codes extract 6.4 as cumulative and is found in Appendix D.

6.5 Thinking aloud

This extract also occurred in lesson two and details two of the children, Annie and Mia, thinking about how they are going to build a settlement in the game.

- 41.20 MIA me and ANNIE have been adventuring and I think we should destroy all the make-ship houses because they are destroyed anyway by other people and some of us so we should use the resources instead of just leaving them there. *[MIA is looking at me, uses hand gestures to accentuate the point, other children looking at MIA and listening quietly]*
- 41.38 ANNIE I think that's a good idea because I mean no one is going to use them now and it would take a long time to fix the boat and the fortress and especially the brick house so I think we should take the resources and customise our settlement to make it look a bit better, brick for the floor and ...and wood from the ship. *[during this conversation ANNIE addresses me and then also turns to SHIV to include him in the discussion. MIA nods head in agreement. ADAM and GRACIE are also listening, RYAN is playing on tablet indicating that he might have lost focus]*

This extract demonstrates evidence of cumulative talk with some exploratory features (Mercer, 2000). The talk is not truly exploratory, as there is little evidence of ideas being challenged or revealing a difference in meaning between the participants. Both children, however, do give full justification of their positions and both produce lengthy statements – the first statement being 41 words long and the second exchange 65 words in length; longer sentences can indicate dialogism (Alexander, 2004). However, Mercer (2000) would classify this talk as uncritical and therefore not as potentially productive as exploratory talk. Nevertheless, I suggest that this talk still has a valuable role. Palincsar and Brown (1986) discussed the notion of shared responsibility in group-work and the positive influence this has on the emotional and cognitive domains of the learner. Learners who share their thoughts and find agreement via a shared plan of action experience reduced anxiety when learning. In this extract you can see how the children are thinking through their ideas and reaching a shared understanding. Non-verbal information shows that most of the children, with the exception of Ryan, are listening and therefore showing respect to the speaker and for Alexander (2004) this is a very important element of a dialogic talk.

Extract 6.5 lacks sufficient use of content-specific language. For this talk to be more meaningful, the children might have proceeded from their own experience to discuss how material reuse is a theme often seen in places where successive phases of settlement have developed – e.g. the Anglo-Saxon reuse of Roman remains. Due to the age of the children, I would not necessarily expect them to be able to unpick or develop this theme on their own. This is where the role of the teacher is important. As a teacher I would have intervened at this point to develop this learning concept with the children, but my brief as a researcher was to

not to interrupt too much in the discussion and I would have also been knowingly developing the conversation in a direction of my own making.

Here, it is useful to return to Resnick's (1999) theory of accountable talk as discussed in Chapter Four. Resnick (1999) notes that for talk to develop learning, it must show the subject knowledge of the children in ways that are appropriate to the discipline being developed and this was lacking in this instance. Alexander (2004) does suggest that Resnick (1999) concentrates too much on knowledge-based paradigms and takes too little account of more open and exploratory ways of knowing. Nevertheless, Resnick makes an important point. While Mercer (2004) notes that the best peer to peer talk is often that in which the teacher does not intervene in the group, Sharpe (2008) emphasises the value of teachers using 'meta-comments'. A meta-comment is an intervention where the teacher provides a conceptual hook about the relationship between ideas. The teacher might summarise ideas, but then help the students to understand why the idea was so important (Sharpe, 2008). I would suggest that this notion is very important here and the dialogue would have become much more conceptually important if this had occurred.

What is evident is that the immersive game environment appeared to have created the opportunity for concepts to emerge, in this case reuse of materials. As the children were engaged with actually having to develop a settlement, decisions and actions had to be discussed in a way that may not have occurred if a paper exercise was taking place. Wegerif's *et al.*'s (2010) theme of dialogic space could also be addressed in relation to this point. As noted in the literature review, Wegerif *et al.* (2010) suggest that dialogues are enhanced by different perspectives and that meaning arises in the context of a difference between voices, opening up a space for dialogue. Therefore, teaching and learning involves drawing students into spaces of dialogue where differences in viewpoint or opinion can be identified and explored. Wegerif (2011) further develops this notion of the metaphor of dialogic space, suggesting that space should allow for reflection and the visualisation of a topic that can open, close, widen and deepen. This should, in turn, promote a dynamic and continuous development of meaning and allow for creative solutions to problems to emerge spontaneously (Wegerif, 2007, 2008).

Following this line of thought, a theme worth further exploration is that the game, as a learning environment, creates a 'virtual' dialogic space, where discussion can take place. Wegerif (2010) maintains that the Internet, as a communication space that makes it easier to voice views or opinions free of factors that may inhibit them in embodied contexts, opens up

possibilities that give almost 'concrete' form to the idea of a dialogic space. Wood (2012) also discusses liminality which is described as a threshold state, a 'between' space where views of the world can be altered as thinking is developed. In this instance, this dialogic space, or liminal area, is provided by the game. The game allows the space for the dialogue to occur in a manner that might not have arisen if carried out in a different environment. Without actually having to carry out actions and simulate building, the theme of re-use/recycling of materials might not have been addressed.

Table 6.4 codes extract 6.5 and is found in Appendix D

6.6. A digression

Extract 6.6 took place in lesson two. It shows the children in an extended discussion about the location of a settlement.

13.38	RYAN	it would probably be quite a good place all in all together
13.40	T	ok why
13.48	RYAN	cos you could make weaponry if you needed it and you would have a bit of water and you could boil it and you could, as SHIV said, make a house up in the trees and no one could find you <i>[ANNIE and MIA and SHIV all look at RYAN, RYAN is looking at me but also turns to SHIV when he is mentioned in the conversation]</i>
13.58	T	Ok
14.00	ANNIE	and there might be some caves there as in jungles or forests there is usually quite a lot and it is a good place for hunting animals as well because it there is quite a bit in forest and jungles <i>[ANNIE is addressing RYAN, MIA and SHIV are looking at ANNIE]</i>
14.15	RYAN	==like deer, you could shoot them from your tree top house
14.16	T	so you might have a food supply which is quite important. Ok are there any disadvantages
14.32	MIA	well the river could flood and we would have to stay up in the trees <i>[gesturing upwards, all other children are listening]</i>
14.33	SHIV	yes, but that is your home so it wouldn't really matter you still have – you still have <i>[gestures to add emphasis]</i>
14.37	MIA	== yes but you would get thirsty and hungry so you like...you would starve <i>[smiling, all children looking at SHIV]</i>

- 14.44 SHIV ==yes but that would – yes but that would be during the winter you would stock up on food anyway wouldn't you? *[RYAN nods in agreement]*
- 14.47 RYAN == ummm yes *[nodding]*
- 14.47 ADAM ==you would drown if the river flooded
- 14.50 SHIV yeah but it wouldn't get up into the trees would it *[ANNIE and MIA look at SHIV]*
- 15.45 MIA yes but you would starve
- 14.54 RYAN ==no you would probably have a meat stock pile somewhere and a drink
- 14.55 MIA Yes
- 15.00 SHIV that's if they have common sense
- 15.01 GRACIE == well you get as much as you can in the summer and when it is winter you step in the tree house and if you need it that bad you go down there and be as careful as you can and if you feel that you are not going to stay alive you go back up..... in the tree *[all children look at GRACIE and SHIV pulls his chair up towards the table as if to make sure he can hear]*
- 15.27 RYAN == yes if it is..... yes, if it is winter you could probably go between the trees and get what you need from above *[all children look at RYAN]*

I chose extract 6.6 for the interesting focus the children show in their talk. The children are talking about different site locations and the pros and cons of a particular place and are discussing the probability of flooding. Their solution to this (to live in trees) is not very practical and ultimately the children themselves rejected this notion as unrealistic and moved on to explore a different solution to the problem. When reviewing the transcripts I originally ignored this piece of talk as I felt that it did not sufficiently meet the set learning objective. I viewed this episode as a digression and dismissed it as wasting valuable time in the lesson as the children were not really proposing a solution that I thought revealed a good understanding of the set task. Furthermore, it demonstrated their misunderstanding and the way the children might have romanticised the problem in suggesting their tree top solution – certainly, they were not proposing something that would have been achievable or realistic.

However, several characteristics of exploratory talk are noticeable in this extract. For instance, the children are talking very imaginatively and very quickly. What is also significant is the way

the children are engaged in a pattern of assertion and counter assertion with much difference in meaning evident. Between 14.33 and 14.44 the children start three sentences with, 'yes but' and then go on to give their opinion which did not necessarily agree with the last person's suggestion. The children also built on each other's thoughts by offering alternative ideas for consideration. The children frequently use meaning making language: words like 'would', 'could' 'might' 'I think' 'because/cos' are all observed. These words are important to note as their use indicates that the children are offering suggestions and giving justification to their thought processes, a feature of exploratory talk (Mercer, 2004). Out of 17 lines where the children contribute, 13 of them contain at least one meaning making word.

Conversely, other parts of the conversation do not meet all the requirements of exploratory talk. Nearly all the group members participate in the discussion with the exception of Adam. The other children do not ask for Adam's opinions, for a conversation to be exploratory all participants should be called to contribute (Alexander, 2010). The children also interrupt each other frequently as opposed to listening to each other. Although interruption is a feature more familiar to peer-to-peer dialogue where different ground rules apply making it more acceptable to intrude, this theme does have to be considered when categorising talk (Mercer and Hodgkinson, 2008). Furthermore, what the children are suggesting is not a geographically or practically accurate solution and is not sound in its reasoning and this also produces a dilemma as to how to analyse this type of dialogue. As Alexander (2004) notes, it is good to initiate an extended discussion but the point of it is of limited value if it is not particularly purposeful. The task of the teacher is to pull together all the threads of a discussion in a timely manner and make it purposeful, this is inherently much more difficult to achieve in a pupil-led discussion where the voice of the teacher is often absent. A future development might be that children could be allocated roles where one child might be responsible for keeping the purpose of the talk in focus.

Perhaps Mercer and Hodgkinson (2008) provide an alternative solution to these problems by suggesting that often discussion is imperfect in terms of reasoning and knowledge generation but valuable in terms of harnessing social learning to promote thinking and motivation. Maybe I am interpreting this extract as unrealistic as I am looking at it through my more knowledgeable adult lens and perhaps I did not consider the notion that the children did not immediately see the idea as unachievable at all but as a valid line of reasoning. This extract, however, does typify similar examples that were produced by the learning scenario provided by the Minecraft game. The talk was not off-task in the eyes of the children and was indeed

conducted in a very serious fashion (this was confirmed by the non-verbal information), which led them to consider many different but unachievable solutions.

When considering this last point in more detail, Alexander's (2004) view on talk gives some valuable information when he suggests that what counts in dialogue is the extent to which instruction requires students to think not just to report on someone else's thinking. Maybin (2006) adds to this argument when she notes that children are often found to be reproducing other people's voices. One of the ways children show their learning is through taking on the voices of teachers and textbooks and reproducing these voices as if they were their own – these types of voices are called 'schooled voices' (Maybin, 2006). For Maybin, children's conversations are the much more complicated dialogic interweaving of voices which is a constant, ongoing process of interactive meaning-making; dialogues occur within utterances and between utterances and knowledge building within talk tends to be provisional and fragmented. Bakhtin (1981) contrasts this type of discourse with the more fixed, authoritative tone of the talk that is provided by texts and teachers, which is merely transmitted and received, not negotiated or transformed. This then, perhaps, is what the immersive learning environment engendered; it required the children to think through different solutions and not to report on a set answer. Some of the solutions offered by the children therefore were practical and some were not. The children were relying less on teacher instruction as the game provided the object around which they formulated their thoughts. Extract 6.6 indicates that the game scenario encouraged different solutions to be suggested in a way that might not have occurred had the task been carried out using alternative teaching methods.

The research of Middup, Coughlin and Johnson (2010) also resonates with the theme detailed above and helps to reappraise the role of this talk through a different lens. In their research of creative discussions, these authors warned against the perils of rushing a group to a conclusion too quickly at the expense of considering a wide range of creative ideas. In this extract this process was entirely necessary and important for the eventual exploratory discussion to occur. As such, the role of cumulative talk is important as all ideas are considered and reflected on in an uncritical manner, using informal language that is accessible to the group, which helps the children move to a realistic solution. Had I stopped this conversation too soon the discussion might not have been so expressive.

Table 6.5 codes extract 6.6 and is found in appendix D

6.7. Exploratory talk?

Extract 6.7 occurred during the second lesson that I worked with the children. The children were discussing where to locate their settlement.

- 27.10 GRACIE ok so when you get the ipad you go looking for stuff and when you get back to the house SHIV can take over with building the house umm [*RYAN and SHIV are looking at GRACIE, the rest looking at their tablets*]
- 27.17 RYAN ANNIE MIA what do you want to do?
- 27.25 MIA I don't know [*shrugs*]
- 27.26 ANNIE ummm we could go adventuring a bit more
- 27.30 GRACIE do you both want to do that or one of you.... or one of you? [*all children listening, ADAM has moved out of shot at this point as he has leaned back in his chair*]
- 27.30 MIA ==yes [*all others indicating they are listening*]
- 27.32 RYAN Yes
- 27.34 RYAN ok ==so ANNIE and MIA will go adventuring
- 27.39 GRACIE ok so we will work on the house?
- 27.40 SHIV == can we build a boat, like a long boat [*interruption, he indicates that he is not listening to others*]
- 27.41 everyone ==why?
- 27.44 ANNIE == would we need a boat? [*all looking at SHIV*]
- 27.44 RYAN ==we don't really need it
- 27.45 MIA ==we can't really sail a boat
- 28.01 T so our objective today remember is early settlement, do we need a boat
- 28.03 everyone no [*SHIV nods, MIA shakes head*]
- 28.05 SHIV ==no it is just for show...say like, say like.... [*gestures towards screen, looks at tablet, other children look at SHIV who is speaking, ANNIE has a puzzled face indicating that she is confused by what SHIV is suggesting*]
- 28.06 RYAN === so you can hop on a long boat and sail away [*looks at T*]

- 28.08 SHIV == say if someone attacked you you could hop in the long boat and sail away [*looks ta tablet and then turns to ANNIE*]
- 28.11 ANNIE but it would waste materials [*all looking at SHIV*]
- 28.11 RYAN Yes
- 28.11 SHIV == yes but it is fitting [*looks at T for support*]
- 28.14 ANNIE ==how? [*looks at SHIV*]
- 28.14 MIA == how? [*looks at SHIV*]

The talk in extract 6.7 is on task and of a focussed nature. The children are making a plan of action as to how they are going to complete the set task and discuss the possibility of the need for a boat.

This extract contains some elements of cumulative and several features of exploratory talk. The talk is directed by the group with only one contribution given by the teacher. There is evidence of the children using assertion and counter assertion particularly in relation to Shiv's suggestion (given at 27.40) that a boat should be produced. Most of the group, in this instance, are not convinced of the need to create a boat with the group saying 'no' to this idea. This forces Shiv to give a further justification to his thoughts. Assertion, counter assertion and justification are all features of exploratory talk (Mercer, 2004). The children are also involved in a process of asking questions of each other as seen at 27.41 and 27.44. There are other questions asked towards the start of this extract that show the children considering the distribution of tasks and what they might like to do next. This could be seen as meeting the requirements of exploratory talk as the children are choosing to discover what each participant would like to do instead of one pupil making an arbitrary plan of action that others have to follow, joint decisions are therefore reached (Mercer and Littleton, 2007).

As with previous examples discussed in the pilot chapter, the talk in the extract above does not meet the requirements of exploratory talk in terms of length of answer. Answers in this extract are quite short, whereas dialogic talk usually consists of longer sentences involving children justifying their viewpoints (Mercer, 2004, Alexander, 2010). Of the 23 contributions, only six were more than ten words long – the longest contribution being 28 words. Furthermore, the extract is characterised by interruption, which would not match the requirement of children

listening carefully to each other (Alexander, 2004). Of the 23 contributions, 13 have some form of interruption occurring.

Returning to the work of Maybin (2006), the feature of interruption might be further analysed and does not necessarily have to be considered such a negative component of the talk. Maybin (2006) discusses the notion of 'duetting' where speakers (normally friends) will repeat each other's talk simultaneously but not necessarily in competition with each other; friends in dialogue often overlap talk moves and indeed continue each other's turns by finishing sentences for them. This kind of duetting can be repeated in classroom talk (Maybin 2006). Here the interruptions and overlaps might make the talk difficult to decipher, which is certainly true of much of the talk obtained in this research project, with individual contributions not making much sense if they stand alone without the other additional, contextualising dialogue. As a result, the meaning and knowledge building is not attributable to any one individual, but is a sum of the whole group's contribution. Here children might produce a 'shared voice' where they interrupt each other in order to finish each other's sentences in order to build meaning. This is seen in the extract below where the children are discussing boats:

- 28.05 SHIV ==no it is just for show...say like, say like... [*gestures towards screen, looks at tablet, other children look at SHIV who is speaking, ANNIE has a puzzled face indicating that she is confused by what SHIV is suggesting*]
- 28.06 RYAN === so you can hop on a long boat and sail away [*looks at T*]
- 28.02 SHIV == say if someone attacked you, you could hop in the long boat and sail away [*looks ta tablet and then turns to ANNIE*]

Ryan finishes Shiv's sentence who in turn interrupts again and adds another build on. For Maybin (2006) these bits of interrupted sections of speech might be typical of the way children might build up general, informalised knowledge and would represent dialogism being achieved. Furthermore, Vass *et al.* (2008) in their research, note that interruption signposted intense sharing, joint focus and content generation. Much of the speech conducted in Hambrook was suggestive of Maybin's (2006) and Vass *et al.*'s (2008) view of how children engage in dialogue. The multimodal information also shows that while the children were interrupting each other, their listening postures and gaze direction indicate they were very engaged with the dialogue.

As well as the length of contributions, participation levels are interesting to note here as shown in Table 6.6:

Table 6.6: Contributions of participants for extract 6.7

Children	Number of individual contributions
RYAN	6
SHIV	4
ANNIE	4
MIA	4
ADAM	0
GRACIE	3

Exploratory talk should represent joint reasoning and requires participation from all group members (Mercer and Littleton, 2007). Table 6.6 shows that for five of the participants their contributions were mostly equal. However, Adam did not contribute with the exception of two instances, where he gave a joint verbal disagreement along with the rest of the group and on another instance asked the question 'why' alongside the rest of the group which could prevent this extract as being described as dialogic. Adam's participation, however, was shown by his non-verbal gesture indicating engagement with the task and his gaze which was directed to other group members. Freire (Shor and Freire, 1987) notes that in a dialogical situation, students should not always have to say something as this would create a false democracy or fake discussion, instead they should show they are listening to other contributions. Furthermore, Schultz (2009) reminds the reader that participation is demonstrated through many modalities and does not always need to be shown via verbal participation. Overall contribution should therefore be evaluated on how 'silence and vocal participation are constructed through interactions between students' (Schultz, 2009, p.19).

Ultimately, no group member particularly controlled the talk, as in the work of Wegerif and Srimshaw (1997) where one child so completely dominated the discussion that other group members become increasingly quiet or withdrew from the conversation altogether. What is, however, noteworthy is the contribution of Ryan who makes the most talk moves in this extract. The teacher described Ryan as a child who had issues with confidence and did not demonstrate much self-esteem. In addition, he was defined as being quiet and reluctant to make a contribution in class. This characteristic, however, was not evident throughout the whole research project with this school and had I not known this information I would never have classified the pupil as a hesitant speaker. Interestingly, this pupil was a good Minecraft

player and this might have allowed him to assume a different role/ identity to that which he normally enacted in school. Gee (2007) discusses the use of the computer game in relation to the cycle of expertise, games let children learn new things, give repeated practice and let them become expert, creating feelings of the accumulation of knowledge and skills rather than the feeling of standing in one place all the time. Gee (2004) asserts that good games let learners experience expertise whereas schools usually do not. In this case, Ryan felt like an expert in this area and this allowed him to overcome the usual reticence he felt when speaking.

The contribution of Gracie was also of note. While Gracie only made three offerings in this extract, they are of an interesting nature. All these contributions involve Gracie maintaining an organisational role, perhaps even a leadership role, as this pupil tries to get the group to decide what it is they are going to do. For instance:

- | | | |
|-------|--------|--|
| 27.10 | GRACIE | ok so when you get the ipad you go looking for stuff and when you get back to the house SHIV can take over with building the house umm [<i>RYAN and SHIV are looking at GRACIE, the rest looking at their tablets</i>] |
| 27.30 | GRACIE | do you both want to do that or one of you or one of you? [<i>all children listening, ADAM has moved out of shot at this point as he has leaned back in his chair</i>] |
| 27.39 | GRACIE | ok so we will work on the house? |

This again stands in contrast with the brief I was given on this child who had been described as lacking confidence. This description was not evident in the research as the child felt assured enough to assume a different sort of role within the group.

Table 6.7 codes extract 6.7 and is found in Appendix D.

6.8. More exploratory talk

Extract 6.8 occurred in the second lesson I worked with the children. In this extract they are discussing a settlement site. At this point the children had been asked to stop playing the game and I had asked them to discuss the potential location.

- | | | |
|-------|---|------------------------------|
| 21.41 | T | are we happy with this site? |
|-------|---|------------------------------|

- 21.41 Everyone yes *[all indicate they are happy, MIA also gives a thumbs up sign]*
- 21.41 ANNIE it's brilliant
- 21.43 T why is it good?
- 21.45 RYAN == because it has everything you need quite close by *[looking at T all others either looking at table or at each other]*
- 21.45 GRACIE == because there's....
- 21.45 ANNIE there's a lake
- 21.47 GRACIE there's like a lake just there, there's some wood that is not that far away, there's ummm....there, if we really need it that bad well...here's stuff growing here, our house is ummm just round the corner, there is a disadvantage with it being on the edge of the island but that is not really affecting us that much in so far, I don't think it will cos our house is all the way over there so we should be fine and I like this area because uuumm because you have got wood there, you have got water there and you can see food nearby *[Ryan and Shiv are listening and then whisper something to each other re GRACIE's reply and then indicate they are listening again, ANNIE and MIA and are listening, RYAN out of shot as blocked by GRACIE, SHIV nods slightly at end]*
- 22.38 ANNIE umm there's a lake and you could drown if you are not careful *[smiling]*
- 22.14 MIA like you are doing *[ANNIE has moved her avatar in to the lake and both ANNIE and MIA are smiling]*
- 22.59 RYAN we could always get to the shipwreck by walking round the land *[all look at RYAN]*
- 22.57 ANNIE yes, I know but this lake you could fall in and drown *[smiling]*
- 22.30 ADAM you could build it up a bit so it's all like...around the edge *[all listening except SHIV who has gone back to playing indicating he is distracted]*

Extract 6.8 demonstrates features of exploratory talk (Mercer, 2004). The talk is on-task as the children are in the process of offering reasons and exchanging information as to why they have selected a specific site on which to base their settlement. Moreover, the children justify their reasons for selecting the site and this is demonstrated by their use of words like 'because' (e.g. Ryan at 21.45 and Gracie at 21.47). In addition, at 21.47 Gracie gives an extremely long

justification for her answer that involves several reasons for the selection of the site location. This answer is 104 words in length and is certainly longer than the average length of response found in Hardman *et al.*'s (2003) research, in which 70% of pupil talk moves used three words or less. Non-verbal data shows that the children have to concentrate hard to pay attention to this answer and that Gracie's contribution is triggering other thoughts that encourage Ryan and Shiv to whisper to each other. However, the children do stay with Gracie and show they value her thoughts through their posture and nods. The children are also involved in challenging and counter challenging each other during their discussion, for instance Annie makes a challenge at 22.38, another feature of exploratory talk (Mercer, 2004).

As with other extracts discussed in this chapter, this episode reconfirms the earlier suggestion that the talk could be improved by more reference being made to subject specific language. While Gracie does give a long and reasoned answer as to why a certain site might be selected, more evidence of the use of geographical language would have shown her ability to apply subject specific language to a specific event. The answer supplied by Gracie shows understanding of the set task but did not use the language that had been modelled at the start of the lesson. The meaning making in this extract is not exact but a more informal display of understanding. Ryan is also speculating and thinking aloud, but he is not using specific or accurate vocabulary (Resnick, 1999). This is another example of Maybin's (2006) informalised knowledge.

Table 6.8 codes extract 6.8 and is found in Appendix D.

6.9. A creative perspective

This chapter now analyses the data collected in Hambrook School in relation to the third research question posed in this study:

How might an immersive gaming environment encourage creative responses from children?

Extract 6.9 presented below centres on one particular lesson where a set of unfortunate events occurred. During the last visit to Hambrook the children decided one of the features needed for survival was that of heat to be produced by fire. After searching the world and obtaining the items needed to create fire (flints) they made a fire in one of their houses. Unfortunately, they inadvertently set their settlement alight, the fire spread, became uncontrollable and ultimately destroyed it. While this presented a dilemma for me as the researcher, as much of what the children had produced in the game was destroyed and

pictorial evidence of their achievements was therefore lost, the talk that occurred around this incident was worthy of analysis.

- 12.19 MIA but its spread, oh my god, it' s really spreading badly [*claps hand over mouth, high pitched voice*]
- 12.23 T so have you found the source
- 12.25 MIA == oh my God [*looking at tablet*]
- 12.26 RYAN == its turning to night [*looking at tablet*]
- 12.27 MIA well, the fire is still spreading [*looking at tablet, concerned expression*]
- 12.28 RYAN no its not
- 12.30 ANNIE not anymore [*looking at tablet*]
- 12.31 MIA I'm sure if you turn around there is more fire [*gesturing with hand*]
- 12.32 RYAN == I just heard a lot a lot of fire behind you [*looking at tablet*]
- 12.33 MIA Look, you can see that glass isn't flammable, cos the glass is still there [*pointing with finger*]
- 12.43 MIA I tested it out on my creative work because I did not know if it was flammable or not but it turns out it's not [*SHIV nods*]
- 12.58 SHIV shall we work through the night? [*looking at tablet*]
- 12.59 RYAN we're working through the night [*looking at tablet*]
- 13.10 ANNIE this is one thing I didn't think I would be doing today [*looking at tablet*]

Extract 6.9 show elements of all four categories of talk. In the lesson, the action was rather chaotic as the fire was spreading quickly throughout the settlement and the children were at a loss as to what to do about it, which resulted in them following their own lines of thinking and not necessarily communicating well. One element that is of interest, however, was the response of Mia in relation to her observation of the glass objects some of the children had made in the world. Mia noticed that after the fire the glass still existed and then made a connection with other work she had been conducting in order to verify this to conclude that glass was not flammable. This line of thinking could be considered as both 'correct' and 'incorrect'. What Mia has noticed is that glass may not necessarily melt at the same temperature as other materials. While Mia needs to go further in her thinking (higher melting

points of glass needed to be discussed – glass needs to be placed in an extremely high temperature furnace in order for it to melt – we did consider this as a group after the game playing had been completed but it has not been included here as data that can be commented on), the game provided an interesting line of enquiry that the child could reflect on. Here is an example where the children are learning by doing (Craft, 2011); the fire was situated in the wrong place and there was a negative consequence to an action. Furthermore, that the glass in the house was still present after the fire gave a conundrum for the child to consider. These incidents show the generally creative nature of the game. The game offers a space where ideas can be generated (e.g. that of glass melting points), mistakes can be learned from and the production of future content is therefore informed by this learning. Craft (2011) names this ‘learning by doing and doing by learning’ – not only are the children required to actually carry out their actions, the content and choices they make has been actively informed by the ‘doing’ to that point. Alternatively, Wegerif (2010) would see this as the game opening up the dialogic space for the creative expression to occur. Wheeler *et al.* (2002, p.370) might suggest this divergent, collaborative, problem solving space enabled by the digital game, gives the children opportunities for creative ideas which these authors call ‘transformative’ thoughts.

Another theme to note here concerns the ‘realness’ of the experience. In this extract the expressions, both verbal and non- verbal, show the dramatic reactions to the events that were taking place. The three lines of dialogue given by Mia exemplify this:

- | | | |
|-------|-----|--|
| 12.19 | MIA | but its spread, oh my god, it' s really spreading badly [<i>claps hand over mouth, high pitched voice</i>] |
| 12.25 | MIA | == oh my God |
| 12.27 | MIA | well, the fire is still spreading [<i>looking at tablet, concerned expression</i>] |

Tuzan *et al.*'s (2008) research found that a game could increase motivation and learner autonomy by providing an authentic and relevant learning environment. The computer game experience provokes creative responses because the children are involved in active learning as provided by the authentic or ‘real’ experience. In this extract the events in the immersive experience served to increase the engagement with the learning task. This also relates to Ryan *et al.*'s (2006) notion of presence within a game as a feature that increases intrinsic motivation. As Mia’s exclamations show, the authenticity of the experience means, ‘that a person perceives and responds to the content of a particular medium as if the medium were

not there' (Ryan *et al*: 2006.p.4). Csikszentmihalyi's (1990) concept of creative flow, an experience that is associated with intrinsic motivation and the merging of action and awareness, also appears to be evident here as Mia's verbal and non-verbal expressions demonstrate an intense engagement and reaction to an unexpected event. Finally, Howard-Jones and Demetriou's (2009) research, that suggested the component of uncertainty in educational games as a factor that increased motivation, could also be seen to be contributory here. Because of the game's dynamic environment, the players never quite knew what was going to happen and so could be caught out by unexpected events as in the case of the fire on this occasion.

Table 6.9 codes extract 6.9 and is found in Appendix D.

6.10 Farming

Extract 6.10 is part of a discussion that took place in lesson two. The children had just discovered some livestock that wanders around in the game.

30.24	ANNIE	I've found a cow shall we like...make a farm [<i>all children look at tablet</i>]
30.26	RYAN	kill it
30.26	ADAM	==kill it
30.27	SHIV	no, don't don't don't, get some wheat and then bring them back and then breed them [<i>leans over and looks at ANNIE's tablet</i>]
30.30	RYAN	bring it back [<i>looking at ANNIE and MIA as does SHIV, rest of group looking at tablet</i>]
30.34	GRACIE	we don't have any wheat though [<i>RYAN looks at GRACIE in acknowledgement</i>]
30.36	MIA	destroy the fences we have got an axe [<i>pointing at screen</i>]
30.30	ANNIE	guys I think we might be coming back with a pet
30.42	ADAM	Why?
30.43	ANNIE	cos I am gonna get some seed and I am gonna plant them and I am gonna lure the cow back [<i>smiling</i>]
30.53	SHIV/ ANNIE	pretty cow pretty cow [<i>smiling</i>]

There are several elements of exploratory and creative talk displayed in extract 6.10. The children have just discovered a cow in the Minecraft world. At this point the children begin a dialogue about what they should do with it. Shiv manages to persuade the rest of the group that the animal should be captured so that it could be bred, this would link with the learning objective based around the children creating a sustainable community. Shiv persuades Ryan to change his point of view about the fate of the cow and Ryan moves from the position of wanting to kill the animal to bringing it back to the settlement and breeding it. This change of point of view could be associated with exploratory talk (Mercer, 2004; Wegerif, 2010). While the children had already begun an arable farm as part of their solution as to how to survive, and had been in the process of finding seed and planting wheat in order to achieve this, they now added an animal farm to their settlement. What to do with this animal and the solution shows how an immersive environment of this type can produce situations where the children must think creativity in different situations in which they find themselves.

Table 6.10 codes extract 6.10 and is found in appendix D.

6.11 Numerical data

The discourse analysis provided above, alongside the coding of each extract, provides exemplar snapshots of the action that occurred over the research project undertaken in Hambrook School. The qualitative discourse analysis provides a good opportunity to make a detailed analysis of particular talk episodes. However, as I was progressing through this process I became interested in searching for overarching trends evident over the course of the four interventions. This led me to consider using a different lens by which I could explore the data. As such, I present some simple quantitative methods to give further information.

6.11.1 Overall contribution to the dialogue

As already noted, for a dialogic categorisation to be given to this study, there should be a relatively equitable level of participation (Mercer and Littleton, 2008, Alexander, 2004). While participation has been commented upon on a small-scale level, I used quantitative methods as a crude count of overall participation levels. Table 6.11 shows the participation levels via number of contributions made per lesson for each of the children over the four lessons.

Table 6.11: no. of contributions made per child per lesson

	Lesson 1	Lesson 2	Lesson 3	Lesson 4
Ryan	67	63	53	98
Shiv	57	68	0	38
Annie	65	55	16	38
Mia	67	41	40	54
Adam	55	48	30	40
Gracie	45	50	54	0

Table 6.11 shows that the children contributed frequently across the course of the lessons, they talked a lot. Over the first two lessons the data shows that the number of contributions were mostly evenly spread. The lowest level of participation was 41 contributions offered by Mia in the second lesson but she and Ryan were also the most talkative children in the first lesson making 67 contributions. This data would contribute to the suggestion that the talk here might show evidence of a dialogic categorisation in terms of participation levels. Lesson three and four, however, show different results. During these two lessons one child was absent for each of them (Shiv in lesson three, Gracie in lesson four). In lesson three the contribution of Annie was noticeably lower than in the other lessons. In lesson four Ryan makes significantly more contributions (98 in total) than the other children. This provides evidence that suggests that the conversation here was not dialogic in nature and is reminiscent of the finding of Wegerif and Scrimshaw (1997) that group interactions when using technology were not equitable with one child dominating the action. However, the fact that Ryan was the most vocal is a very interesting feature for this normally quiet child. Across the four lessons Ryan actually made the most contributions in all but one lesson. In the fourth lesson when the children accidentally set fire to their settlement, Ryan took the lead to put the fire out and rebuild the settlement. This is noteworthy in that this is further evidence that the game might have given this child the confidence to find a voice in the group.

6.11.2 Meaning making words

When conducting the qualitative discourse analysis a theme that became apparent was the frequency of some types of words that the children were utilising and this became a subject

for further investigation. An analysis of the use of these words would also help in answering research question two, which concerns how children are making meaning in these lessons. The words selected for further analysis, as explained in Chapter Three include those which can be associated with children justifying their actions, words like 'because/cos' and 'think' might indicate this (Mercer, 2004). These words also link to the distinction made by Langer and Moldoveanu (2000) between mindful and mindless vocabulary. Being mindful involves seeing all possibilities, this would involve an approach that uses vocabulary like 'could be' and 'maybe'. Wegerif (2013) further links the use of these words as providing evidence of creative talk, while Craft (2011) associates them with the creative, possibility thinking. Table 6.12. shows the frequency of use of these meaning making words across the four lessons

Table 6.12: meaning making words used over the course of four lessons

Meaning Making Word	Lesson 1	Lesson 2	Lesson 3	Lesson 4
might	1	5	2	6
could	43	43	13	19
should	14	11	5	18
would	22	32	9	7
shall	9	7	7	2
maybe	2	2	3	6
why	6	3	3	9
but	24	26	10	19
think	22	19	8	12
because/cos	12	22	13	18
if	24	22	13	12

Table 6.12 shows that the children were indeed using meaning making words in their talk in every lesson and this gives evidence that the talk may have been dialogic in nature. In particular, the word 'could' was commonly used, indicating that the children were involved in

offering suggestions to the discussion. The children used the most meaning making words in the first two lessons, lesson three demonstrated the least use of these words. In lesson three the level of overall contributions of the children was also the lowest. I reviewed the transcription for lesson three, but could find no immediate reason as why this should be. The word 'why' was not used very frequently and provides evidence that the children were more involved in making statements and observations as opposed to questioning each other.

I examined the transcripts to ascertain if there were times in the lesson when the children were quiet or discursive. The transcripts showed that there were frequent examples of discussion and cooperation throughout, this group worked well together from the outset even though they were not all in the same friendship group.

6.12 Conclusion

For this school group the immersive game environment provided numerous opportunities for talk to occur. The children talked continuously throughout the four sessions I was with them. The talk that has been analysed shows many, but not all, of the features of exploratory and creative talk. There were also instances of disputational and cumulative talk.

The data shows that among the children in Hambrook school the immersive game created an environment that encouraged talk to occur. The children's experimentation with ideas and solutions was mediated by technology, and the immersive environment of Minecraft, and this particularly encouraged talk. The fact that in the learning environment there was a simulated night and day, different terrains, different landscapes and a world that was inhabited by flora and fauna provoked situations for the children to discuss. For instance, the presence of animals initiated much discussion as to what the children might do with them and if they should kill them to provide an immediate food source or if they should be more strategic about their management of them. The children discussed themes linked to the geographical concepts of place and space as well as reuse and sustainability (Scoffham, 2010).

Furthermore, the children and I could manipulate the Minecraft world to produce more opportunities for talk. For instance, the opportunities to make initial embryo settlements of different kinds served as a vehicle whereby children had to make immediate choices as to if and how they might use these areas. This gave immediate challenge and focus to the game as soon as they started it.

In the immersive environment the children's actions had consequences which provoked further discussion. For example, a misplaced fire had enormous consequences for the children, which provoked a great deal of talk and took the dialogue to places that it might not have achieved had the work been carried out in a more traditional manner. This feature might be linked to metaphoric notion of the dialogic gap or the 'space for reflection' that allows for a creative solution to occur. The game gives a virtual presence for the dialogic 'space' and links with Wegerif's (2010) argument that, 'new communication technology is beginning, to give a heightened tangibility to the vision of universal dialogue that has always been implicit in thinking' (Wegerif, 2010, p.127).

The game also provided many opportunities for teaching moments to occur. This reminded me of Sharpe's (2008) notion of meta-comments, an intervention where the teacher provides a conceptual hook about the relationship between ideas. While I did not do so due to fear of leading the conversation and unduly influencing the discussion, there was moment after moment where situations provided by the game gave opportunities for the practitioner to move the learning forward through intervention and interaction.

Research (Mercer & Littleton, 2007; Littleton & Mercer, 2013) notes that to encourage the development of exploratory/dialogic talk it can be helpful to establish a set of ground rules or establish talk lessons with children about what counts as productive discussions. These ground rules revolve around the central concepts of sharing ideas, giving reasons for thinking, questioning ideas, consideration of others, involving everybody and accepting responsibility (Mercer and Littleton, 2007). As noted at the start of this chapter, I made the decision to discuss the importance of these concepts at the start of the intervention but I chose not to give the children 'lessons' in talking together as had occurred in some other research studies on talk (Mercer and Littleton, 2007). The data shows that children were able to produce conversations that had many characteristics of exploratory talk. While the talk was noticeable for the amount of justification, challenge and counterchallenge it produced, the level of interruption did not reflect the characteristics of a dialogic stance. Perhaps as Hennessy (2011) suggests in her research on talk and IWBs, it would have been more helpful to keep emphasising the ground rules and to actively develop reasoning skills to achieve talk that could be classified as wholly exploratory. Instead, the talk was more reminiscent of Maybin's (2006) notion of a dialogic talk pattern that produced informal knowledge that was characterised by interweaving, fragmented and interrupted utterances. The language used was not subject specific and this is also a limitation of the work that was completed

The contribution of all the children in the group was high and this supports the notion that a game can help to transfer the traditional IRF exchange in the classroom in to an IDRF exchange – the ‘D’ standing for the word discussion (Wegerif, 2010). However, the novelty factor of the game might also have been responsible for this as well as the fact that I had ‘chosen’ the children to work on this game and this recognition gave them more confidence.

As noted by Mercer & Littleton (2007) and Alexander (2004), for a dialogic conversation all parties should seek to contribute in a balanced way; this was evident in the first two lessons. As the lesson continued, the role of two children in particular was notable. Ryan became increasingly dominant and eventually took on a leading role in the final lesson. Gracie’s dialogue demonstrated that this child acted as the organiser and a focus for the group. These children had been described as unconfident individuals, however, they were both enthusiastic Minecraft players. Expertise in this area allowed the children to become more confident in the group dynamic and helped to empower them to find their voices.

Chapter 7: Analysis of talk in Chester School

This chapter analyses the experience of children using Minecraft in a different school. I selected Chester School as it presented a different set of circumstances to Hambrook School. During the time of the research it was of average size with 200–250 children on roll. The number of children eligible for free school meals was below average. However, the proportion of children who were classified as having special educational needs was above average and the school was located in an area of the city that was identified as scoring higher than national averages on multiple indices of deprivation. In a recent Ofsted inspection, the overall behaviour and achievement of pupils was described as requiring improvement, although the children were said to enjoy coming to their school to learn.

A group of six children, three girls and three boys aged between ten and eleven years (Year Six) were selected by the class teacher to take part in the research. They participated in the Minecraft scenario during three sessions of 90 to 105 minutes (these lessons were longer than their equivalents in Hambrook School, where I took four sessions, so an equal amount of time was spent with each group of children overall). The same children attended each session, enabling them to pursue the Minecraft learning challenge in a developmental and focussed fashion on each consecutive occasion. They were from the same class, but selected to create a group that contained a range of abilities in literacy and difference in gender, as explained in the methodology chapter, section 3.4. While the children were all known to each other, they were not necessarily friends and may not normally have chosen to work together. Information concerning each of the participants is presented in Table 7.1

Table 7. 1. Contextual information about the participants in Chester School

Tazmin: girl	At the time of the research Tazmin was achieving above national expectations for literacy. The teacher described her as a good contributor in class and as an articulate and confident child.
Rose: girl	Rose was achieving the national expectations for literacy. She was a confident child who was slightly more reserved than Tazmin.
Michael: boy	Michael was achieving below national expectations for literacy. He had a confident personality and was quick to contribute to the classroom discussion.
Kafe: boy	At the time of the research Kafe was achieving below the national expectations for literacy. In class he was experiencing severe behaviour problems and had difficulty

	in concentrating. Interventions and extra support were in place to help him make better progress both academically and behaviourally.
Archie: boy	Archie was achieving in line with national expectations for literacy. He was a confident contributor and a lively individual.
Ruth: girl	Ruth was achieving above national expectations for literacy. She was a confident but self-contained individual who was very quiet in class.

The selected children had all volunteered for the research project and consequently came to the experience with a sense of enthusiasm. Not all of the children had prior experience of playing Minecraft. Rose and Archie were new to the game, although they reported that they had heard much about it and were aware of its aim. I did not give these children special instructions, but paired them with more experienced children who quickly showed them the operation of the game and assisted them when it was their turn to use the tablets.

Minecraft is not difficult to play, but the controls and objectives are not immediately apparent or intuitive. When first playing there are no written instructions or hints available to guide the player, who is just left to explore. This did not hinder the two novices who demonstrated no hesitation when playing and simply asked their partner how to use it if they were in difficulty. When working with these two children I felt that the desire to play the game overcame any sense of doubt they may have harboured about not having experienced Minecraft before. This links to Gee's (2007) argument that computer games have motivational characteristics that keep their users engaged.

As with Hambrook School, the sessions at Chester School followed a similar pattern. On each occasion, I would begin with an introduction, which would include a link back to the learning that had occurred in each prior lesson. The lesson would involve the children working for 15-20 minute periods on the tablet computers, each followed by a period in which they would pause and discuss the task at hand, considering what they had achieved in the preceding part of the lesson. The final part of the lesson involved the children producing written work that related their Minecraft building to the learning objective.

I wanted to try and replicate conditions established in Hambrook School at Chester, but this did not prove wholly possible. In Hambrook I had been fortunate enough to be given a large office to work in with the children, but Chester School was not able to afford an equivalent facility. Here, our lessons took place outside the classroom in a corridor. Schools regularly use

bases outside of classrooms to work with groups and, in this case, the children were accustomed to sitting at the tables we used. However, schools are busy places and our location meant that we were exposed to the typical comings and goings of school life. Staff members and children would pass by quite regularly, either on errands or between activities, such as when children moved from their class to the hall. There were frequent interruptions from children who were intrigued about what the research group were doing. The sessions were also interrupted by noise emanating from other classrooms that were based around the corridor. Each time a classroom door opened noise would accompany it. All these issues combined to make it more difficult for the children to concentrate and the video recordings reveal the children frequently having their attention diverted.

7.1 Talk in Chester School – initial considerations

This section of the chapter considers the different characteristics of the talk in Chester School in relation to the first two research questions:

1. What are the features of children's group talk when using an immersive gaming environment?
2. How do children use talk to make meaning when using an immersive gaming environment?

As with Hambrook School and the pilot study, when I started each lesson with the children I set the ground rules for the session. This included telling them that:

- all members of the group were invited to contribute
- the children were asked to avoid speaking over each other
- to listen carefully to all contributions and to discuss decisions
- the children did not have to put up their hand to speak and were encouraged to talk freely.

In Chester School the lessons were characterised by continuous talk throughout. The sessions were noisy and the talk flowed at a fastmoving pace. However, as with Hambrook School, I was not only interested in the amount of talk, but in the depth and detail of the dialogue. The children undertook tasks enthusiastically, but completed them more quickly than the task warranted. This suggests that the children may not have been thinking in depth and would consequently gain less educationally from discussion. The work they produced both in the game and subsequently on paper reflects this (see appendix H for one example of the work from Chester School). The children did not spend much time exploring the Minecraft scenario

and did not thoroughly evaluate the buildings they discovered on the island. At the start of the sessions they were more inclined to make quick, personal decisions and present them to the group as actions to be taken, not as possibilities that might be discussed and agreed. This led to incidents of disputational and cumulative talk as well as exploratory talk.

I now present and reflect on notable extracts of the talk that occurred in Chester School. To present an 'honest' picture of the events that occurred I have included extracts where the children are focussed on the problem I set them and others where they are not. I have also included extracts of talk where children are playing within the game and those where they have paused to talk about their actions.

7.2 Disputational talk

In extract 7.2, the first lesson, the children were exploring the Minecraft scenario and were looking for suitable locations on which they might create a settlement.

- 24.36 KAFE we've already found our settlement *[looking down at tablet playing the game]*
- 24.39 TAZMIN I think we should have separate settlements *[looking down at tablet playing the game]*
- 24.40 ARCHIE we are just going to live on this boat, we are going to live on this boat. Yes we are, you didn't say we can't *[looking down at tablet playing the game]*
- 24.51 ARCHIE you didn't say we can't live on the boat did they. KAFE they didn't say you can't live on the boat *[looking down at tablet playing the game]*
- 24.52 KAFE we're not *[looking down at tablet playing the game]*
- 25.57 MICHAEL we've already got our house *[looking down at tablet playing the game]*
- 25.01 TAZMIN we haven't got anything *[looking down at tablet playing the game]*
- 25.02 MICHAEL can't you live in that castle and extend it *[stops the game and looks at TAZMIN and ROSE]*
- 25.05 MICHAEL we broke it *[continues to look at TAZMIN]*

This talk took place when the children had only really just started playing the Minecraft challenge. The extract shows that the children were on task and well-focussed at this point and this is supported by a multimodal analysis of the video. All the children had their heads

down throughout most of this extract indicating that they were playing Minecraft intently and with enthusiasm. Furthermore, while the children talked throughout they rarely stopped playing the game. The children had only been playing for about eight minutes and, significantly - to my slight dismay - some of them had clearly already decided where to locate their settlements. This led me to think that some pupils were making snap decisions, possibly designed to enable them to start playing quicker, rather than thinking deeply about the task itself and the challenge that it represented.

The snap decisions referred to above were accompanied by discourse that was argumentative, which provides evidence of the talk being disputational in nature. Littleton and Mercer (2013) note that disputational talk is characterised by the talk being competitive rather than shared. In extract 7.2 ideas were simply asserted and, where they were not found to be compatible, the children resorted to defensive positions. For example, at 24.40 and 25.51 Archie stated that he was going to live on the boat, but the way it is said suggests a defensive stance: 'you didn't say we can't live on the boat, did they? Kafe, they didn't say you can't live on the boat'.

At this point Archie was still looking at his tablet and intently playing the game. When studying the film of the children it is difficult, on first inspection, to know who Archie is arguing with – it is almost as if he is arguing with himself. However, because he tried to draw Kafe into the dialogue to support him, and as Tazmin initiated the conversation by saying, 'I think we should have separate settlements', it is likely these comments were aimed at Tazmin and Rose (who were working together on one tablet). It would appear that Archie thought that he needed to state his position very clearly in case other pupils chose to argue with him (which they did not). Archie positioned himself defensively in this extract and presented his actions as a 'fait accompli' instead of proposals that could be offered for further discussion.

Other features of this extract are also disputational in nature. At 24.39 Tazmin asserted that she thought that the group should have separate settlements, but she did not give any justification for this. Exploratory talk would be accompanied with reasons for a held opinion (Mercer, 2004). Similarly, Archie and Michael do not explore the reasons why they have selected to live in their chosen locations. The children also did not make any connections to the learning objective, which was to consider the locations of the natural resources on the island and use these to inform their decisions about the location of their homes. The children were not really listening to each other or building on previous contributions, they were merely asserting their own positions and working for themselves. This would equate with Mercer and

Littleton's (2013) further description of disputational talk which suggests group members work on their own with few attempts to pool resources or to offer constructive criticism.

Table 7.2. shows extract 7.2 categorised statement by statement giving further evidence of the disputational nature of this extract. The category D4 that is seen frequently in this table indicates individualised decision-making. This table is found in Appendix E.

7.3 The disputational talk continues

The next extract I have selected for discussion also features characteristics of disputational talk. This extract also occurred in the first lesson towards the start of the Minecraft exercise. In this extract some of the children discovered that if they collected certain materials in the Minecraft world they could make weapons which they could use to harm each other. It would have been easy to simply ignore this part of the talk in favour of the selection of extracts which concentrated on the learning that took place. This, however, would not have presented the complete picture of the behaviours that occurred in this school and to try to portray as accurate a representation as possible I have decided to include it.

19.37	KAFE	hey, look behind you [<i>laughs and points to something on the tablet</i>]
19.40	TAZMIN	stop it, don't be mean [<i>TAZMIN is speaking to KAFE, KAFE is wounding TAZMIN's avatar in the game, MICHAEL and KAFE both laugh</i>]
19.46	KAFE	did you try and break cobblestone?
19.49	ARCHIE	we found two people, we've found you
19.56	ARCHIE	I'm going to try and kill TAZMIN and ROSE we've only got one heart left [<i>ARCHIE laughs – KAFE joins in laughing, clapping his hands together mischievously</i>]
19.59	KAFE	we've got a sword, we've got a sword [<i>KAFE laughs, MICHAEL smiles</i>]
20.02	TAZMIN	we've only got one heart left stop chasing me
20.04	KAFE	we're not [<i>MICHAEL places head in hands</i>]
20.07	MICHAEL	we're chasing the other ones
20.12	MICHAEL	you need a sword to break them
20.19	ROSE	they are after us (meaning MICHAEL and KAFE)
20.22	ROSE	they are after us

- 20.23 TAZMIN I know they are
- 20.24 MICHAEL we've been in that house, look they are getting into our house
KAFE, get them, get them [*MICHAEL looks at ROSE and TAZMIN, Michael giggles*]
- 20.35 ROSE stop killing us [*sounds annoyed*]

Extract 7.3 shows that the children have clearly moved off-task and are simply playing the game and not thinking about the set task. In the pilot study and in Hambrook School, the children spent a little time off-task at some points during the learning experience, but there was a generally cooperative feel to the lessons. The first lesson in Chester School produced a different situation. The children had only been playing the game for a short while before the three boys, in particular, started using it in unproductive fashion, ignoring the task in hand and playing the game in a way that I had not intended. Multimodal information shows that the boys found this very funny and there was laughing and giggling throughout this extract. I think that one of the reasons the three boys did this was to test the boundaries of my expectations for their behaviour in the game and to see if I would stop their activities, which I promptly did. I had always intended to intervene if behaviour became an issue but I realise that my role as a researcher and a teacher conflicted at this point. By intervening, I was influencing their behaviours.

This event is also a reflection of how poorly the children were operating as a group when I started this exercise. In this case the extract accords with Mercer's (2000, p.145) thoughts that, 'research in classrooms on children's activities in pairs and groups generally shows that much of it is unproductive with more disputational than exploratory talk happening'. At this stage in the lesson opportunities were being lost as the children were not communicating effectively and were behaving both competitively and destructively. This is evidenced at 19.56 where Archie states, 'I'm going to try and kill Tazmin and Rose, we've only got one heart left'. As noted in extract 7.2 competitive behaviour is another feature of disputational talk (Mercer, 2000; Mercer and Littleton, 2013).

Ultimately, the three boys had become over-excited by being able to play a game and I had to ask myself why the children had initiated this type of behaviour. The three boys were collaborating to present resistance to the task and this may have been related to group dynamics and identity. While the scope of this research is more focussed on the content of talk than on social dynamics, it would present an incomplete picture of the data to completely ignore this issue. Indeed, Leeman (2010) argues that interaction can only be understood if

social dynamics are explored and that social interaction has the potential to progress or inhibit discussion. In Chester School the verbal and non-verbal behaviour indicated that the social make-up of the group was influencing events and I now pause briefly to consider this in relation to extract 7.3.

Leeman (2002; 2010) notes that there is a dearth of research that explores the connection between cognitive and social processes in dialogue. However, his research on the reasoning of primary-aged children, found that, when reasoning did not advance, children adopted particular behavioural styles that were coined 'sustained resistance'. Leeman's (2002; 2010) research suggested that children were occasionally able to convince others in their group to adopt a similar position of sustained resistance and this might have been the case in extract 7.3. The children were working in an off-task fashion and continued to do so when they found solidarity in working together. Their unity gave them further strength and encouraged them to continue with their actions.

Gender was also an influential factor here. Underwood *et al.* (2000) noted that boys dominated the dynamics of the interaction and the learning resources when using computers. This is supported by Hakkarinen and Palonen (2003) who also postulate that boys dominate in computer supported collaborations. Maybin (2006) found that in some contexts boys would seize the opportunity for displays of macho masculinity. In extract 7.3 the boys' negative behaviour allows them to dominate the action and their accompanied laughter and non-verbal gestures compound the situation. In light of Maybin (2006), moreover, the decision on the part of the boys to chase and kill other players could be interpreted as a display of 'macho masculinity'.

Alternatively, the importance of preparing the children for the sessions may have been an additional consideration. The children were told that I was particularly listening to their contributions and were provided with ground rules for their talk. However, in this instance I may have needed to establish whether the children were used to working in this way and to have emphasised the ground rules that established expectations for conduct in terms of their overall behaviour and not just talk. This recalls one of Wegerif's (2010) key findings from working with children around computers. He states that preparation for working as a group and the application of clear ground rules are essential pre-requisites for the effective use of computers by children.

Table 7.3 shows extract 7.3 broken down and classified using predefined codes. The gives further indication of the disputational and competitive nature of the extract, it is found in Appendix E.

7.4 Cumulative talk

Extract 7.4 gives an example of talk that I have classified as cumulative. This extract occurred in lesson one, but it has a different feel to it than the previous extracts that were classified as disputational. At this point in the lesson the children were exploring the Minecraft island and had decided to locate their settlements individually working on their own. The extract presents part of the conversation where I asked the children to consider this decision.

30.45	T	so you have all settled on this island, you have got to survive, do you think you are going to survive separately?
30.50	MICHAEL	yes,
30.50	ROSE	we could
30.51	TAZMIN	in some ways yes and in some ways no
31.04	ARCHIE	technically we are near each other [<i>points to and look at KAFE</i>]
31.05	KAFE	and we are near you [<i>points to ARCHIE</i>]
31.10	T	some ways yes and some ways no TAZMIN?
31.10	TAZMIN	because more people could always help and have better ideas and you can all work together to build a big house in the same place but when you are by yourself you can do ideas that some people wouldn't think of and you can go off on your own and there is less chance of more of you dying [<i>TAZMIN is talking to the teacher here and not addressing the rest of the group</i>]
31.35	T	what does anyone else think?
31.36	MICHAEL	spot on
31.36	KAFE	spot on [<i>makes a thumbs up sign</i>]
32.36	ARCHIE	===yes [<i>KAFE nodding, smiles, all others laugh and nod</i>]

The talk in extract 7.4 shows that the children were on task. There is a sense from the talk that they were able to build on each other's contributions. The first few statements from 30.50 to 31.05 record five of the children, all offering contributions about the same subject. This part of the extract demonstrates that the children were working together to produce a response that

they all understood the focus of. The language also possesses a different tone to the extracts presented previously, in that it starts to acquire a character that is both cooperative and collaborative instead of competitive. The children use language designed to signal unity, agreement and cooperation - a feature of cumulative talk (Mercer, 2000; 2004).

Further analysis of extract 7.4 offers additional indications that the talk is more detailed in nature than the previous two extracts presented. At 31.10 Tazmin offers a long reply to a set question and tries to explain her reasoning, denoted by the use of the conjunction 'because', which exhibits an exploratory feature (Mercer, 2000;2004). However, her vocabulary choices do not show particularly good subject knowledge about settlement and, as Resnick (1999) highlights, subject specific vocabulary is an important feature of talk that is accountable.

The end of the conversation also has a cumulative feel in that the children are very much in agreement with Tazmin's statement made at 31.10 and the conversation is built in a unified but uncritical manner. While this section of the extract provides evidence of joint thinking, there is no demonstration of children offering alternative suggestions or new solutions in order to progress the conversation further. Instead, there is just repetition of phrases with Kafe repeating Michael's comment of 'spot on' at 31.36 and, as Mercer (2004) notes, repetition is another characteristic of cumulative talk. This is an interesting moment where most of the children found Michael's comment of 'spot on' at 31.36 rather funny, this was signalled by spontaneous giggling and nodding of heads. There was a sense here that this was an instance where the children started to move towards a more supportive atmosphere, which was more affirming than it had previously appeared. In this instance humour provided the uniting factor for the group. As in previous chapters, the cumulative talk is once again serving an important purpose. The fact that the children had started to agree changed the atmosphere in the group and created conditions for possible future exploratory talk. Without discussions of this type, the dialogue may not have been able to further develop.

Table 7.4 categorises extract 7.4 using the predefined codes showing the cumulative nature of the discussion at this point in the lesson, this table can be found in appendix E.

7.5 Cumulative talk continues

The following extract occurred in lesson 2. The children were in the process of building their settlements, having selected their location. The children were actively building in the game and this extract represents part of the conversation they were conducting while building. The

children were talking to each other across the table while simultaneously working in the Minecraft game.

9.54	KAFE	that's someone's house, that' someone's house <i>[staring at screen]</i>
10.00	TAZMIN	that's my house <i>[staring at screen]</i>
10.04	KAFE	you can't break it ARCHIE, that's their house, that's their house <i>[Michael stops playing and turns to Archie]</i>
10.07	TAZMIN	ARCHIE, ARCHIE <i>[exclamation, looks at ARCHIE]</i>
10.10	KAFE	ARCHIE please do! Not! break the house, <i>[MICHAEL is starting at the screen but punctuating and emphasising words Please Do Not]</i>
10.10	MICHAEL	anyway TAZMIN now you can go and take from theirs
10.21	KAFE	oh yeh I've got some, I've got some... umm ...wool so you can build a bed <i>[looks at TAZMIN]</i>
10.25	TAZMIN	oh thank you <i>[looking at screen]</i>
10.24	MICHAEL	we've only got 2 bits you will have to get one more

I have included this extract as it represents a further change in the conversation from the extracts that I classified as disputational. In particular, it shows a contrast from extract 7.3 in which the children were working against each other. This extract concerns events, principally between four of the children Tazmin, Kafe, Michael and Archie and follows a decision, on the part of Archie, to destroy someone's house. This suggests a lack of focus within the group, but the talk that follows shows a change in the wider group dynamic.

Instead of just letting this event happen, Kafe decided to try to stop Archie's behaviour. This is interesting as, in the previous lesson, Archie and Kafe had colluded to spend time subverting the activity by using the game disruptively and had been jointly reprimanded as a result. However, in this extract Kafe adopted a different position and at 10.04 he states, 'you can't break it Archie that's their house, that's their house'. Furthermore, at 10.10 Kafe resumes his defence of Tazmin and very politely asks Archie not to break her house.

Joining the conversation at 10.10, Michael then shows he wishes to support to Kafe's behaviour by suggesting that Tazmin would be entitled to retaliate to Archie by indulging in similar behaviour and taking some of their resources. Furthermore, Kafe offers Tazmin some of his resources to help mend her house, which had been broken because of Archie's actions. This

represented a significant change in the behaviour of individuals and the group. Kafe had started to take on the role of the teacher and had taken it upon himself to influence the actions of the group. Michael also supported Kafe, an extremely positive turn of events that marked a departure from the erratic behaviour that had negatively influenced the group until this point. Tazmin also contributed to this by exclaiming to Archie in a voice that sounded as if she were reprimanding her peer. This resulted in Archie stopping this behaviour and I did not have to act at all to issue sanctions as I had on previous occasions.

The talk moves discussed above reminded me of Maybin's (2006) reported voices where children take on a voice and reproduce it as if it were their own. Maybin (2006) notes that children might often take on other people's voices, especially their teacher's, and I would suggest that Tazmin does this when she exclaims 'Archie, Archie!' (10.07) as if she were admonishing him like a parent to a child or a teacher to a pupil. Maybin (2006) calls this type of speech 'stylisation', where a voice shows signs of mimicking, but makes their own perspective on the reproduced voice very clear. Kafe's contribution is also of note. His requests to Archie to curtail his behaviour could be seen as 'appropriation' (Maybin, 2006). Kafe adopted my previous authoritative perspective on behaviour, but reproduced it in his own words. It was he who was now sanctioning whereas I had previously held this role. Maybin (2006) cites Bakhtin's (1981) work here, and suggests that appropriation and stylisation bring two voices together as one and produces different statements on identity. The children were taking on and acknowledging the voice they were reproducing, but they were also defining themselves alongside the voice and what it stood for.

Kafe's appropriation of my authoritative role indicated that he had changed his position from the one depicted in extract 7.3. Kumpulainen and Lipponen (2010) note how the participatory position of students cannot be viewed as stable and that it is important to recognise that students can often change their stance as the learning community develops. This would appear relevant to Kafe in this extract.

Ultimately, extract 7.5 is representative of a general change in how the group operated over the three instances I worked with them. The group started communicating poorly, but this changed over the course of the lessons and they started to work together better – many of the conversations were focussed on how the children had helped each other. This positive feedback gave an increasingly good atmosphere and motivation to play. Deci and Ryan's (1980;1985) theory of self-determination states that relatedness, or the ability to interact with others in a secure and positive way, acts an intrinsic motivator. Motivation to play Minecraft

also had an influencing factor as two children in the group were prepared to reprimand Archie's bad behaviour lest he jeopardize the study.

This extract shows features of a cumulative conversation. This is demonstrated by the shared cohesion in the dialogue. Another feature of cumulative talk is shown by the repetition of phrases; Kafe not only repeats himself (9.54) within a sentence, but also repeats requests to reinforce his point (10.04 and 10.10). Littleton and Howe (2010, p.279) state that, 'cumulative talk represents talk that seems to operate more on implicit concerns of solidarity and trust' and extract 7.5 is a reflection of this as it seeks to censor the untrustworthy behaviour of one individual.

Table 7.5 shows extract 7.5 broken down into separate statements and coded; this is found in appendix E.

7.6 The talk develops

This extract is taken from the transcript of my second lesson with the children. During this part of the lesson the children had paused their activities and were discussing the reasons for their choices for locating their settlements.

- | | | |
|-------|--------|---|
| 32.30 | TAZMIN | so we built our house near everybody else so if we needed help we could just go to them and also the main reason we built it here was because there was lots of flat land and lots of space and it was already half built and we didn't have to use that much and it came with a chest and it was near water and really close to trees [<i>looking at me, all other children looking at TAZMIN, Kafe is playing on tablet even though he had been asked not to</i>] |
| 33.11 | ROSE | we have worked hard, it was really hard to start with as we had to use lots of stuff but we have had loads of people helping us do it [<i>points to MICHAEL and KAFE, Kafe playing on tablet but also looks at ROSE, others are looking at ROSE</i>] |
| 33.21 | TAZMIN | at the very beginning people kept coming in and making us things to help us get it done quicker [<i>looks at me</i>] |

Extract 7.6 demonstrates elements of both cumulative and exploratory talk. At 32.30 Tazmin's dialogue demonstrates that she is on task and giving reasons for her choices. Giving reasons for a decision is a feature of exploratory talk, as suggested by Mercer (2004). What is more, the identified reasons for location are relevant and mostly appropriate (i.e. flat land, water and

trees), which suggests that she has understood the requirements of the task. Structurally, this statement is also longer (70 words) and this indicates a sustained attempt to describe and explain an extended line of reasoning. The rest of this extract is cumulative in nature, the following two contributions are supportive, but do not materially progress the thinking or challenge the status quo of the conversation (Mercer, 2004). It is also interesting to observe that Rose discusses that several group members had been helping her – a turn of events that contrasts to the situation in lesson one where children worked against each other. This further signposts a shift in the social situation within the group towards a more cooperative dynamic. The cumulative nature of this conversation plays an important role. As in Hambrook School in extract 6.5, the children are showing how they value the contributions of the group as each individual's offering relates to, and builds on the last, so they jointly reach the conclusion that working together is a desirable objective.

This extract shows a division between the talk that demonstrates 'schooled knowledge', that is talk which revolves around the learning objectives, and 'community knowledge' – talk which centres on how the group operates (Maybin, 2006). The talk in Chester School became increasingly focussed on how the group were helping each other. The children positioned themselves to show how they were working cooperatively and the subsequent conversation demonstrated the group's growing accountability to the community within which they were working. Bielaczyc and Collins (1999) note how by working towards a common goal gives a group community identity and a sense of who we are – they associate this with effective learning frameworks and the creation of an atmosphere that is conducive to the co-construction of knowledge. This sense of community identity was increasingly evident as the children worked in the Minecraft environment in this school.

Table 7.6 shows extract 7.6 classified using predetermined codes and is found in Appendix E.

7.7 Moving towards dialogism

Extract 7.7 was selected from part of a discussion that occurred in lesson two. At this point the children were discussing where to locate their settlements. Tazmin and Rose had already created a temporary settlement, but were not entirely happy with their choice of location. The group therefore started to suggest alternatives.

- | | | |
|------|------|--|
| 4.27 | RUTH | you also need some flat land <i>[looking at me for acknowledgement, I nod]</i> |
| 4.29 | KAFE | they need trees, there needs to be lots of trees |

- 4.33 TAZMIN ARCHIE said that you needed to be near farms but I notice the land there is actually really bumpy and there are lots of dips in the land *[all the group look at TAZMIN signalling they are listening carefully]*
- 4.54 T is that an advantage or a disadvantage?
- 4.55 ARCHIE advantage *[looking at teacher]*
- 4.56 TAZMIN I think disadvantage because if there is lots of umm bumpy bits then there is not really going to be a big space to build a house or enough space *[all looking at Tazmin or me]*
- 5.00 KAFE well we could fill in the holes *[making a levelling gesture with hand, looking at TAZMIN]*
- 5.04 TAZMIN yeh, but that would take a lot of time
- 5.10 KAFE not really, just go somewhere else and dig up some earth to fill in the holes and then you've got flat land *[most of the group are listening, this is signalled by the direction of their gaze which is aimed at KAFE, MICHAEL is not looking at KAFE but biting his fingernails – he may have lost focus]*

Extract 7.7 shows elements of exploratory talk as suggested by Mercer's classification (2000, 2004). The children were on-task throughout this exchange and their talk demonstrates that they recognised the need to consider the importance of different locational factors in the situation of their settlement. This was entirely linked to the learning objectives for the session.

The extract shows that four out of the six of the children were collectively considering a problem and jointly discussing it. The extract begins with Kafe and Ruth offering two purposeful and relevant suggestions concerning the location of a settlement. This is followed by Tazmin at 4.33, who introduces another issue of farming by recalling and building upon a statement that Archie had offered earlier in the lesson. This speech act demonstrates that Tazmin had listened to Archie and signals that she valued his thoughts, which she took into consideration when forming her own viewpoint.

The discussion then moved on to a debate about the physical makeup of the landscape. Tazmin declared that the current location may not have been suitable for farming due to the 'bumpy' nature of the land. Following a prompt from me, the children then went on to discuss the advantages and disadvantages of this feature. At 4.55 Archie offers the answer that bumpy land would actually be an advantage when locating a settlement, but offers no reason

for this. However, this prompts Tazmin to propose an alternative point of view and a fuller explanation concerning the appropriateness of the space available.

Here, the children are starting to exchange views by offering challenges or counter challenges, with one child (Tazmin) giving a justification for their assertion. These talk moves are indications of dialogic elements (Mercer, 2004; Mercer and Littleton, 2007). The exchange was then developed with Kafe offering a suggestion for the solution to the problem of the unsuitable terrain, but Tazmin continues to challenge Kafe by saying why she did not think this was a good idea. Kafe offers a last challenge to Tazmin at line 5.10. At this point the conversation comes to a full-stop and no one offers other suggestions with this being followed by a silence.

The halt in the conversation reminded me of the concept of dialogic resolution (Howe *et al.*, 2007; Howe, 2010). It is argued that in addition to exchanging views, children must also move on to resolve their discussion in a productive way for them to make the most progress in their learning. However, Howe *et al.* (2007) and Howe (2010) note that this element was rarely observed during their research and argue that children in middle childhood found it hard to resolve differences in opinion. In developing this point, Howe (2010, pp.35-36) described her observations of children conducting group work in science as, 'bypassing the agreement stage altogether, or restricting their agreement to superficial features'. In extract 7.7 the children came to a full stop in their conversation and did not appear to know how to resolve the situation. The moment passed with the children returning to their learning activity. This is where my role within the group felt compromised – had I been in the role of a classroom teacher I would have pushed these children further to resolve the discussion.

The extract also provides further evidence of the informalised nature of the talk. As discussed in Chapter 5, the geographical vocabulary that it demonstrates is limited, particularly at 4.33 where Tazmin describes the physical makeup land as 'bumpy'. She did not echo the language that I had modelled at the start of the lesson, nor did she use a 'schooled voice' (Maybin, 2006). This informalised talk gives further evidence of Mercer and Hodgkinson's (2008) description of the imperfect reasoning produced by group collaboration previously referred to in Chapter 5. By using the word bumpy Tazmin conveys an understanding of a potential problem but does not possess the precise language to fully express herself. Resnick's explanation (1999) of accountable talk would require more subject specific language. Consideration of the research of Mercer and Hodgkinson (2008) may help shed more light on this point. They draw on the work of Barnes (1976) who suggested that exploratory talk, where

speakers would try out ideas to hear how they sounded, was more tentative in nature than presentational talk, where the speaker concentrates on adjusting the language for the audience. Mercer and Hodgkinson (2008) refer to this as 'thinking aloud', an offering by the child of partly formed ideas. At 4.33 and 4.56 Tazmin is trying out her ideas and the 'umms' that interrupt her sentences show the fragmented nature of her thoughts. She is considering her thoughts and rehearsing ideas as she speaks and exhibits the features of thinking aloud. Looking back through the transcripts I notice that Tazmin does this on several occasions, in extract 7.4, for example - at 30.51 - where she states, 'in some ways yes and in some ways no' when considering a choice of settlement location. Ultimately, Tazmin's talk is informal in nature, she uses the words that most help her express herself quickly and easily; this is representative of much of the talk within the group.

Structurally, the children offered contributions that show increased length than in the previously presented extracts. Of the eight sentences presented by the children (excluding my contribution), half were more than ten words long, the longest contribution comprising 30 words. This reflects that the children were explaining their answers. However, two of the children - Rose and Michael - offered no contributions at all. The non-verbal gestures taken from this episode do show that Rose was following the action for most of the time. This was evidenced by her attentive body language and the direction of her gaze, which was towards the speaker or towards me. She could be said to have been supporting the dialogue non-verbally, therefore, but as Mercer and Hodgkinson (2008) observe a feature of dialogic expression is that all the children should participate (2008). This did not happen in this extract and Michael ultimately lost focus by the end of this exchange, at line 5.10 he started to look down at his fingers and bite his nails.

Another factor is my own participation in this conversation. As explained in Chapter 3, I participated in the conversation and I have to acknowledge my positionality in influencing the talk in this extract in that I knowingly posed a very open-ended question that would provoke discussion. However, the resulting answers are not limited to those that would typify the traditional IRF talk exchange; instead the children independently develop and extend the discussion by offering their own suggestions.

Table 7.7 shows extract 7.7 classified using predetermined codes and is found in Appendix E.

7.8 Another dialogic moment

The next extract of conversation occurred in lesson three. By this stage the children had mostly built their settlements and were considering how to make them more sustainable. During this extract the children were not working in Minecraft but had briefly paused and were talking as a group.

- 19.36 TAZMIN we..... havealmost.... finished our roof. We have collected a lot more wood to go into our house and make some.... a gate for the umm farm to protect it and we have found umm some saplings and some seed and put them in the umm, put them in umm the farm so that if anyone else needs them they are there
- [Children are quiet for a few seconds RUTH had left the group for a few minutes she returned and there was a brief interlude while she sat down and I explained to her what the children were discussing]*
- 20.25 TAZMIN we need a community, a community
- 20.25 T a community, what does a community mean?
- 20.26 MICHEAL well, it means, it means there are other buildings around it, so like, so like a village or
- 20.32 ARCHIE == well we could make more buildings
- 20.34 MICHEAL == cos there's like that would be a community of
- This is followed by several ummm, err and pauses
- 20.51 ARCHIE well, umm there are cathedrals
- 20.52 TAZMIN well there are not always cathedrals
- 20.53 MICHAEL well there are some cathedrals
- 20.55 TAZMIN == but a community could be like just a group of people like church community or some thing
- 21.03 MICHEAL it could be a church, it could be a cathedral it could be a royal palace
- 21.05 TAZMIN it could be any group of people
- 21.14 T I'm interested in ARCHIE 's idea of a religious place do think that is important,?
- 21.24 MICHAEL No
- 21.30 TAZMIN well, it is to some people

- 21.32 T anything else?
- 21.35 ARCHIE what about an entertainment complex
- 21.45 TAZMIN that's not essential [*intonation of voice implies that TAZMIN is surprised that he may have considered this, the implication being that this answer was absurd in nature*]

Extract 7.8 shows several elements of exploratory talk. Tazmin starts the conversation with an entirely purposeful suggestion about how her settlement might be made sustainable. This shows her giving reasons for her actions. She follows this with a suggestion that a settlement might become more sustainable if it became a community and the children consider this. Lines 20.32 and 20.51 show two contributions in the form of suggestions concerning this theme. At 20.52 Tazmin offered a challenge to Archie's suggestion that a community is signified by the presence of a cathedral. At this point Michael entered into the discussion and added a further challenge to Tazmin.

This sequence was quite slow moving at some points and was interspersed with 'umms' and 'errs' indicating that the children were 'thinking aloud' as well as signposting that they found the concept of defining a community rather challenging (Mercer and Hodgkinson, 2008). Further exploratory features are shown by the presence of the use of tentative thoughts indicated by the children using words like 'could be', as shown in lines 20.55, 21.03 and 21.05. The sequence concluded at 21.35 when Archie suggested that a community might be signified by the presence of an entertainment complex. This was immediately challenged by Tazmin who clearly felt, as indicated by her intonation, that this would not be relevant to the settlement being created in the Minecraft environment.

While extract 7.8 meets the requirements of exploratory talk in several respects there are other elements that are missing. In this extract the children were carefully discussing a concept, but there is limited evidence that they moved in their thoughts and opinions. Nor did they seem able to change their stance or view issues from other people's perspective, an important element of exploratory talk (Mercer, 2004; Alexander, 2010; Wegerif, 2010). As in extract 7.7 the process of resolution (Howe *et. al* 2007; Howe, 2010) was lacking. In addition, the children interrupted each other, which is contrary to one of the ground rules set by proponents of dialogic talk (Alexander, 2010; Mercer, 2004; Mercer and Hodgkinson, 2008). This occurred three times in this extract, at 20.32, 20.34 and 20.55. In this instance, however, I did not judge the interruptions as a negative occurrence, rather it signalled the children's motivation and sense of urgency to present their views and have their say in the conversation.

When considering the structure of extract 7.8 important elements were missing. In this discussion participation was not shown by all of the group. Kafe was absent from the group during lesson three, but Ruth and Rose were present and made no contribution. The lack of participation by these two children was a recurring theme throughout the lessons conducted with this school. They were clearly quieter members of the group dispositionally, although multi-modal evidence demonstrates that they were thoroughly engaged with the task throughout. I return to the reasons for their silence in section 7.14.1.

Exploratory talk is also denoted by lengthy contributions (Mercer, 2004). The majority of the sentences in extract 7.8 are short in length and ten of the fourteen contributions made by the children contain less than ten words. This gives evidence that the children were not necessarily explaining themselves in the fullest possible way. Only four sentences were more than ten words in length, the longest contribution comprising of 59 words.

Table 7.8 shows extract 7.8 classified using predetermined codes and is found in Appendix E

7.9 The talk continues

I present this final extract of dialogic talk as further evidence of the kind of talk that occurred in Chester School. This extract occurred in lesson three at a point when the children had paused their building to review their progress.

25.51	TAZMIN	I think we should do....I don't know because there are a few ideas that I think would be quite important, like a place of worship, or like defence or animals should be kept
25.50	T	ok, what do you want to do
25.52	ROSE	Umm
26.00	ROSE	I don't know
26.03	MICHAEL	I kinda think protection [<i>some children still have hands on tablets and are building even though they had been asked to stop</i>]
26.11	ARCHIE	== or some animals, or some animals
26.11	MICHAEL	== yeah
26.12	T	you could split into teams and do both
26.15	TAZMIN	yeah...I think we could turn the castle into something
26.17	ARCHIE	== yeah, that is what I was going to do, I reckon

- 26.21 MICHAEL == you two do one thing and us two will do another
- 26.32 TAZMIN == oh yeah
- 26.32 ROSE == and then we look at the different things and we see, and we see what we think is best
- 26.35 T ok what are the two things you are going to do?
- 26.37 MICHAEL I, I
- 26.39 TAZMIN == a worship place and probably animals I think
- 26.42 MICHAEL ==I, I, actually shall we do a homeless shelter! [*rise in intonation, MICHAEL is trying to make his voice heard*]
- 26.47 ARCHIE == as I think it is quite important
- 26.50 TAZMIN ==but to be honest do you think it is necessary and it is quite hard to build
- 26.51 MICHAEL oh yeh, I see

During this extract the dialogue flowed and was characterised by the children attentively jointly discussing issues. The children were on task and engaged in the conversation, even though they were also working on their tablets. Their engagement is shown by the way they built on each other's contributions through an understanding of the focus of the discussion. The children were discussing how to turn their settlement into a community and how they would go about this, with different pupils offering different suggestion for consideration, a feature of exploratory talk (Mercer, 2004; Hennessy *et al.* 2014). Tazmin does this at 25.51, 26.15 and 26.39, Michael at 26.03 and 26.42 and Archie at 26.11.

These suggestions were accompanied by the children employing dialogic characteristics through the use of meaning-making language as exemplified by the use of 'I think...' at 25.51 and 26.47 (Mercer, 2004). Ideas were not only exchanged, but also challenged, leading to changes in points of view. An example of this occurs at the end of this extract when Tazmin challenged Michael's suggestion that their community would require a homeless shelter. This is shown at 26.50 when Tazmin questioned whether it was important enough to warrant the work it would entail, an idea that Michael accepted, saying 'oh yeah, I see' (26.51). Issuing challenge and counter challenge and being able to see through the eyes of another, are both elements of a dialogic conversation (Mercer 2004; Mercer and Littleton, 2007).

As previously explained the presence of contributions that are longer in length gives evidence that children were explaining their ideas. The longest contribution, at 34 words, is given at the start of the extract. However, of the fifteen contributions (excluding my own suggestions) only five were more than ten words in length. In addition, there is evidence that the children were not valuing contributions. They frequently talked over each other and ten of the talk moves started by an interruption. In doing so the children indicated that they had forgotten, or were choosing to ignore, my rule that they avoid speaking over each other. As with extract 7.8 not all children participated evenly. Ruth was absent from the conversation and Rose's role was passive in nature. The unequal participation levels of this group mean that this extract does not meet all the requirements for dialogic speak.

Table 7.9 shows extract 7.9 categorised statement by statement using predefined codes and is found in appendix E.

7.10 Creative considerations

I now consider my third research question in relation to the data obtained in Chester School.

How might an immersive gaming environment encourage creative responses from children?

The following extract occurred in lesson 2. The children were discussing the reasons for the location of their settlements. In the game the children had congregated around the settlement created by Archie and Ruth, the children were discussing the feasibility of this location choice.

28.23	T	ARCHIE and RUTH how is your house located, I want the others to stop.
28.23	KAFE	ok <i>[laughs and carries on with using tablet]</i>
28.33	T	ok I'm going to stop as someone is not listening <i>[T looks at KAFE]</i>
28.44	RUTH	umm it is near trees and water so you can get food and wood <i>[all children looking at Ruth, KAFE still playing with tablet]</i>
29.05	ARCHIE	<i>[offers a suggestion but it was lost due to noise in corridor]</i> <i>[T spends time asking KAFE to put down tablet or he will face a sanction, he does as T asks]</i>
29.23	KAFE	they could drown <i>[all children looking at T]</i>
29.35	TAZMIN	well it could be, if they didn't notice that there was a quite deep bit of water and they could go under it is near really deep water and

- they could get trapped [*all children look at Tazmin using listening poses*]
- 29.37 KAFE they could swim
- 29.44 ROSE I was going to say the same thing
- 29.46 TAZMIN it could flood, water could all come flooding in
- 29.50 T oh is that right?
- 30.11 KAFE their settlement is no good it is a wreck [*laughs, ARCHIE laughs too*]
- 30.14 ROSE it could catch fire cos it is made from wood
- 30.25 KAFE and it is in water
- 30.26 T anyone else?
- 30.39 TAZMIN they are quite far away from other places I can see and umm and you would have to get across a whole bit of water to get to them and they are quite high so you would have to climb up things to them [*points upwards, Kafe playing tablet again*]
- 31.14 KAFE there are lots of streams near, they could go different ways that could flood

Towards the start of this extract, Ruth justifies her settlement location. The extract shows the other children being rather disparaging about Archie and Ruth's choice of location as it is in a rather perilous position. The reason for this choice of settlement was given at line 28.44 where Ruth states that, 'it is near trees and water so we can get food and wood'. These two reasons for settlement locations were indeed relevant, but other important locational factors had not been taken into account and perhaps these children had rushed their decisions resulting in a poor choice. The rest of the group quickly spotted the inappropriateness of their thinking and had no hesitation in explaining to Archie and Ruth the shortcomings of their site.

The children's experience of the using avatars within the immersive learning environment helped them to understand the several disadvantages that Archie and Ruth's location choice presented. There was much more happening in this extract than just dialogue, the experiential environment, a creative place for 'learning by doing' (Craft, 2011), within the game was influential. For example, the children's recognition of the potential for flooding was not just based on their observation of the physical landscape. They were forced to negotiate the water as they explored their surroundings, their avatars hopping between streams to find a dry place to stand. The steep drop-off of the land by the water, which added to the hazardous nature of

the location, was also observed and this factor was much more easily presented in an immersive learning environment than through a picture as the children had to physically avoid falling in.

As the discussion unfolds Tazmin returns to a theme that had been dominant in her discourse about settlement location: proximity to others and the support that they could provide. At 30.39, she notes that they are 'quite far away from everyone', signifying her understanding that the settlement would be isolated. To get to this settlement the children had had to journey through the game and they could see that other settlements were located on the horizon, the children were given a feeling of distance between spaces, which then prompted a feeling of isolation for Tazmin. While this could be presented through pictures, I would argue that the experience of being in the world and travelling to each other's locations was influential in their formation of reasoning. This is supported by Coffman and Klinger (2007, p.352) in their research of virtual worlds in the classroom who suggested that the immersive environment:

provided learners with the ability to discover information from different angles and perspectives and through these and other unique experiences in the virtual 3-D environment, a constructivist method of learning is possible.

In this case the Minecraft scenario enabled a more comprehensive understanding of the encountered landscape and helped the group understand the consequences of their decisions concerning settlement choices. Furthermore, this extract might provide a good example of Wheeler *et al.*'s (2002) theory on creativity, that is, the combination of social interaction and problem solving in an open-ended environment that helped children to 'transform' their thoughts (Wheeler *et al.*, 2002, p.370). These authors also discuss the importance of being able to return to their work and to further reflect on a theme, this can be seen with Tazmin frequently returning to the theme of space and place over the different occasions that I worked with her.

Table 7.10 shows extract 7.10 broken down using predetermined codes and can be found in Appendix E.

7.11 Revisiting earlier extracts

I return to part of extract 7.7 to develop my previous point, concerning the creative process prompted by 'learning by doing' (Craft, 2011). The following fragment of extract 7.7 also shows that experiential learning encountered by the children prompted their thought processes.

- 4.27 RUTH you also need some flat land *[looking at me for acknowledgement, I nod]*
- 4.29 KAFE they need trees, there needs to be lots of trees
- 4.33 TAZMIN ARCHIE said that you needed to be near farms but I notice the land there is actually really bumpy and there are lots of dips in the land *[all the group look at TAZMIN signalling they are listening carefully]*

This part of extract 7.7 concerns the comment made by Tazmin that the landscape was 'bumpy' which was informing her decision on where to locate her settlement. Here, Tazmin shows she is learning from the experience of being in Minecraft. The virtual learning environment produced different terrains which forced Tazmin to consider the practicalities of her decision in a way that might not have occurred in a more traditional learning environment. The immersive learning environment provided a landscape where children had to build settlements that encouraged them think through their actions and their consequences. It is interesting to reflect on the work of Papert (1993), who discusses Piaget's (1932) model of children as builders of their own intellectual structures. Papert (1993, p.11) developed Piaget's (1932) idea, stating that all children needed materials to build with and was concerned with the invention of 'objects to think with'. As a result, Papert developed LOGO as the object around which he encouraged children to build and think. Similarly, the immersive learning environment provided by Minecraft provides a space where children have to physically carry out actions to realise ideas and in doing so they are compelled to think about their activities which, in turn, informs their discussions.

7.12 Solving problems

Extract 7.12 concerns the creative characteristic of children solving problems. This episode occurred in lesson three where the children were spending time developing their settlements so that they became sustainable.

- 11.30 TAZMIN we could do something with the fence
- 11.32 MICHAEL umm make the farm better ..we need to make it (the crops) grow quicker as it hasn't been growing as they are not doing very well *[looks at ARCHIE as if for support]*
- 11.35 TAZMIN we need bone meal (said altogether)
MICHAEL KAFE
- 11.37 T where do you get that from?

- 11.37 MICHAEL bones [*shrugging and raising his hands as if the answer was obvious, TAZMIN and ROSE laugh*]
- 11.38 ARCHIE where do you get bones from?
- 11.40 MICHAEL ==and skeletons
- 11.40 ARCHIE Yeh...

As noted in Chapter Five, the events that occur in the Minecraft world prompt thought processes that involve the children needing to overcome problems. The children had created a farm so that their settlement might become more sustainable. The environment that Minecraft provides follows its own rules - cycles of night and day, weather patterns and the like - and responds to actions that the children take. When they created a farm and planted crops, for example, they had to wait for these to grow before they could consume them. While they waited they could watch the process in action or they could take certain actions to reduce the growing time. To do this the children discussed the application of animal fertiliser and by combining their knowledge of the real world and the game they developed a workable solution to solve the dilemma of their crops failing to thrive. Again, Koffman and Clinger's (2007, p.352) research is relevant here; extract 7.12 supports their assertion that immersive learning environments make learners, 'think, explore, discover, and manipulate content to become better problem solvers and learn'.

Table 7.11 shows extract 7.12 categorised using predefined codes and is found in Appendix E.

7.13 Divergent thoughts

When further considering creativity in Chester School, I return to Extract. 7.9 which can be viewed through a creative perspective as well as a dialogic lens.

- 25.51 TAZMIN I think we should do.... I don't know because there are a few ideas that I think would be quite important, like a place of worship, or like defence or animals should be kept
- 25.50 T ok, what do you want to do
- 25.52 ROSE Umm
- 26.00 ROSE I don't know
- 26.03 MICHAEL I kinda think protection [*some children still have hands on tablets and are building even though they had been asked to stop*]
- 26.11 ARCHIE == or some animals, or some animals
- 26.11 MICHAEL == yeah

- 26.12 T you could split into teams and do both
- 26.15 TAZMIN yeah...I think we could turn the castle into something
- 26.17 ARCHIE == yeah, that is what I was going to do, I reckon
- 26.21 MICHAEL == you two do one thing and us two will do another
- 26.32 TAZMIN == oh yeah
- 26.32 ROSE == and then we look at the different things and we see, and we see what we think is best
- 26.35 T ok what are the two things you are going to do?
- 26.37 MICHAEL I, I
- 26.39 TAZMIN == a worship place and probably animals I think
- 26.42 MICHAEL ==I, I, actually shall we do a homeless shelter! [*rise in intonation, MICHAEL is trying to make his voice heard*]
- 26.47 ARCHIE == as I think it is quite important
- 26.50 TAZMIN ==but to be honest do you think it is necessary and it is quite hard to build
- 26.51 MICHAEL oh yeh, I see

This extract shows evidence of creativity through the theme of divergent thought. Craft (2000) notes that an indicator of creativity is to be able to present more than one solution to a problem. In this extract the children made several different suggestions for ways to develop their community. Suggestions ranged from providing a place of worship, keeping more animals, creating more defences and even creating a homeless shelter. The children were not fixed on one path and were willing to consider a number of different alternatives and reflect on multiple perspectives. This links to research on collaborative creativity that is associated with open-ended tasks which, in this instance, was mediated by the Minecraft learning environment; it provided numerous ways to approach problems and allowed the pupils to make their own choices via the use of an informal voice (Vass *et al.*, 2008; Rojas-Drummond *et al.*, 2006; Rojas-Drummond *et al.*, 2008; Rojas-Drummond *et al.*, 2010).

As in Chapter Five the divergent nature of the digital game can also be linked to the notion of dialogic space and creativity. The experience of Minecraft resonates with the work of Mercer *et al.* (2010a) on interactive whiteboards. They assert that whiteboards provided a tangible space for dialogue to occur. The annotation of the board and the manipulation of virtual objects allowed for many voices to enter a dialogue as well as providing space in which

children explored different solutions. Similarly, Minecraft provided a virtual space in which objects could be created and jointly discussed.

7.14 A different perspective

In seeking to answer the research questions I now incorporate some simple quantitative data to present a different angle through which the talk might be considered.

7.14.1 Participation

Extracts 7.8 and 7.9 illustrate that not all the children were participating equally, one of the principles of a dialogic conversation is that all parties should be encouraged to contribute (Mercer, 2004; Alexander, 2010; Wegerif, 2010). As I examined the data for Chester School I could see that two children, in particular, were noticeably quiet. It was therefore useful to investigate this theme further using simple counting techniques to ascertain how the children were participating. Table 7.13 shows the number of contributions made by each participant in each session.

Table 7.13 Participation levels made by each child in the group at Chester School

Child	No. of contributions in Lesson 1	No. of contributions in Lesson 2	No. of contributions in Lesson 3
TAZMIN	27	39	82
ROSE	10	10	17
MICHAEL	28	22	98
KAFE	36	40	Absent
ARCHIE	31	27	49
RUTH	10	10	10

The data shows unequal contributions across the group. Rose and Ruth contributed less than the other four children. Multimodal information, however, gives evidence that these two children were the group members who were on task throughout, they worked intently on the Minecraft activity but did not necessarily contribute to the group discussion that took place. Ruth was the member of the group who contributed least overall. She was described by the class teacher as a particularly quiet individual and the level of her contributions may have just reflected her preferred demeanour. Another plausible explanation is the dynamics of the

group. Underwood and Underwood (1999) note that children working in groups have significantly different experiences depending on their gender and group composition and it is when boys and girls are paired together that are both most likely to perform poorly. Ruth, who interacted the least, was in the only mixed pair and this may have had an effect on her contribution.

Underwood and Underwood (1999) argue that mixed pairs worked more successfully together when each child was comfortable with the other; a sense of trust was very important in opening up their thinking to the group. Reappraising the data in Table 7.13, Underwood and Underwood's (1999) concept of 'feeling comfortable' is significant for the whole group participation level not just that of Ruth. Kafe was absent for the last session and this had an impact on the group. Kafe, as noted at the start of this chapter, came to the group with significant behavioural problems. His conduct in the group was, at times, challenging but not unmanageable. Multimodal information shows him laughing and giggling inappropriately. He is also seen encouraging other children to collude with him in low-level disruptive behaviour. Kafe was working under the supervision of an unknown individual (me) in a situation where there was no chance to establish a relationship outside the activity. I did not know the behavioural policy of the school and the situation had the potential to deteriorate. Nevertheless, Kafe was keen to participate throughout and so he took note of my directives. His enthusiasm to play the game kept him motivated in a situation where he might otherwise have become further distracted

In the final session, where Kafe was absent, there was an evident change in the contributions of individuals in the group. All the children participated more, but it was the impact on Michael that was most interesting. Michael, who made only 22 contributions in lesson two, made 98 in lesson three. Michael had been paired with Kafe in the previous two lessons and the evidence shows that Michael contributed more in Kafe's absence. Kampulainen and Lipponen (2010) note that fostering dialogic inquiry is a hugely demanding task and its realization both depends upon, and is constrained by, social relations and learner agency within the group. This is supported Salonen *et al.* (2005) who posit that tasks undertaken within small groups of children can only be fruitful if group members are able to mutually co-regulate their cognitive and social interactions. When the dynamics of the group changed Michael's position within the group also changed. He became the most participant speaker and an individual who would take a lead in the group.

7.14.2 Meaning making

I now consider the quantitative data in relation to the number of words associated with meaning making as an indication of the presence of exploratory talk. Table 7.14 shows the number of meaning making words contributed by the children in each lesson.

Table 7.14 Meaning making words contributed by the group

Meaning Making Word	Lesson 1	Lesson 2	Lesson 3
Might	1	0	0
Could	11	16	15
should	1	0	16
would	12	4	2
Shall	0	1	4
maybe	1	0	4
Why	3	0	5
But	4	7	5
think	6	5	25
because/cos	19	8	6
If	13	9	8

The number of meaning-making words present reflect the level at which the children were working – in that there was less use of these words than in Hambrook School and the pilot study. This indicates that there was less evidence of exploratory talk in Chester School. However, in lesson three there is increased use of meaning making words and this could again reflect the changed social dynamics of the group in that instance.

When reviewing the transcripts, the talk was least exploratory in the first lesson. Only towards the end of the second, and in third lesson, did the talk move into more elaborate discussion. In this school group disputational talk incidences preceded cumulative and exploratory incidents. Perhaps the dynamics in the group served to inhibit the group initially. It was only after the

children became used to working with each other, as well as working with myself, did the discussion develop.

7.15 Conclusion

This section briefly summarises some of the themes pertinent to the analysis of the data collected in Chester School. I reflect upon these themes in detail in Chapter Eight.

Chester School offers further evidence that the immersive game environment mediated the children's exploration of problems in ways that enriched their interaction. The talk in this school was fast paced, voluminous, continued, complex to transcribe and varied in nature. There were parts of the lessons where the talk was certainly disputational, there were other parts where the children were off task. However, the talk moved from being initially disputational to a discussion that showed many, but not all of, the features of a dialogic exchange. It was difficult to authoritatively declare any one extract as wholly dialogic as it was usually lacking in one or more characteristics.

The informal nature of collaborative group talk was also a continuing theme in this chapter. The children constructed meaning through an informal presentation of language that lacked subject specific vocabulary. My understanding of how the children made meaning also continued to change through my work with these children. The thinking was tentative, hesitant and often hard to decipher in a sentence by sentence analysis of the talk. Meaning making occurred over time and was pieced together cumulatively by a process of the children 'thinking aloud' (Mercer, 2004; Mercer and Hodgkinson, 2008). The immersive learning environment provided a 'space' where these thoughts could be rehearsed and tested.

The way the children made meaning through Minecraft was dependent on the social interaction in the group. This group presented as one that did not naturally work together, it contained children who were not given to always behaving cooperatively or being accustomed to stay on task. The group moved from working against each other to working in an increasingly collaborative and cooperative manner, where they justified their decisions based on their accountability to the group as a whole. An emphasis on helping each other became a recurring feature in the talk of the children.

The way the children talked depended on their position within the group and their positions changed as the learning progressed. The presence of a child with behavioural difficulties had several consequences. Although he did display challenging behaviour, the desire to play the game was a significant motivational factor that kept this child engaged and integrated into the

group. However, although he was contributing, his presence and behaviour did have a marked effect on the talk, much more than I had initially realised. This is illustrated by the way that the other children expressed themselves differently and contributed more when he was not present. As Barnes (2010, p.6) notes:

Exploratory talk provides an important means of working on understanding, but learners are unlikely to embark on it unless they feel relatively at ease, free from the danger of being aggressively contradicted or made fun of.

The immersive game environment was influential in that meaning making was formed through a constructivist approach where children were learning by doing and seeing the consequences of their actions. This helped the children to evaluate the advantages and disadvantages of the decisions they made in relation to their settlement choices. The fact that the learning environment simulated real life events also encouraged them to problem solve. The open-ended nature of the experience provided multiple possibilities for the learners and therefore encouraged divergent thought through the rehearsal of different solutions to a problem.

Chapter 8: Conclusions

This chapter summarises the findings of this thesis in relation to the three research questions to formulate conclusions about the features of talk when using an immersive game environment. From a theoretical perspective, I will explore the relationship between technology, creativity, play and talk in a learning context. I accompany this summary with a process of reflection of my research journey where I review some of the strengths and limitations of this study. Finally, I will complete this thesis by making some recommendations for future research in this field and for practice when using immersive game environments in the primary classroom.

Before presenting my conclusions in detail, I present a summary of my findings from my research that add to knowledge in this field of learning.

In this research the use of a commercially produced game engendered rich, expressive, face-paced and fluid talk, and served as a motivational tool to learn with. The game provided a virtual space where children could rehearse their ideas using informal language devices. The immersive game environment facilitated group talk not just in the sense that it created an appealing focus for the conversation but also because the children were active participants, enacting and evaluating their decisions. They could postulate an idea, discuss it and then implement it in a dynamic, virtual space. As the children worked in the game as a group, they talked as a group. Working in the virtual world helped to move the focus of the talk from one that concentrated on the swift presentation of just one correct answer and instead allowed for an extended discussion of a problem through collaboration and the co-construction of knowledge. This co-construction of knowledge was seen in the extracts of cumulative and exploratory extracts of talk presented in this thesis. Cumulative talk was not previously seen as being highly dialogic in nature. Recently, there has been more interest in cumulative talk and this research illustrates how this type of talk, in a gaming context, led to collaborative, co-constructive and creative engagement with the task. The research indicates that the value of an immersive learning environment lies in the emphasis that it places on sharing, agreeing and testing ideas in a creative way.

8.1 Features of group talk using and immersive learning environment.

The first research question investigated in this study asked:

What are the features of children's group talk when using an immersive gaming environment?

8.1.1 Talk, talk and more talk

The evidence collected demonstrates that an immersive game environment can engender talk: talk that is fast paced, fluid and engaged. The group's interactions were partially mediated by the game and, as a researcher, I was surprised by the impact this had on volume and quality of the talk. Indeed, the amount of talk produced by the children in this study made it difficult and time consuming to transcribe as the children were so animated.

The time taken to transcribe the collected data constituted a major part of this research journey and the sheer volume of the talk demonstrates that the immersive learning environment acted as a stimulant that promoted dialogue instead of suppressing it. The dataset shows that, with the exception of two children in Chester School, the children interacted frequently. The children talked both with their partner with whom they were operating the tablet computer and with rest of the group. Moreover, the transcripts demonstrate how the intertwined dialogue moved quickly back and forth between the children.

Silence – or lack of it, was also important. Discourse analysis not only attends to the analysis and meaning of language but it also takes into account presence of silence (Punch, 2009). The transcripts show there are rarely extended periods of silence. While the children knew I was interested in their talk, this is the reason why I was filming them and this would have influenced their behaviour, the amount of talk generated and the lack of silence that occurred, serves as a counter argument against any influence I might have had on the children.

8.1.2 Motivational features

The talk analysed in this research serves as evidence of the children's motivation. The talk was lively and mostly on-task with children paying close attention to their work, as evidenced by the pilot study and Hambrook School. As I look back through my analysis chapters I notice how I have described the talk and how often I have used terms like 'excited' and 'loud' to introduce the talk in the pilot study (Chapter Five, section 5.1.1). In Hambrook School, I discuss the 'pace' and 'freedom' (Chapter Six, in introduction) that characterises the talk. The children in Chester School exhibited more examples of off task behaviour in week one, suggesting less motivation. However, as the sessions progressed their talk became increasingly focussed.

Attention to other modes also shows that the children were motivated by the experience.

Studying the direction of gaze was helpful in evidencing this. Children in both schools frequently talked while simultaneously playing, indicating their focus on the game. They were

simply too busy to stop playing. Analysis of the talk while playing indicates their attention was on the task as well as the act of playing the game. In addition, when the children did stop playing the multimodal information shows that they were looking at the person to whom they were speaking and were not being distracted or losing focus part way through the dialogue. Only in Chester School did the non-verbal gestures show that, at times, the focus of the children was not on the game or on each other.

Research anticipates that immersive learning environments are highly motivating experiences (de Freitas, 2006; Gee, 2007; Garris *et al.*, 2002; Malone & Lepper, 1987), and this research illustrates how this can be harnessed constructively in a classroom setting. Sandford *et al.* (2006) state that games, usually familiar, commercial off-the-shelf games which possess higher production values and richer, more detailed graphics are more motivating. In contrast to Sandford *et al.* (2006) the game used in this research project does not boast high production values and is not the most graphically sophisticated, but was still a highly motivating experience. However, I agree that using a game with which the children were so familiar from their wider cultural landscape was certainly an appealing factor and helped to sustain that close attention to detail. The use of the Minecraft language described in the pilot study (see Chapter Five, extract 5.10) where the children show their background common knowledge of the game, through their use of a common vocabulary specifically and uniquely related to Minecraft, is also evidence of this appeal. As Buckingham (2007) argues, educationalists need to bridge the digital divide between schools and children's out-of-school cultures and, for many children, this might be achieved through the culture of computer games.

The theme of motivation can also be linked to Deci and Ryan's (1980; 1985) theory of self-determination and particularly to the role of the intrinsic motivators: competence, autonomy and relatedness. Competence is provided by the challenge that a well-designed game engenders through which the children can demonstrate skills and acquire new ones. Minecraft is designed so that players can get started with little experience or understanding but learn to interact with the environment and exploit it in increasingly sophisticated ways as they play the game. Skill can be shown through the mastery, scale and complexity of objects that are built. To aid this children can read companion manuals or use websites to research information and techniques that improve the efficiency and sophistication of play. This intrinsic motivational feature of competence was shown by the different research groups. Both the children at Hambrook and Chester schools brought in supplementary Minecraft manuals to achieve better skill within the game. In addition, as noted in the previous paragraph, through their specialised

Minecraft vocabulary (Chapter 5, extract 5.10) the children 'proved' their competence to each other and the level of skill they had acquired.

The children were also able exhibit autonomy in their play and this was another important motivational factor of the game. The open-ended nature of Minecraft afforded the children a good element of choice as to how they acted within it. The fact that there was not just one predetermined answer and that the children had a good degree of control has been shown to be a motivational factor within a digital game (Ryan *et al.* 2006). In this research this was evident in examples from different schools. For instance, in extract 5.8 the children discuss numerous different strategies for securing access to a good water source. In extract 7.13 the children in Chester School suggest different uses for their built artefacts which range from building a place of worship to providing a homeless shelter. The choice afforded to the children also allowed them to try numerous solutions to problems, thus enabling creative responses.

Deci and Ryan's (1980; 1985) third intrinsic motivational factor of relatedness was evident throughout the thesis. The research of Ryan *et al.*' (2006) suggests that relatedness, the ability to interact with others, is particularly significant for MUVE and MMORGS. The fact that the children could all communicate virtually within one game environment via avatars, as well as communicating in the physical world, offered opportunities for discussion and for group cooperation.

Finally, motivation was encouraged through immersion in the Minecraft game. The children were immersed in an online world that they could influence through their actions. This was extremely appealing to the players. Ryan *et al.* (2006) refer to this as a 'presence' in the game and argue that this sense of authenticity of experience is extremely powerful. In this research, events became very real to the children as shown dramatically in extract 6.9 when they accidentally set fire to their settlement. During this incident they became lost in the action in a manner that might be difficult to replicate in more traditional learning environments. This can also be linked to the creative element of flow (Csikszentmihalyi, 1996), a blurring of action and awareness, as players are swept up by the events in the game.

8.1.3 The interaction demonstrated features of disputational, cumulative, and exploratory talk

In my effort to understand the talk I sought to identify dialogic talk from that which was not. I looked at the data using Mercer's (2000; 2004) typology of talk, where exploratory talk is

perceived as the most cognitively impactful form. The talk featured all elements of this typology in all the settings where the children exhibited moments of dialogism via exploratory talk, but also cumulative and disputational talk. I have tried to give a representation of all the different types of talk that occurred and have not sought to leave any out in order to give a falsely celebratory slant to the data. Indeed, in Chester School the talk started off predominantly disputationally and Mercer (2000; 2004) would classify this as unproductive. I have included details of this in Chapter Seven in an effort to portray the true nature of what occurred in this school.

8.1.4 Dialogic talk – an unobtainable goal?

While the talk could be easily identified as disputational and cumulative, a dialogic element was more difficult to determine. It emerged from the literature review that the form and meaning of dialogic talk was a contested concept. Mercer (2000; 2004) and Alexander (2004) had different requirements in their categorisation of a dialogic exchange and actually determining a clear definition of dialogic talk was difficult from the outset. For instance, Alexander (2004) stipulates that dialogic talk is made of up different categories which he entitles collective, reciprocal, supportive, cumulative and purposeful. Mercer (2000; 2004), on the other hand, presents different levels of talk in a hierarchy – disputational, cumulative and exploratory talk.

I initially determined on using Mercer's (2000; 2004) classification of dialogic talk but during the analysis stage of the research this left me with a sense that I was not representing a complete picture of a dialogic classification. Having then produced a more detailed coding instrument that took account of different characteristics, it emerged that dialogic talk was a complicated and multifaceted process. This journey of dissection and clarification resulted in both advantages and disadvantages during this research process. I was now much more certain of the nature of dialogic talk and was more confident in the quality of the analysis of my data. However, the complex nature of a dialogic definition meant that it was difficult to classify any one extract of conversation as wholly dialogic.

The arguments of Skidmore and Gallagher (2005) help unpick the dialogic difficulties referred to above. They refer to the complexities of dialogic talk when they state that Alexander's (2004) explanation of dialogism is accompanied by a lengthy list of 47 indicators situated under the seven overall headings which they see as too complicated to be useful as a tool for teachers. Burbules (2000) also questions the ideal version of dialogical pedagogy, which he negatively juxtaposes with the realities of conversation in a class. Lefstein (2010) continues

with this theme by examining some of the problems of actualising a dialogic conversation between pupils. He states that,

Instead of adapting their ideas to existing structures of school, idealists theorize about dialogue in such a way that its application in school becomes an impossibility, something to dream about doing (Lefstein, 2010, p.181).

Before I started this research journey I viewed myself as having good understanding of the potential tensions between theoretical perspectives and the practical realities of noting instances of a dialogic conversation. However, the data set collected demonstrated that the talk between children was much more complex and difficult to understand than I had anticipated. The rules and regulations over the classification of talk led me to become increasingly cautious in determining which extracts constituted dialogism and which did not merit such a label. As such, when discussing the features of the talk I conclude that many extracts of the talk presented in this research show 'elements' of a dialogic conversation but cannot be wholly classified as such.

8.1.5 Considering cumulative talk

This research has made me reappraise the role of cumulative talk. Drawing on the Bakhtinian (1981) notion that dialogues are developed by different perspectives and that meaning arises in the context of a difference between voices, Mercer (2000; 2004) stipulates that the most productive type of talk is that which contains challenge and counter challenge. In comparison, cumulative talk would be considered a positive contribution but one that is uncritical in manner and consequentially less effective for advancing the thinking process.

When I began this research I had a similar focus and assumed that I would identify dialogism with conversations that contained features of exploratory talk. However, during the research journey cumulative talk started to take on more significance. Much of the cumulative talk was very affirming and supportive in nature and I recognised that the children gained a sense of security from it. To challenge a peer can be a difficult objective for a primary school child and I came to realise that they would only do this if they felt they were safe to do so. The cumulative talk played a crucial role for the children in helping them to feel secure with each other. This was particularly evident in Chester School where the children did not naturally gel and were a challenging collection of pupils. Here, the children went through a journey in which they realised the benefits of cooperating and helping each other which was reflected in talk that had many cumulative features. Only at the end of lesson two and during lesson three did the

children move on to exhibit more exploratory elements to this conversation. As such, I have increasingly come to value the role of cumulative talk.

I also argue that the digital space occupied by the avatars of the children where the children played in the same game (but accessed from different tablets) encouraged an atmosphere of sharing and collaboration. This was shown in Chester School (extracts 7.4, 7.5. and 7.6) where the children were so concerned with helping with each other.

As Craft (2011, p37) argues,

the manipulation of [virtual] space may be driven by individual impetus, but is often manipulated with the feedback from or collaboration of others, characterised frequently by generosity in the sharing of knowledge and skill between players to help with the realising of ideas.

I argue that in this research the game was more successful, and the children got more achieved, when they helped each other through the sharing of knowledge and resources and this aspect contributed to a cooperative spirit and the emergence of cumulative talk.

Ultimately, I would now see cumulative talk as equal in value to exploratory dialogue. The research of Dobson (2012), that discusses how students shared ideas in an open and uncritical manner via cumulative talk, demonstrates the value of building on contributions to give the dialogue a shared historical understanding. Littleton and Mercer (2013, p.60) call this concept 'dynamic common knowledge' which 'is accumulated through the activities of a group, whereby participants begin to appreciate their role in relation to others'. This complements 'background common knowledge' – a shared and specialized vocabulary common to members of a community (Littleton and Mercer, 2013). In this research, dialogue where the children used and developed the ideas of others (see extracts 6.5 and 7.6) and demonstrated a shared language (see extract 5.10) was an important part of the discussion. The dialogue would simply not have been so rich without this type of cumulative talk and was indicative of their joint focus and interest in the task.

The cumulative talk also accords with researchers who discuss collaborative creativity suggesting that in some tasks it is not always necessary to use argumentation (Rojas-Drummond *et al.* 2006; Rojas Drummond *et al.* 2008, Rojas-Drummond *et al.* 2010, Vass *et al.* 2008). This research demonstrates how the open-ended task provided by the immersive learning environment, allowed the children to share their ideas using informal language in ways that emphasised joint negotiation, shared solutions and the co-construction of knowledge

producing multiple possible solutions and different trains of thought. These discussions enabled some rich and creative conversations to occur (extracts 6.6, 6.9, 7.13) where their value lay in all the array of possibilities that were considered. The children expressed themselves freely and were not hampered by the need to make considered language choices. Furthermore, Middup, Coughlan and Johnson's (2010) research that states that reaching a conclusion too soon in a discussion limits creativity was also pertinent. There were times (extract 6.6) when I was tempted to stop an extended discussion, but refrained from doing so as this would have limited the richness of the talk and freedom with which the children were expressing their ideas.

8.2 How do children use talk to make meaning when using an immersive gaming environment?

This section explores how the children made meaning using Minecraft with reference to dialogic talk.

The talk engendered while working in Minecraft demonstrated many dialogic characteristics but, as noted above, there were often elements missing. My abiding memory of this process is that the talk was not straightforward to interpret – it was an arduous task to try to extrapolate how the children made meaning. The dialogue can only be described as 'tangled' and perhaps this reflects the thinking processes, which is rarely linear in nature. During the Minecraft sessions lines of thinking were developed by an intricate web of ideas that were contributed to by several group members. As Maybin (2006, p.24) notes from her research, 'meanings were often ambivalent, picked up and foregrounded in different ways by subsequent speakers'. This was pertinent and common to my research journey. Maybin (2006) goes on to introduce two themes which are also significant to my own research: fragmented lines of enquiry and duetting.

8.2.1. Fragmented lines of enquiry

The first theme to be explored is the assertion that meaning making occurs at a number of different interrelated levels -where utterances cut across boundaries - and is provisional and fragmented (Maybin, 2006, Vass *et al.* 2008). This notion is aligned with Bakhtin's (1981) concept of an 'inwardly persuasive discourse' which he juxtaposed with the static, authoritative discourse of textbooks that is fixed and can only be received by the pupil. The talk observed in this research was different. Often the talk was overlapping; moreover, the children interrupted each other on numerous occasions. This would appear to be problematic

for this study as one of prerequisites for dialogic talk is that children listen carefully to each other (Alexander, 2004; Mercer and Littleton, 2007) or follow a set of ground rules that might involve them 'talking one at a time' (Mercer and Littleton, 2007, p.71). The children in my study did not do this despite my introduction of ground rules at the start of each lesson. At first I saw interruption as a negative occurrence but as my journey with the interpretation of my data progressed, I increasingly saw this as evidence of the groups' engagement with the exercise and an expression of their eagerness to contribute – the children could not wait to get their thoughts across. While this interruption did result in fragmented lines of discussion, I did not view this as a negative occurrence.

8.2.2. I know what you are thinking: duetting

The second theme introduced by Maybin (2006) is her use of Falk's (1980) concept of 'duetting'. This is where adults, who know each other very well, demonstrate mutual understanding in their dialogues communicated through speakers repeating or paraphrasing each other, talking simultaneously and continuing each other's turns. Maybin (2006) asserts that duetting features in children's group talk and this resonates with this research. There were instances (in Hambrook School, in particular) when duetting was observed. The concept of duetting allowed me to understand better the overlapping and interrupted nature of the talk and this, for me, was often when the conversation was at its most dynamic and when the children might progress in their understanding of concepts.

I would also like to return to the theme that the thinking exhibited was tangled and complex. There was evidence of incomplete lines of thought and contributions that tailed off. This made tracking the meaning making difficult. Reviewing the literature during the analysis stage of this process helped me to understand this further. Barnes' (1976; 2008) work on exploratory talk helped me to understand these partly formed contributions of individual speakers. Barnes (2008, p.65) describes exploratory talk as,

hesitant and incomplete because it enables the speaker to try out ideas and hear how they sound, to see what others make of them, to arrange information and ideas into different patterns

There were many examples of this particularly in the talk exhibited in Chester School. Mercer and Hodgkinson (2008) state that they used Barnes' (1976) concept of exploratory talk as a starting point for their own classification of talk that is presented in this research. Thinking

aloud was a way that children exhibited meaning making when using an immersive learning environment.

The thinking aloud, duetting and fragmented lines of enquiry meant that analysing one contribution alone was often unhelpful unless it was placed in the context of the whole discussion. Ultimately, the transcripts indicate that the children were working in a shared learning space where they co-constructing ideas together. This aligns with Lave and Wenger's (1991, p.15) work on situated learning that suggests learning is a process that takes place within a participation framework, not in an individual mind; the learning is 'distributed amongst participants, not a one-person act'.

8.2.3 Informal language patterns

The children in all the research groups made meaning using informal language devices. The language used by the children did not reflect the subject specific vocabulary related to the geographical learning objective that had been set. I initially viewed this as a negative outcome of the research. Discovering the work of Maybin's (2006) on informal language use was integral in recasting my perception of the value of this talk. Returning to Haworth's (1999) work also shed further light on this theme. Haworth (1999) argues that that whole class interaction privileges the teacher who transmits information to the class. She stipulates that an inevitable consequence of privileging the teacher in this way is the displacement of 'community discourses' – Haworth's title for the alternate voices of children - which she suggest are marginalised during whole class interaction.

Whole class interaction falls heavily across the discourse of some children concealing the many voices, nuances and accentuations which classroom interactions might embrace (Haworth, 1999, p.114)

This quote is relevant to this study as during research process the children demonstrated a good understanding of the locational factors involved in settlement choices but they did so in very basic terms. In Hambrook School, (extract 6.6) for example, children spent time experimenting with ideas that I considered fanciful and wasteful at the time – although the body language of the children indicated that they thought the conversation relevant and important. However, repeatedly viewing and reinterpreting the data allowed me to see that the immersive game environment provided the space where the children could rehearse their ideas and express themselves freely and fully. I agree with Haworth's (1999) assessment of the small group interaction observed in her research, that the resulting conversation is like neither

everyday conversation nor normative classroom interaction. In a sense, the immersive game environment acted as a bridging or middle space where children could experiment and rehearse their ideas, or shape and reshape their ideas, and this was of significance. The children were demonstrating their knowledge, but instead of using subject specific vocabulary they chose informal language choices.

The National Curriculum (DfE, 2013), in contrast, emphasises the use of formal language and subject specific vocabulary. For instance, even at a very early stage of learning at Key Stage 1 the curriculum for Geography states that pupils, 'should understand basic subject-specific vocabulary relating to human and physical geography' (DfE, 2013, p2.). It will, therefore, be important for a teacher to harness the informal language conveyed in a gaming environment and help to introduce more specific language choices to make the most of the potential learning offered by this immersive game environment.

8.2.4 Empowerment

The transcripts indicate that increased learner agency was of significance in relation to how the children made meaning. I was playing Minecraft alongside the children, but I was often the least experienced player in the group. Indeed, at times I was in a position of catch up compared to the children who traversed the Minecraft world more easily than I did. The transcripts show that at various times I had to ask the children how to solve problems or achieve certain actions within the world. This created a different situation from the normal teacher/pupil relationship.

This statement is made with caution, as I am aware that the power balance between the children and myself was not, at any time, equal. As Lefstein (2010, p.9) argues,

Teachers are also vested with epistemological authority - the teacher's curricular knowledge has been officially authorized; school is ostensibly designed to cure pupils of their ignorance. In this setting, complete reciprocity, in which what we expect of others we must expect of ourselves, is an impossibility, and the epistemological stance of openness is threatened

Multimodal analysis of the children's non-verbal actions gives evidence of this. While I was certainly the person who was talking less, the direction of the children's gaze shows that I was indeed the person with the most authority within the group. The children's gaze would often be directed at me more than others and, even when they were talking to one another, the

children tended to glance in my direction, to check that I was listening or showing any sign of approval or disapproval.

While I was still the person who could sanction or reward – allow or refuse and oversaw the conduct of the children, there was one distinct difference to normal classroom procedures in that I was playing alongside the children and I was not the best Minecraft player in the group. The children demonstrated patience and bemused humour at my lack of ability to carry out actions compared to the speed and efficacy of their own, more practised, manoeuvres. On the occasion when I could not get out of the sea and onto land the children took great delight in explaining that I had chosen to extract myself where the landscape was too steep and severe – instead I had to swim to a location where I could walk up onto a bay or choose a less steep incline. This had the result of empowering the children to acquire a sense of expertise. For one child in Hambrook this sense of expertise was particularly significant. Ryan was described by the teacher as a poor communicator, but his level and nature of contribution show that he became one of the leaders of this group. Ryan viewed himself as an expert player within this environment; this enabled him to change the role that he normally played out. Moreover, in Chester School children (extract 7.5) assumed the role of teacher monitoring the behaviour of others.

In Hambrook School and during the pilot, speech patterns at the outset of each session were dominated the deliberate use of Minecraft-specific vocabulary in discussion about different aspects of the game. These were opportunities for the children to demonstrate their prowess and to position themselves as the holders of knowledge that not equalled by the adult. Kumpulainen and Lipponen (2010) use the term ‘accountable authors’ in relation to this theme and they state that learner agency is important in pursuit of children making meaning through dialogic enquiry. They go on to suggest that when teachers leave the expert role, learner agency is increased in pupils, this is pertinent to children observed in this research. The open-ended environment provided by Minecraft, positioned the children as active agents in the learning environment where they could make meaning through shared inquiry and through construction of knowledge (Kumpulainen and Lipponen 2010). Boaler and Greeno’s (2000, p.53) research note,

how you can function in a situation depends on how you are positioned or how you position yourself. Positioning students as accountable authors appeared to set up a lively and multi-voiced discussion

Minecraft, therefore, placed the children in a different role than the normal classroom interaction. One of the criticisms of education is that formal education rarely manages to harness the agency learners bring from their other environments, e.g. homes and playgrounds, and fails to exploit the cultural tools of the children. Immersive game environments offer an opportunity to challenge this theory. When using Minecraft the children were using a product that was familiar to them, their own play world that they could dominate, and this enabled them to assume a different position than may have been usually available to them. The learners were afforded the stance of being active initiators in collective discussions who could then negotiate, challenge and reason, with my role being that of one who could support meaningful engagement (Kumpulainen and Lipponen, 2010).

8.3 How might an immersive gaming environment encourage creative responses from children?

Craft (2011) argues that 'learning by doing' is a feature of creative learning. Learning by doing was observed in this research. The children did not only need to discuss their ideas, but to realise them in the space in which they operated as well. The requirement for the generation of content provided opportunities for both successes and mistakes. This gave rise to creative responses. For instance, in this research, trying to build a virtual settlement on a landscape that was too precipitous or alternatively open to flooding made the children realise the impracticalities of this kind of decision in a concrete way.

Resnick (2006) states that when technology fosters creativity it supports learning through designing. This entails active participation, control, responsibility, problem solving and encourages feelings of personal connectedness, as there is a space where ideas are explored through a relevant context. Resnick (2006) argues that digital technology should be seen more as a paintbrush than a television, as an active tool, in other words, with which children construct their understanding of the world, rather than a televisual experience that encourages passive reception. In this way creative responses were encouraged as the immersive game environment provided a tool for the children to use, they designed the space they inhabited and this forced them to think creativity when they encountered problems during the activity.

Creative responses can be linked to Wegerif's (2007; 2008) notion of the dialogic space. This is the dialogic pause or a space for reflection, which allows creative solutions to problems to

emerge spontaneously. Furthermore, Wegerif *et al.* (2010) propose the notion that dialogues are enhanced by different perspectives and that meaning arises in the context of a difference between voices, opening up a space for dialogue. In the immersive game environment, the virtual and physical acts of communication were intertwined. The fact that all the children could operate within the same game environment meant that they were engaged in an experience that was shared in a tangible and immediate sense. This increased the potential for group communication and the opportunity for different perspectives to arise.

This idea can be further developed via the concept of an expanded learning space (Wegerif, 2007), a virtual embodiment of the notion of the dialogic space. Chappell and Craft (2009) called these spaces 'living dialogic spaces'. Such spaces are characterised by openness and dynamic exploration, recognising and working with differences in perspectives. The children could all act within this liminal or middle space and this encouraged sustained dynamic engagement where they could actualise their ideas as a group. This enabled collaborative and collective contexts where creative thinking emerged through actual and virtual learning conversations (Craft, 2011).

An immersive learning environment is one where 'real world events' are simulated. Players experience night and day, weather conditions, geologically different landscapes and terrain. Through the result of their own actions players can influence events, they can change the look of a landscape, build infra-structures, plant and tend to growing crops or be responsible for them not thriving. The consequences of the children's actions, mediated by the game, encourage dialogue that might not otherwise occur and this allows for more creative outcomes than more traditional forms of learning. Here the children are invited to consider the interplay between the game mechanics and the physical laws of the 'real' world upon which those mechanics are based. They identify how they can create the conditions in the environment that will promote the events within the game that they consider desirable, just like people try to control their environment in the real world. It is the interplay between the real and the game world that fosters learning, as this requires the children to use their knowledge of both in order to understand and predict what is happening. For instance, in Hambrook School, a poorly located fire took hold and quickly spread through the immersive learning environment. This unexpected event prompted a whole line of dialogue about the causes of the fire, responsibility for the fire, how to rebuild their environment and how this might be carried out differently next time.

The open-ended nature of this learning environment helped to realise another criterion used to determine creative responses – that of divergent thought (Craft, 2000). In the virtual game space there was no one way the children could realise the solution to a problem. The space allowed the children to make many different suggestions. As Loveless *et al.* (2006) suggests, this environment gave the learner agency and choice and therefore more possibilities for a creative outcome. The challenges faced by the children produced many different responses. For instance, the children in the pilot study had to tackle the problem of getting fresh water and this resulted in a number of suggestions about how they might transport water up a hill or where they might locate a well.

8.4 Reflection on the research journey

As I come towards the end of this thesis, I seek to understand my own role in the research process and my influence on it.

I agree with Cohen *et al.* (2011, p.225) when they state that, 'enquiry is not a neutral activity, researchers are not neutral, they have their own values, biases and world views and these are the lenses through which they look'. I began this research project equipped with long-standing experience as a practitioner, having worked as a teacher and, in a university environment, helping beginner teachers develop and refine their skills. Looking back, I think I saw this thesis as a journey that would explore the process of meaning making and lead to definite answers to questions about learning. I no longer view this pursuit in such concrete terms. I can identify with Richardson and St Pierre (2005, p.969) when they note that when evaluating research, the student,

can no longer think of inquiry simply as a task of making meaning, comprehending, understanding and getting to the bottom of the phenomenon under investigation but rather they put meaning in its place, [they ask] how do meanings change, how have some meanings emerged as normative and others been eclipsed and disappeared?

I agree with Richardson and St Pierre (2005) who suggest that however much I seek to depict a rational account of the research, others may experience the same events but they will refract and interpret them through different professional eyes, genders and sensibilities.

8.4.1 The problem with learning objectives

When I look back to the start of the data collection, I realise how my occupation as a teacher educator influenced my thinking – perhaps I was acting from this perspective rather than as a

researcher. Part of my current role is to enable student teachers to become good practitioners and help them realise that they are accountable for the learning journey of a group of thirty or so children throughout the time they teach them. They need to ensure that children make good progress against the requirements of the QTS standards (DfE, 2011a). My dialogue with student teachers is centred on this theme so that they can plan and articulate which groups of learners made good progress towards a set learning objective in a lesson. I now realise this position was very influential on my own research. I was very concerned that the children that I worked with met the learning objective. I can see in my analysis of the talk that one of the first issues on which I comment is focused on this. My decision to ask the children to formulate a written product also originated from the need to show how they had met the learning objective so that I had another piece of evidence that I could share with their teachers.

When I reread the paragraph above it sounds perfectly sensible that I should want the children to make progress – the whole point of the research is to enquire how children make meaning. I do realise, however, that I may have been overly focussed on this theme. My own philosophical standpoint, referred to in the introduction of this thesis, details my belief in understanding the processes of learning. My first Higher Education post was heavily influenced by the ideas of Rousseau (1762/2003). This philosophy suggests that education should aim to be child-centred where children are intrinsically motivated by the task itself. The learning process is central, with discovery and experimentation at its heart (Bartlett and Burton, 2007). As I look back through the transcripts I am aware that my concern with meeting learning objectives resulted in my stance becoming product orientated which might have been at the expense of the process of learning. The research indicates that the value of an immersive learning environment lies in the process of using this tool; it's open-ended and interactive environment encourages many possible answers to one question. To try to rush children to one singular answer would be to miss the point of the opportunities it offers. The value of the gaming environment lies in the way it places the focus on the process of constructing and negotiating meaning. As the researcher, I was able to see this learning as it happened and appreciate how the technology created opportunities for play, talk and creativity within this process.

8.4.2 The problem with play

Over-emphasis of the learning objective could also have negatively influenced the quality of play carried out by the children. I have come to realise that there is a tension between using a piece of software that encourages play and then overtly aligning this with a learning objective

and asking children to try to meet this target. In the literature review I refer to Ortlieb (2010, p.242) who describes play as a, 'minimally scripted, open-ended exploration'. The fact that I was concerned with meeting the learning objective may have limited the freedom of the play experience and be contrary to a child-centred, constructivist approach to education.

The idea that play should be a free endeavour can be traced back to Rousseau (1762/2003) who refers to freedom when he discusses play. Froebel (1900) also used this word but added the verbs of joy and spontaneity. In child-centred education children are given choices about the type of play in which they engage but it is to be an 'enjoyable, self-directed, non-goal oriented' activity (Burman, 2008, p.263). Grieshaber and McArdle (2010) argue that it is widely accepted that play should be freely chosen and personally driven and therefore question whether play can be used to achieve specific educational goals. They refer to the idea of naturally produced play; free play is children's natural way of learning that should not be interfered with and argue that in educational establishments this is an unachievable idea as the play is manufactured by the set-up and arrangement of the environment. In my own research, I manufactured the play environment by providing the children with a ready-made landscape to explore where I had deliberately placed objects to encourage them to think about the best place to locate a settlement. I was careful not to state what the children should do with the objects and let them decide – interestingly all the players chose to ignore them – indicating they did feel some sense of autonomy over their play environment. However, by dictating the conditions of the environment I 'played' the children instead of letting the children play. Furthermore, I also limited freedoms as I set the rules for the play and dictated the etiquette for behaviour within the immersive learning environment – when one child in Chester School decided to injure other virtual players I took control of the play environment and sanctioned him.

I also look back and realise the tension I created by asking the children to 'play' Minecraft but then censored them when they gave reasons for their decisions that related to playing the Minecraft game instead of geographical reasons that related to the learning objective. This is exemplified in Chapter Six extract 6.3 when Shiv says:

- | | | |
|-------|------|--|
| 11.21 | SHIV | never build a settlement next to the edge of the world |
| 11.24 | T | why is that? |

- 11.28 SHIV cos it messes up your settlement, say you wanted to build a block, it would just go into the edge of the world and you can't get any animals

In my interpretation of the extract I classified this type of answer as unhelpful but perhaps I did not give enough consideration to the fact that in the eyes of this child this answer was a completely valid one. There is also a possibility that by employing a vehicle that children use extensively in their own leisure time and for their own intrinsically motivated purposes, and then asking them to use it to learn through, could be to remove most of the fun experiences offered and stands to limit their enjoyment of it.

8.4.3 The problem with interpreting children's voices

Haworth (1999) discusses the complexities generated by research that presents speech extracts from transcripts as evidence. I have necessarily been selective in identifying passages of speech according to my interpretation and my idea of what is significant. This form of editing means that the reader of this research has a different, less complete experience of the children's talk than I did. The evidence presented has involved a process of reduction, and interpretation that is at least somewhat opaque to the reader. Even the complete transcripts do not capture the richer more complete experience of witnessing the children's communication in real time. As Richardson and St Pierre (2005, p.962) note, this process of interpretation itself is often obscure,

writing is always partial, locational and situational and ourselves are always present no matter how hard we seek to suppress them, but only partially present because in our writing we repress parts of ourselves as well

In her investigation of group talk, Haworth (1999) discusses her own participation in the process of engendering talk, a theme that resonated with my own research. In the discourse analysis of her data, Haworth (1999) deliberates on how she has ignored her own role and suppressed her own voice. Looking back through my findings chapter, I am struck by my absence and I make few appearances in my analysis of the text. As set out in the methodology chapter, although I was participant in the whole process, even playing alongside the children in the game, I deliberately set out to play a minor role in the talk. However, during my analysis of the pilot study and of Hambrook School, I rarely refer to my presence in the talk, indeed I side step my role. In my effort to prioritise the voices of the children I am largely absent in the interpretation of the text. In avoiding analysing my own contribution to the dialogue, I found

myself able to evade discussing my participation in creating significant moments; Haworth describes this as 'a pedagogic tactic' (Haworth, 1999, p.294).

All through this research process, I was aware that I am schooled in the understanding of how to create opportunities for talk, making it likely that I would be influencing the children's speech on an almost unconscious or instinctive fashion. As Silin (2005) argues, the practitioner makes critical choices about the interplay of voice and silence; when a practitioner speaks another does not and this opens the space for others to announce themselves. During the research I was always aware of the need to give children the space in which to dwell and then elaborate on their thoughts. I refrained from stepping too soon into the conversation. I was aware that I knew how to use non-verbal gesture to encourage children to expand on their contributions; having spent many years working with children and adults this approach is probably ingrained in how I teach. Indeed, this understanding almost worked against me when conducting the research as it inhibited me when working with the group – perhaps I was worried that I through my knowledge of dialogue I might be wholly responsible for the talk that took place and that that the role of the game might be diminished.

As I look back it is only during my time spent in Chester School, when the children found it harder to work together as a group, that I refer more fully to my involvement in the sessions. For instance in Chapter Seven, extract 7.7 I start to recognise my role in the process when I write,

I have to acknowledge my positionality in influencing the talk in this extract in that I knowingly posed a very open-ended question that would provoke discussion.

I think this sentence exemplifies the conflict I felt between the teacher/researcher roles that I carried throughout this whole process. This tension, and limitation, to the research process has to be acknowledged. As I come to the end of this process just acknowledging this factor makes me finally feel more comfortable with my role. A teacher would do all they could to encourage good learning situations – when practitioners use Minecraft they will naturally seek to be part of the conversation. Looking at the transcripts evidence is given that I certainly was not the participant that talked the most. Indeed, as much as possible I allowed children to find their own voices. However, I now realise that it is unrealistic to suggest that I was not influential in the formation of the talk occurred in each situation.

8.4.4 Strengths and limitations of the research process

Strengths

This research provides an in-depth study of the talk of small groups of children when using an immersive game environment. As Punch (2009) notes, this detail is particularly necessary when complex social behaviour is involved as is of the case in much educational research. The research also observes effects in a real context, the children were learning in a school with all the interruptions and idiosyncrasies school life brings (Cohen *et al.*, 2007). As such it provides an intensive examination of empirical evidence of how children talk when using a commercial game and can be used as evidence against some of the 'headlines' that are presented about computers games in the media and texts. Furthermore, I hope the way I have attempted to tell the story of the events that took place within the school provides an accessible piece of research that a wide audience can understand (Cohen *et al.*, 2007). I hope that the discourse presented gives a detailed picture of the authentic voices of the child and provides a useful summary of learning using this type of technology.

Limitations

This is a small- scale piece of research which was implemented in a particular time and place. I acknowledge that it is not possible to generalise all the conclusions to every educational context. However, in line with Bassey's (1999) ideas of fuzzy generalisations, I believe that this research provides evidence for the benefits of the use of immersive gaming environments to mediate collaborative group work that can be translated into different situations with a reasonable expectation that it will promote talk.

I am aware that I could be accused of anecdotalism (Silverman, 2010) and I hope I have not shied away from presenting data of all types, not just that which showed features of a dialogic conversation. I hope that I have sufficiently acknowledged the contributions of those children in Chester School who were much quieter than the others in the group.

When conducting the research, I used just one method of data collection – that of observation and then an accompanying discourse analysis. I have interrogated this data through different lenses, but I cannot say that I have triangulated the data using different methods as is common in traditionally staged research (Richardson & St. Pierre, 2005) and case study. However, I have not confined my data set to just one school but used different schools in an attempt to validate my findings as well as to understand if this type of activity could fit into different settings. It might have been useful to add additional data collection methods such as interviewing the children to ascertain their views on Minecraft and the journey that they had undertaken. However, from the outset I wished to conduct a detailed analysis of the dialogue of children filmed over a series of interventions. I wished to be able to undertake repeated

inspection of the dialogue to fulfil a comprehensive analysis of the data to satisfy myself I understood what had occurred (Silverman, 2010). To be able to view and review, to ensure I was thoroughly analysing was the most interesting and enlightening part of this process. On analysis of my pilot study I realised the enormity of task I had set, and this contributed to my decision keep with just one method. In addition, I was also driven by the fact that my choice of tool, Minecraft, has gained prominence in schools and there was a need to be rigorous but not be so overwhelmed by my data that its analysis resulted in an extended submission when there is a need for empirical research in this area. Nevertheless, while I consider detailed analysis of the talk in the schools a worthwhile endeavour, using one method may be a limitation of this research.

The discourse analysis that took place was the most difficult part of this research journey. Accompanying extracts of talk with a written analysis felt subjective and I was aware that I could be guilty of the claim that adults take from pupils' talk not only what they might mean but also what they should and could mean from an adult's perspective of the world (Cohen, *et.al* 2007). I was aware of the need to not only review the talk, but to 'read between the lines of the classroom talk by way of interpreting the intentionality of the participating discussants' (Cohen *et.al*, 2007, p.391). The accompanying tabular classification of the discourse helped to assure that I was not being biased in my interpretation. However, I am also aware that the coding instrument that I formulated was an imperfect tool. It was often very hard to categorise an extract sentence-by-sentence as contributions could have more than one interpretation. I also sought to examine how children might make meaning through the immersive game environment and as such the analysis looked for the use of meaning making works, it did not however give a linguistic analysis of the data set and I am aware that this could be another limitation of this research project.

Using video to collect data proved to be a successful method by which to capture children's interactions in the pilot and in Hambrook School. Most importantly, it allowed me to detect and analyse non-verbal data to further understand the dialogue. As I progressed through the research the attention to detail given to non-verbal communication became increasingly important, particularly in Chester School where relationships between the children were less well established. In Chester School the location of the group of children in a corridor meant that the video recording device was harder to position effectively and provided less insight. Here the use of dictaphones helped to augment my understanding of what was said in the sessions but I still found some passages of talk hard to decipher which resulted imperfect transcripts in some places.

When I selected the children to play Minecraft I sought to create groups that were diverse in terms of literacy and gender. As I progressed through the analysis of the data the role of gender became less significant. In both schools, the data showed that both genders might participate more or less. The reasons for children contributing within the game were less to do with gender and were related to other factors. For instance, in Hambrook School the dominance of one player, Ryan, can be explained by his knowledge of the game, which exceeded that of several other members of the group and this gave him the confidence to take a lead. However, there were also times when Gracie, also a competent Minecraft player, would lead the direction of travel within the game. There was no great difference between the contributions of the rest of the children within the group and no verbal or non-verbal evidence to suggest that either gender was more motivated or engaged than the other – in fact they all demonstrated an intense focus throughout. In Chester School, Ruth and Rose talked less than the others in the group throughout the time that I worked with them although the non-verbal data revealed their focus and engagement with the task. However, data analysis shows that all the children were inhibited to some degree due to the challenging behaviour of one of the group members. When that child was not present the children contributed more freely. Indeed, when the challenging child was absent his male partner's (MICHEAL) contribution tripled as did that of another female (TAZMIN) within the group. The safety the children felt within the group was a greater influence than gender in this instance.

However, despite these considerations I am confident that my methods provided a comprehensive and informative insight into the children's engagement with, and communication about, the immersive gaming environment.

8.5 Recommendations for practice

Immersive learning environments offer affordances that are difficult to create using traditional approaches. Games like these are best used when children can jointly work on realistic problems when playing as a group in a virtual world. In this research the children worked in pairs on tablets and would frequently pause to reflect on their work as a group. This gave a good opportunity to talk at different times with different people. Within the game itself the children were not told how they should work, they could have decided to work as pairs or as a team. The children in both schools worked in pairs on tasks but this work then contributed to a group endeavour. The group work inside the game gave impetus and opportunities for discussion and I would recommend that children would get the most from this learning environment when used in this manner– individual use would be less productive. The children

need to talk each other in the game itself via avatars and also face to face sitting around a table. The children need to have ownership of the task so that they are actively engaged in creating virtual objects and derive intrinsic motivation from their use of cultural artefacts.

The children will demonstrate the 'learning' through their talk and through the artefacts they produce. However, the talk will not happen so effectively unless the teacher understands how to manipulate the game to best create a learning context within it. For instance, in the scenario used in this research the virtual world was manipulated to give instructional cues including 'ruined' or partially constructed settlements that the children could further develop. The children were not told that they had to use these embryo settlements but they did provide hooks to encourage them to talk about the advantages and disadvantages of each before they eventually decided to make their own settlements. By this means the children acquired a clear understanding, not just of about the overall goal, but of possible constructive approaches.

Immersive learning environments need to be employed alongside clear, curriculum related goals. While, the children need to be aware of the intention and the objective underpinning the learning activity, immersive gaming environments allow activities to be less prescriptive and give children wider scope for creative and collaborative engagement with their learning. Teachers should not use the game in a *laissez faire* way, they should understand why they are using it and be able to communicate links to broader curriculum objectives to the children. For instance, in this research I always started the lessons with the learning objectives. During the course of the lesson the teachers needs to refocus the children on it using verbal cues and prompts.

Immersive games provide a middle space where children can voice their ideas. This space allows for the Bakhtinian (1981) notion of diversity and plurality of voice. The talk that emerges here appropriates more of the authentic voice of the child as opposed the presentational language that emerges in whole class discussion situations (Maybin, 2006). The practitioner can then help the children develop their language to use more subject specific terminology as required by the National Curriculum (DfE, 2013).

The learning offered by immersive games is creative but the children might take time to explore. This is different to the types of learning frequently encountered in school where pace and the quick acquisition of subject knowledge is paramount. Within the immersive game the pace of learning is dictated by the children's exploration of ideas and not by the structure

imposed on them by a teacher. The immersive environment is best employed to provide a space where the processes that the children engage in are just as valuable as the product they produce. If children are presented with motivating problems within the virtual world they will not only learn about a particular curriculum subject but will be able to also develop their thinking skills as evidenced by the data collected throughout this thesis. In the cumulative and exploratory talk collected in this research the children engaged with construction, creation, evaluation, solving, judging, recommending, comparing, imagining, predicting, modifying, experimenting and designing (Bloom, 1956). The opportunity to engage with thinking skills is one of the strengths of games of this type.

Fundamental to this point is the idea that the immersive game environment creates a virtual space where children can rehearse, test, negotiate and ultimately refine and develop ideas as they move towards a final product. Their talk has been shown to contain many examples of fluid thinking where ideas are offered, rejected, combined and agreed upon in a playfully constructive way that is rarely encountered in more formal, higher stakes classroom environments. This was evidenced in section 6.6, where the children were discussing the merits of living in tree houses by a river. Although this idea was rejected and was ostensibly purposeless, the use of evidence and reasoning that the children demonstrated eventually reinforced their overall learning. Moreover, events happen within this environment that encourage talk and create opportunities for children to reflect on their actions. Extract 6.9, where the children accidentally set their village on -fire, resulted in consequences in the game that produced lengthy discussions. Children therefore need to be given enough time to explore issues in detail. They also need to be able to save and return to their work to give them opportunities to further develop their learning and build on previous ideas.

The interactions of the children concerning their engagement with tasks in the immersive game environment also illustrates how the game promoted collaborative rather than individualistic thinking processes. In each school successive encounters with the game resulted in increasing levels of cooperation and practitioners need to realise the potential of immersive learning environments to promote communal practice and learning.

Practitioners need to recognise that they may not be the experts when using immersive game environments. This can act as an empowering mechanism for some children who can be experts of the game, whereas in the classroom pupils might view themselves as different types of learners. As a result, they acquire greater ownership of the learning task and a greater inclination to experiment and try new things. By allowing the children to construct their own

responses to set challenges through learning by doing the immersive learning environment encourages the personal expression of ideas. This recalls Papert's and Harel's (1991) view of Logo programming as a way to facilitate the construction of knowledge from the ground up where children can make knowledge their own and begin to personally identify with it.

From a teacher's perspective ownership of the learning environment by pupils is not without its challenges. If they were empowered in this way but acted individually and in an unstructured manner this could undermine the activity and many of the principles discussed in the last few paragraphs. Teachers should therefore consider using set ground rules for talk to reinforce group working and collaboration. In this research this was achieved by clarifying expectations at the start of each session. Having done this the children started to regulate their own behaviour as a group.

Advocates of games like Minecraft (Bharti, 2014; Drzewiecki, 2014; Miller, 2012) suggest that Minecraft is a creative and flexible resource that can be used to access many areas of the curriculum. However, I argue that it offers particular potential for children to experience learning tasks that are more difficult to recreate inside the classroom – the opportunities to present geographical and historical challenges in the form of recreating ancient civilisations make games like Minecraft a tool with a particularly rich potential. The act of building and occupying allows children to not only understand issues of form and structure but also explore what it means to inhabit that space in that period of history. For example, having built a Roman villa, children could then be confronted by the way that issues like gender and social status impacted on the use of that space.

My experiences of conducting this research suggest that as in any lesson practitioners need to be well prepared before playing in an immersive game environment. While they might not be expert players, they do need to have experienced the learning environment and plan just as they would for a more traditional lesson. The space provided by an immersive game environment, and the activities carried out, can serve as an alternative means of assessing learning as opposed to producing written products. The work undertaken within the game can be used to show the children's understanding of a concept. This would be particularly valuable for children who find it difficult to express themselves via the written word.

8.6 Recommendations for future research

In 2006 de Freitas stated that there was a need for further research that could quantify the way immersive game environments were being used. De Freitas (2006, p.5) notes,

One of the main obstructions to uptake of games in learning contexts is a lack of empirical data to support the fact that they work, and a lack of understanding of how these games might be used most effectively in practice.

This is still the case in the primary classroom in 2017. I suggest there is a need to conduct further detailed studies using participatory methodologies exploring how we can develop our understanding of the different ways children learn. We also need more evidence that investigates how much, and in what ways, games are used in the classroom.

Further research is needed in the use of immersive learning environments with different age groups. As noted above, this research was carried out with children aged ten to eleven. Merchant (2015) argues that more research is needed on how virtual play influences the lives of all young people but adds that there is a particular concern with the lack of research studies in relation to young children where they are active participants of virtual environment. Researchers like Marsh (2013) have investigated virtual worlds like Club Penguin which is particularly aimed at young children (5 years and above). In this arctic environment children adopt a penguin avatar to explore a frozen landscape during which they might interact with other penguins. In her study of 5-11 year old's use of the world, she explored the literacy practices the children used throughout the play. However, Merchant (2015, p.306) points to the rapidly expanding market in this area and I agree with his call for further studies that provide a 'rich description of young children's virtual play'. Club Penguin alone is reported to have had 8.5 million users (Tach, 2012), and is just one of a similar type of platform. Moshi Monsters is another example is this type of genre aimed at 5-7 years olds, which had 80 million registered users in 2012 (Knowles, 2015). With virtual worlds now reaching the lives of so many young people further research is needed.

In addition to the above point, further research is required due to the diversity of experience that constitute the virtual world landscape. Club Penguin is classified as a virtual world environment but looks very different to the world of Minecraft, the subject of this thesis. Not only do the visual qualities of these two worlds differ, but the play experience varies too. The opportunities for building content in worlds like Minecraft are not available in other virtual world environments that offer affordances to interact but not to build objects in the same manner. This diversity of experience again highlights the challenge of researching this area, but also accentuates the need to document different experiences of virtual games.

Finally, Merchant (2015) signposts the dynamic and ever-changing markets of virtual world environments. Virtual world games experience peaks and troughs in their popularity and he

argues that, 'acknowledging the ephemeral nature of these environments seems to be a necessary condition for researching this field' (Merchant, 2015, p.307). For instance, the aforementioned Club Penguin that was popular five years ago closed in March 2017 and was relaunched as Club Penguin Island available only as a mobile experience (Frank, 2017). While virtual worlds change, the overall appeal of playing games of this nature continues as do the potential opportunities for learning. As such, further research in the manner of this thesis is required to continue to explore the pedagogic potential of these environments.

Linked to the previous point of the ever-changing landscape of virtual worlds, during the process of this research a modification to Minecraft, called Minecraft Edu became available. Minecraft Edu is version of the game that is specifically tailored for use in the classroom and research in to the potential of this would continue to add to the body of knowledge in this field. Accounts of classroom use of this version of Minecraft attest to its value. For instance, in 2013 one school in Sweden made Minecraft Edu a compulsory part of the curriculum (Marsh, 2015). Alternatively, primary school teacher Matthew Bell used it to recreate all the school buildings at his place of work (Marsh, 2015), Moreover, it is claimed that all secondary schools in Northern Ireland are set to receive funds to purchase the virtual world. (Stuart, 2015). TeacherGaming reports that Minecraft Edu has been used by more than 3,000 teachers in hundreds of schools around the world (Stuart, 2015). The rising popularity of the game has resulted in commercially produced sequences of work emerging for use in the primary classroom. For example, the publisher Rising Stars has produced a sequence of work called 'Switched-On Minecraft' (Chambers and Broadbent, 2016) that suggest activities using Minecraft across the whole of the curriculum. Broadbent (2016) also gives different examples of how children can use Minecraft for activities ranging from air-raid shelter construction to numeracy lessons with children in Year 2 (aged 6-7). As such, because of the continued expansion of Minecraft and the accompanying sequences of work, I would argue for further research to be carried out with Minecraft Edu to see how best it can be employed across the curriculum.

I conducted this research with children working in the one joint, digital space in their own schools. It would be useful to conduct further research exploring the potential of an immersive game environment where a group of children are playing in one digital space but its constituents are located in geographically different schools.

8.7 The problem with the educational landscape at this moment in time

Throughout the journey of this research process the educational landscape has dramatically changed. Schools now work from a new curriculum (DfE, 2013) that emphasises knowledge and products as opposed to celebrating the process of learning. As Gibb (2015, p7) notes, and I quote at length:

The new National Curriculum published in 2013 (DFE, 2013) is a programme of study in the spirit of Hirsch. At primary school, the National Curriculum in English is properly sequenced so that pupils learn how to read and write in a structured and comprehensive fashion. In Year 2, pupils will be introduced to the apostrophe and the comma; in Year 4 they will encounter the possessive pronoun; and in Year 6 they will be taught about the colon, ellipsis and the passive voice. In our new more ambitious mathematics curriculum, pupils will be expected to multiply and divide proper fractions; calculate the area of parallelograms and triangles; and read any number up to 10,000,000 by the end of primary school, as well as having memorised their multiplication tables by the end of Year 4.

This quote demonstrates the very structured approach to learning that is now emphasised as well as the evocation of strategies like memorisation as a teaching aid. Gibb (2015) goes on to discuss the role of textbooks in imparting this knowledge and applauds some of the new free schools that are pioneering this approach to learning. One of these named schools states as its vision as believing in standing in front of the class and teaching, believing in learning things by heart; the school states it would never do group work (Michaela Free School, London). This research supports a case for an approach that is of an oppositional stance to this.

I leave this research with an understanding informed by data that an immersive game environment fosters a social world where collaborative talk facilitates the co-constructivist production of knowledge. Such a social world creates opportunities for talk amongst children and gives situations where children make meaning through differences in perspective. I conclude this research with a quote from Bakhtin (1984, p 110):

Truth is not born nor is it to be found inside the head of an individual person, it is born between people collectively searching for truth, in the process of their dialogic interaction.

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Appendix A Transcription Codes

[words in square brackets] non-verbal information

== overlap/interruption

..... short hesitation when speaking

Appendix B: Coding Instrument

D1 The children disagree (Mercer, 2004)	These terms will show features characterised as disputational talk
D2 The children make their own decisions (Mercer, 2004)	
D3 Responses are short in length (Mercer, 2004)	
D4 Children are pursuing their own lines of dialogues (Mercer, 2004)	
D5 The language is competitive in nature (Mercer and Littleton, 2007)	
Cu1 The talk needs to be supportive (children articulate their views freely) (Alexander, 2010)	These terms will show features characterised as 'cumulative talk'
Cu2 Purposeful, uncritical statement (Mercer, 2004)	
Cu3 Uses repetition (Mercer, 2004)	
Cu4 Uses elaboration (Mercer, 2004)	
Cu5 Uses confirmations (Mercer, 2004)	
Cu6 It is cooperative (Mercer & Littleton, 2004)	
E1 Offers ideas with reasons denoted by the use of words like because (Mercer, 2004)	These terms will show features characterised as 'exploratory' talk

E2 Makes suggestion (Hennessy <i>et al.</i> 2014)	
E3 Tries out tentative thoughts denoted by the use of meaning making language particularly I think, would, could, (Mercer, 2004)	
E4 Accepts changes of points of view (the dialogic gap) (Mercer, 2004; Alexander, 2010; Wegerif, 2010)	
E5 Pupils admit when they did not know (Mercer, 2004)	
E6 Children build on each other's ideas (Alexander, 2010)	
E7 The talk needs to be collective (children learning together) (Alexander, 2010)	
E8 Able to see through the eyes of others (Mercer, 2004)	
E9 Offers challenge or counter challenge (Mercer, 2004; Mercer and Littleton, 2007)	
E10 Asks questions (Hennessy 2014 <i>et.al</i>)	
Cr1 Children need to solve problems (Craft, 2011)	
Cr2 Children need to make connections , they think about relationships not isolated events, facts and skills (Cropley, 2001)	
Cr3 Children take risks (Craft, 2011)	

<p>Cr4 Children learn by 'doing'. Mistakes are made and learned from (Craft, 2011)</p>	
<p>Cr5 Talk is playful (Wegerif, 2010; Craft, 2011)</p>	
<p>Cr6 Emphasis is on a reflective approach over an impulsive approach, children discuss the effectiveness of their actions (Wegerif, 2010) also called Transformation by Littleton and Mercer (2013)</p>	
<p>Cr7 Children show divergent thought (Craft, 2000)</p>	
<p>Cr8 Children are mindful (Langer and Moldoveanu, 2000) with their language and show possibility thinking (Craft 2000; 2013). They use the language of perhaps, 'it might be' 'what if'</p>	

Appendix C: Coded Tables of dialogue for pilot study

Table 5.2 codes extract 5.4.

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
41.01	HOLLY	guys what do you need?		Cu6		
40.52	HOLLY	Yeah				
41.01	TOM	I'm making the== farm		Cu1		
41.02	HOLLY	== I was making a farm				
41.05	TOM	oh were you				
41.05	HOLLY	oh look all my little trees have grown	D2			
41.07	TOM	I'm clearing land for you		Cu6		
41.09	HOLLY	thank you		Cu5		
41.10	TOM	that's totally what I was doing		Cu6/ Cu1		
41.10	HOLLY	thank you		Cu5		
41.17	HOLLY	I'm getting a tree farm		Cu2		
41.20	TOM	I'm also digging the holes for the water and I'm also digging the land right by it		Cu6		

41.20	JULIA	please can you get more wood		Cu6		
41.21	HOLLY	I'm making a tree farm		Cu2		
41.33	TOM	oh I'm making a wheat farm		Cu2		
41.36	HOLLY	oh do you want some seeds then, I'm making a wheat farm		Cu6/Cu3		
41.41	JULIA	I'll be the luxuries person		Cu2		
41.41	TOM	luxuries?		Cu3		
41.41	JULIA	yeah I'll get some luxuries		Cu5		
41.43	HOLLY	look at my little house	D2			
41.49	TOM	so you are the luxury person		Cu5	E1	
41.50	HOLLY	TOM can you make the farms like the tree farms and things and I will help JULIA with the house		Cu6		
41.57	HOLLY	I'll make my house JULIA and you make your house. Ok Deal?		Cu6/Cu5		

41.58	TOM	but she is making my house				
42.00	HOLLY	oh yes		Cu5		

Table 5.3 codes extract 5.5

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
30.23.	TOM	let's make our main house first		Cu2		
30.25	JULIA	no cos if it is a settlement then we need lots more places to make a village			E1 E9	
30.29	HOLLY	guys I have good news		Cu2		
30.30	T	what do we think, are we going to make a settlement in the way JULIA has said or				
30.47	TOM	cos that save materials cos they will be smaller and only have one person in them			E1	
30.55	JULIA	we would use just as many making one small one as we would one big one			E9 E2	
31.00	JULIA	I just think we should do that, cos it's more about surviving and not about looking good and three small one will get done quicker			E2 E1 E6	
31.05	TOM	well, not necessarily			E9	

31.06	JULIA	in the real world TOM would you build a castle?			E6 E9 E3	
31.13	TOM	yes but we are not trying to make a castle just one main house			E2 E6 E9	
31, 16	JULIA	would you build a mansion?			E9	
31.20	JULIA	would you build a massive house or would you build a small house?			E9	
31.27	TOM	well if there is three people living in it I would have to as big for three people to live in it			E3	
31.29	JULIA	or you can make small ones for three people			E10	
31.31	TOM	yes but it would take just as long			E1 E9 E3	
31.35	TOM	well that is what I think anyway why don't we make ...(unintelligible)			E3 E9	
31.41	JULIA	no cos otherwise it is going to take forever			E1	
31.44	HOLLY	I think there should be more houses just in case we were invaded			E3	
31.49	TOM	they would still be right next to each other though			E3 E6	
31.55	HOLLY	I know but then if we scatter them about==			E6 E1	
31.55	JULIA	== people would be less likely to invade, they would			E6, E1 E3	

		just think...if we had like more in those houses they would probably think oh there is no point, it's just three little houses and a small farm but if it was a big house people would like go there as they would think they were more powerful				
32.25	TOM	well , I don't know		Cu2		
32.31	JULIA	I think they should be small houses			E3	
32.34	HOLLY	I think small houses		Cu6		
32. 36	TOM	we won't look very powerful though			E6 E9	
32.38	JULIA	no that's the point cos otherwise would you rather be powerful or safe or==			E6 E1	
32.46	HOLLY	==we could build a big wall, I don't really mind what material it would be out of and then we could have more shelter			E10 E6	
33.02	TOM	guys if you had it like this big you could have a bed			E6 E10	
33.10	T	ok you haven't got long so you need to decide what to do				
33.17	JULIA	guys, I think we should just build three small houses			E3	

		as it is going to have to be done straight away				
33.20 HOLLY	HOLLY	Ok		Cu5		
33.20 JULIA	JULIA	Ok I will go with what they say			E5	

Table 5.4 codes extract 5.6

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
24.50	HOLLY	cos it is in a high place, it is on flat land, it's got loads of resources for use to use and it hasn't been built on already			E1	
25.00	JULIA	it is also quite near the other islands so we could go over to there if we need (unintelligible)			E3,E1 E6	
Conversation is diverted by unexpected interruption						
26.08	T	have we got anything missing (from the site chosen for settlement)				

26.10	HOLL Y	we have got wood, we have got protection			E6	
26.10	JULIA	eerr we have got building materials, I think the only thing is the slope			E3 E6	
26.16	HOLL Y	== we could build shelter which is what we are going to do			E6	
26.20	JULIA	==the only thing we don't have is the slope			E6 E9	
26.20	T	why do you need the slope?				
26.21	JULIA and TOM	to protect us from the wind			E6	
26. 23	T	Ok				
26.24	TOM	eerr we do have water cos there is a massive sea right there	D4		E1	

Table:5.5 codes extract 5.8

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
26.24	TOM	eerr we do have water cos there is a massive sea right there			E10	
26.26	JULIA	==we have got lots of little pools and things			E2	

26.30	TOM	==I could make a well			E2 E3	Cr1
26.33	T	so the sea, is the sea a good source of water?				
26.35	JULIA	Yes		Cu5		
26.36	TOM	==err no it is saltwater			E9	
26.37	JULIA	but there are like loads of lakes			E9	
26.38	TOM	== we could boil it over a fire			E2 E3	Cr1
24.44	T	is that the most practical thing				
26.45	JULIA	No	D3			
26.48	JULIA	there are ponds and things dotted around the island				
26.38	TOM	==we could fish			E2 E3	Cr1
26.49	Holly	Yes				
26.51	TOM	but we have no water but we could boil it			E2 E1 E3	Cr1
26.54	JULIA	== we do have water TOM cos I have seen it			E9	
26.55	TOM	found some (shows T the ipad image)		Cu2		
26.57	JULIA	I told you it was there	D5			
26.57	T	Ok				
27.00	JULIA	there's lot of water		Cu2		
27.01	T	but that is right at the bottom of a mountain				
27.03	HOLLY	but we can bring it up in buckets			E1 E2	Cr1

27.04	TOM	== yeah we can		Cu6 Cu5		
27.04	JULIA	Yes		Cu5		
27.05	TOM	we could make a well			E2 E3	Cr1
27.06	HOLLY	Yes		Cu5		
27.07	T	oh right ok but you know is that a really practical thing for a settlement?				
27.14	TOM	not necessarily no		Cu5		
27.14	JULIA	No		Cu5		
27.15	T	cos who is going to get the water every night				
27.16	TOM	Me	D3			
27.25	JULIA	if we ---if we wait and we have to go up and down there and as soon as we get the materials to make a bucket, if we bring it up we could bring it up and make a never ending water sources				Cr1
27.32	TOM	== could we build now			E3 E2	
27.33	T	well I want you to decide if you are happy				
27.38	TOM	yes, we can boil it		Cu5		
27.40	T	have you resolved this water issue, if you were settlers would you really want to boil your water				

27.44	TOM	no but there is a lake right there			E1 E2	
27.44	JULIA	==there is a lake or two			E6	
27.48	HOLLY	we could build a well			E2 E3	
27.50	TOM	== I can make steps and then it will be really easy			E6	
27.57	T	in the real world would that be the answer				
27.57	TOM	no not really		Cu5		
27.58	T	so you are going to have to think round that aren't you				
28.01	JULIA	there is another one here which is more sheltered so we would be able to get down to the water			E2	Cr1
28.01	TOM	==we could make a well			E2 E3	
28.07	TOM	guys why don't we just make a well		CU 3 Cu6		
28.15	JULIA	I'm stuck	D4			
28.18	TOM	all in favour of making a well say I		Cu6		
28.18	HOLLY	I		Cu6		
28.24	JULIA	nose.....(laughs) sorry....I				Cr5

Table 5.6 codes extract 5.9

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
21.07	JULIA	yes, this is perfect cos it has got flat land, trees and it is pretty near the other islands as well			E1	
21.15	HOLLY	and it is pretty [smiling]				Cr5
21.18	TOM	HOLLY this is about early settlers and you are on about how pretty it is, should I plant some flowers or something!			E9	Cr5
21.24	HOLLY	whenever I go and look for land...	D4 (though difficult to classify due to interruption)			
21.24	TOM	==wow there is actually flowers there				Cr5
21.27	HOLLY	I thought some poppies				Cr5

Appendix D Coded information for extracts of talk presented in Hambrook School

Table 6.2 codes extract 6.2

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
7.31	ADAM	we need to do the best kind of settlement to survive		Cu2		
7.34	MIA	==sheep in the house	D4			
7.35	ANNIE	let's get the sheep so we can pen them			E2	
7.40	MIA	a brown sheep is heading into the brick out	D4			
7.41	RYAN	yes so if we explore over there, I don't think anyone has been there before	D4		E6	
7.41	ANNIE	===I think we should head off that way			E3	
7.45	RYAN	glow stone	D4			
7.46	ANNIE	oh collect that		Cu6		
7.40	ADAM	we've got two bits		Cu6		

Table 6.3 codes extract 6.4

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
6.19	SHIV	what we are going to do here is make more rooms and them make a landing so you can still see down and then will make fences around it		Cu2		
6.21	RYAN	I think we should have a guard post up top so we can see for miles			E2	
6.2	GRACIE	yes, so you can see everything that is going on		Cu5		
6.24	RYAN	a 360 degree guard post		Cu5	E6	
6.27	GRACIE	so you can keep an eye on the farm while you are in your house basically and make sure nothing is being destroyed		Cu6	E6	
6.27	T	a good idea?				
6.28	RYAN	Yes		Cu5		
6.30	MIA	Yes		Cu5		

Table 6.4 codes extract 6.5

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
41.20	MIA	me and ANNIE have been adventuring and I think we should destroy all the makeshift houses because they are destroyed anyway by other people and some of us so we should use the resources instead of just leaving them there			E1 E2 E3	
41.38	ANNIE	I think that's a good idea because I mean no one is going to use them now and it would take a long time to fix the boat and the fortress and especially the brick house so I think we should take the resources and customise our settlement to make it look a bit better, brick for the floor and and wood from the ship		Cu6	E1 E2 E3	

Table 6.5 codes extract 6.6

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
13.38	RYAN	it would probably be quite a good place all in all together		Cu1		
13.40	T	ok why				
13.48	RYAN	cos you could make weaponry if you needed it and you would have a bit of water and you could boil it and you could, as SHIV said, make a house up in the trees and no one could find you			E1, E3	
13.58	T	Ok				
14.00	ANNIE	and there might be some caves there as in jungles or forests there is usually quite a lot and it is a good place for hunting animals as well because it there is quite a bit in forest and jungles			E1, E3, E6	
14.15	RYAN	==like deer, you could shoot them from your tree top house			E6,E3	
14.16	T	so you might have a food supply which is quite important. Ok are there any disadvantages				

14.32	MIA	well the river could flood and we would have to stay up in the trees			E3 E2	
14.33	SHIV	yes, but that is your home so it wouldn't really matter you still have – you still have			E9 E3	
14.37	ADAM	== yes but you would get thirsty and hungry so you like...you would starve			E9 E3	
14.44	SHIV	==yes but that would – yes but that would be during the winter you would stock up on food anyway wouldn't you?			E9 E3	
14.47	RYAN	== ummm yes		Cu5		
14.47	ADAM	==you would drown if the river flooded			E9 E3	
14.50	SHIV	yeah but it wouldn't get up into the trees would it			E9 E3	
15.45	MIA	yes but you would starve			E9 E3	
14.54	RYAN	==no you would probably have a meat stock pile somewhere and a drink			E6	
14.55	MIA	Yes		Cu5		
15.00	SHIV	that's if they have common sense		Cu5		
15.01	GRACIE	== well you get as much as you can in the summer and when it is			E1	

		winter you step in the tree house and if you need it that bad you go down there and be as careful as you can and if you feel that you are not going to stay alive you go back up..... in the tree				
15.27	RYAN	== yes if it is.....yes, if it is winter you could probably go between the trees and get what you need from above		Cu4	E1	

Table 6.7 codes extract 6.7

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
27.10	GRACIE	ok so when you get the ipad you go looking for stuff and when you get back to the house SHIV can take over with building the house umm		Cu2		
27.17	RYAN	ANNIE MIA what do you want to do?			E10	
27.25	MIA	I don't know		Cu2		
27.26	ANNIE	ummm we could go adventuring a bit more			E2	
27.30	GRACIE	do you both want to do that or one of you or one of you?			E10	

27.30	MIA	==yes		Cu5		
27.32	RYAN	Yes		Cu5		
27.34	RYAN	ok ==so ANNIE and MIA will go adventuring		Cu2		
27.39	GRACIE	ok so we will work on the house?		Cu2	E10	
27.40	SHIV	== can we build a boat, like a long boat difference			E2,E10	
27.41	Everyone	==why?			E10	
27.44	ANNIE	== would we need a boat?			E9	
27.44	RYAN	==we don't really need it			E9 E6	
27.45	MIA	==we can't really sail a boat			E9 E6	
28.01	T	so our objective today remember is early settlement, do we need a boat				
28.03	Everyone	No		Cu5		
28.05	SHIV	==no it is just for show...say like, say like...			E9	
28.06	RYAN	=== so you can hop on a long boat and sail away			E6	
28.08	SHIV	== say if someone attacked you you could hop in the long boat and sail away		Cu4		
28.11	ANNIE	but it would waste materials			E9 E1	
28.11	RYAN	Yes		Cu5		
28.11	SHIV	== yes but it is fitting			E9 E1	

28.14	ANNIE	==how?			E10 E9	
28.14	MIA	== how?			E10 E9	

Table 6.8 codes extract 6.8

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
21.41	T	are we happy with this site?				
21.41	everyone	yes		Cu5		
21.41	ANNIE	it's brilliant		Cu4		
21.43	T	tell me why, why is it good?				
21.45	RYAN	== because it has everything you need quite close by			E1	
21.45	GRACIE	== because theres...			E1	
21.45	ANNIE	there's a lake			E1	
21.47	GRACIE	there's like a lake just there, there's some wood that is not that far away, there's ummm....there, if we really need it that bad well...here's stuff growing here, our house is ummm just round the corner, there is a disadvantage with it being on the edge of the island but that is not really affecting us that much in so far, I don't think it will cos our house is all the way over there			E1	

		so we should be fine and I like this area because uuumm because you have got wood there, you have got water there and you can see food nearby				
22.38	ANNIE	umm there's a lake and you could drown if you are not careful			E9	
22.14	MIA	like you are doing			E9	
22.59	RYAN	we could always get to the shipwreck by walking round the land			E3	Cr1
22.57	ANNIE	yes, I know but this lake you could fall in and drown			E9	
22.30	ADAM	you could build it up a bit so it's all like...around the edge			E3	Cr1

Table 6.9 codes extract 6.9

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
12.19	MIA	but its spread, oh my god, it's really spreading badly				
12.23	T	so have you found the source?				

12.25	MIA	== oh my God		Cu3		
12.26	RYAN	==it's turning to night	D4			
12.27	ADAM	well, the fire is still spreading			E6 (build on from first statement of MIA)	
12.28	RYAN	no its not	D1			
12.30	ANNIE	not anymore		Cu2		
12.31	MIA	I'm sure if you turn around there is more fire			E9	
12.32	MIA	==I just heard a lot alot of fire behind you		Cu2		
12.33	MIA	== Look, you can see that glass isn't flammable, cos the glass is still there			E1	Cr2
12.43	MIA	I tested it out on my creative work because I did not know if it was flammable or not but it turn's out it's not			E1	Cr2
12.58	SHIV	shall we work through the night?	D4			
12.59	RYAN	we're working through the night		Cu3		

13.10	ANNIE	this is one thing I didn't think I would be doing today				
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Table 6.10 codes extract 6.10

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
30.24	ANNIE	I've found a cow shall we like...make a farm			E2	
30.26	RYAN	kill it	D1			
30.26	ADAM	==kill it		Cu2		
30.27	SHIV	no, don't don't don't, get some wheat and them bring them back and then breed them			E9	
30.30	RYAN	bring it back			E4	
30.34	GRACIE	we don't have any wheat though			E9	
30.36	MIA	destroy the fences we have got an axe			E2	Cr5
30.30	ANNIE	guys I think we might be coming back with a pet		Cu2		
30.42	ADAM	Why?			E10	
30.43	ANNIE	cos I am gonna get some seed and I am gonna plant them and I			E9 E1	Cr7

		am gonna lure the cow back				
30.53	SHIV ANNIE	pretty cow pretty cow				Cr5

Appendix E: Coded tables of dialogue for Chester School

Table 7.2 codes extract 7.2

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
24.36	KAFE	we've already found our settlement	D1, D4			
24.39	TAZMIN	I think we should have separate settlements			E3,E2	
24.40	ARCHIE	we are just going to live on this boat, we are going to live on this boat. Yes we are you didn't say we can't	D1, D5, D4			
24.51	ARCHIE	you didn't say we can't live on the boat did they. KAFE they didn't say you can't live on the boat	D5			
24.52	KAFE	we're not	D3			
25.57	MICHAEL	we've already got our house	D1, D3, D4			
25.01	TAZMIN	we haven't got anything	D3, D4			
25.02	MICHAEL	can't you live in that castle and extend it			E2	
25.05	MICHAEL	we broke it	D3			

Table 7.3 codes extract 7.3

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
19.37	KAFE	hey look behind you (laughs)	D3	Cu2		
19.40	TAZMIN	stop it (to KAFE, KAFE wounding TAZMIN) don't be mean				
19.46	KAFE	did you try and break cobblestone			E10	
19.49	ARCHIE	we found two people, we've found you	D5			
19.56	ARCHIE	I'm going to try and kill TAZMIN and ROSE (laughs) we've only got one heart left	D5			
19.59	KAFE	we've got a sword, we've got a sword (laughs)		Cu2		
20.02	TAZMIN	stop chasing me	D5 D3			
20.04	KAFE	we're not	D5 D3			
20.07	MICHAEL	we're chasing the other ones	D5			
20.12	MICHAEL	you need a sword to break them	D5			
20.19	ROSE	they are after us (meaning	D5			

		MICHAEL and KAFE)				
20.22	ROSE	they are after us	D5			
20.23	TAZMIN	I know they are	D3			
20.24	MICHAEL	we've been in that house, look they are getting into our house KAFE, get them, get them	D5			
20.35	ROSE	stop killing us	D3			

Table 7.4 codes extract 7.4

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
30.45	T	so you have all settled on this island, you have got to survive, do you think you are going to survive separately				
30.50	MICHAEL	yes,		Cu5		
30.50	ROSE	we could		Cu5		
30.51	TAZMIN	in some ways yes and in some ways no		Cu5		
31.04	ARCHIE	technically we are near each other		Cu2		
31.05	KAFE	and we are near you		Cu5		
31.10	T	some ways yes and		Cu 4 Cu5		

		some ways no TAZMIN?				
31.10	TAZMIN	because more people could always help and have better ideas and you can all work together to build a big house in the same place but when you are by yourself you can do ideas that some people wouldn't think of and you can go off on your own and there is less chance of more of you dying			E1	
31.35	T	what does anyone else think?				
31.36	ARCHIE	spot on		Cu5		
31.36	KAFE	spot on		Cu3		
32.36	MICHAEL	yes		Cu5		

Table 7.5 codes extract 7.5

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
9.54	KAFE	that's someone's house, that's someone's house		Cu2/Cu3		
10.00	TAZMIN	that's my house		Cu2		
10.04	KAFE	you can't break it ARCHIE, that's their house, that's their house				
10.07	TAZMIN	ARCHIE ARCHIE				
10.10	KAFE	ARCHIE please do not break the house	D5	Cu1 Cu3		
10.10	MICHAEL	anyway TAZMIN now you can go and take from theirs		C1	E6	
10.21	KAFE	Oh yeh I've got some, I've got some umm wool so you can build a bed		Cu1 Cu6		
10.25	TAZMIN	oh thank you		Cu1		
10.24	MICHEAL	we've only got 2 bits you will have to get one more		Cu1 Cu6		

Table 7.6 codes extract 7.6

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
32.30	TAZMIN	so we built our house near everybody else so if we needed help we could just go to them and also the main reason we built it here was because there was lots of flat land and lots of space and it was already half built and we didn't have to use that much and it came with a chest and it was near water and really close to trees			E1	
33.11	ROSE	we have worked hard, it was really hard to start with as we had to use lots of stuff but we have had loads of people helping us do it		Cu1, Cu2		

		<i>[points to MICHAEL]</i>				
33.21	TAZMIN	at the very beginning people kept coming in and making us things to help us get it done quicker		Cu1, Cu2		

Table 7.7 codes extract 7.7

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
4.27	RUTH	you also need some flat land			E2	
4.29	KAFE	they need trees, there needs to be lots of trees			E2	
4.33	TAZMIN	ARCHIE said that you needed to be near farms but I notice the land there is actually really bumpy and there are lots of dips in the land			E3 E6	Cr4
4.54	T	is that an advantage or a disadvantage?				
4.55	ARCHIE	advantage	D3			
4,56	TAZMIN	I think disadvantage because if there is lots of ummm bumpy bits then there is not really going to be a big space to build a house			E1 E3 E9	

		or enough space				
5.00	KAFE	well we could fill in the holes [<i>making a levelling gesture with hand, looking at TAZMIN</i>]			E9 E2	
5.04	TAZMIN	yeh but that would take a lot of time			E9	
5.10	KAFE	not really, just go somewhere else and dig up some earth to fill in the holes and then you've got flat land			E9 E2	

Table 7.8 codes extract 7.8

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
19.36	TAZMIN	we have almost finished our roof. We have collected a lot more wood to go into our house and make a gate for the farm to protect it and we have found some saplings and some seed and put them in the umm, put them in umm the farm so that if anyone else needs them they are there			E1	

20.25	TAZMIN	we need a community, a community			E2	
20.25	T	what does a community mean				
20.26	MICHAEL	well, it means there are other buildings around it, so like a village or				
20.32	ARCHIE	==well we could make more buildings			E2	
20.51	ARCHIE	well, umm there are cathedrals			E2	
20.52	TAZMIN	well there are not always cathedrals			E9	
20.53	MICHAEL	well there are some cathedrals			E9	
20.55	TAZMIN	== but a community could be like just a group of people like church community or some thing			E9	
21.03	MICHAEL	it could be a church, it could be a cathedral it could be a royal palace			E2/E3	
21.05	TAZMIN	it could be any group of people			E2/E3	
21.14	T	I'm interested in ARCHIE 's idea of an				

		religious place do think that is important				
21.24	MICHAEL	No	D3			
21.30	TAZMIN	well it is to some people			E9	
21.32	T	anything else?				
21.35	ARCHIE	what about an entertainment complex			E2	
21.45	TAZMIN	that's not essential			E9	

Table 7.9 codes extract 7.9

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
25.31	TAZMIN	I think we should do....I don't know because there are a few ideas that I think would be quite important, like a place of worship, or like defence or animals should be kept			E1,E3	Cr7
25.50	T	ok, what do you want to do				
25.52	ROSE	Umm				
26.00	ROSE	I don't know			E5	
26.03	MICHAEL	I kinda think protection			E2	Cr7
26.11	MICHAEL	== yeah		Cu5		
26.12	T	you could split into teams and do both				
26.15	TAZMIN	yeah...I think we could turn the castle into something			E2	Cr7

26.17	ARCHIE	== yeah, that is what I was going to do, I reckon		Cu5/Cu4		
26.21	MICHAEL	== you two do one thing and us two will do another				
26.32	TAZMIN	== oh yeah		Cu5		
26.32	ROSE	== and then we look at the different things and we see, and we see what we think is best		Cu2	E2	
26.35	T	ok what are the two things you are going to do?				
26.37	MICHAEL	I, I				
26.39	TAZMIN	== a worship place and probably animals I think			E2, E3	Cr7
26.42	MICHAEL	==I, I, actually shall we do a homeless shelter			E9	Cr7
26.47 C	ARCHIE	== as I think it is quite important		Cu5/Cu4		
26.50	TAZMIN	==but to be honest do you think it is necessary and it is quite hard to build			E9	
26.51	MICHAEL	oh yeh, I see			E8	

Table 7.10 codes extract 7.10

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
28.23	T	ARCHIE and RUTH how is your house located, I want the others to stop, so it will help you to survive				
28.23	KAFE	Ok	D1	Cu6		
28.33	T	ok I'm going to stop as someone is not listening				
28.44	RUTH	ummm it is near trees and water so you can get food and wood			E1	
29.23	KAFE	they could drown			E2	
29.35	TAZMIN	well it could be , if they didn't notice that there is a quite deep bit of water and they could go under, it is near really deep water and they could get trapped			E3	Cr4
26.37	KAFE	they could swim				
29.44	ROSE	I was going to say the same thing		Cu5		
29.46	TAZMIN	it could flood, water could all come flooding in			E3	
29.50	T	oh is that right?				
30.11	KAFE	their settlement is no good it is a wreck			E9	
30.14	ROSE	it could catch fire cos it is made from wood			E2 E1	
30.25	KAFE	and it is in water			E2 E6	

30.26	T	anyone else?				
30.39	TAZMIN	they are quite far away from other places I can see and umm and you would have to get across a whole bit of water to get to them and they are quite high so you would have to climb up things to them			E1	Cr4
31.14	KAFE	there are lots of streams near here , they could go different ways that could flood			E3	

Table 7.11 codes extract 7.12

Time	Actor	Dialogue	Disputational	Cumulative	Exploratory	Creative
11.30	TAZMIN	we could do something with the fence			E2	
11.32	MICHAEL	ummm make the farm better ..we need to make it grow quicker as it hasn't been growing as they are not doing very well,			E1, E2	
11.35	TAZMIN MICHAEL KAFE.	we need bone meal	D2		E2	
11.37	T	where do you get that from?				
11.37	MICHAEL	Bones				Cr1

11.38	ARCHIE	where do you get bones from				
11.40	MICHAEL	==and skeletons	D2		E2	
11.40	ARCHIE	Yeh		Cu5		

Appendix F Screenshots of the play in the Minecraft World

Screen shot of the settlement produced by the pilot group

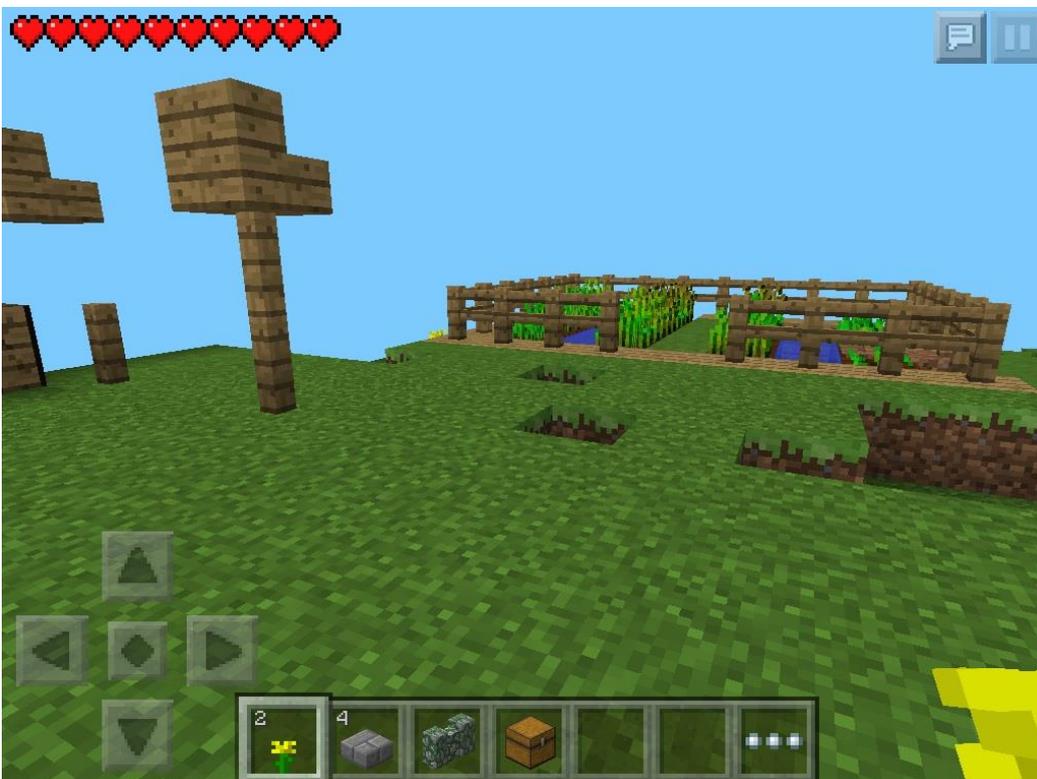


A screen shot of the well that was discussed in Chapter Five, extract 5.8





An example of a shelter built by pupils in Chester School



An example of crops planted and growing by pupils in Chester School

Appendix G Exemplar transcript

Exemplar Transcript from Lesson 1 Hambrook School

8.45 T so what do we think about our pictures anybody

8.48 ANNIE well I think this is quite good because you have got mountains for things like rock and ors and things and then you could build a farm on a south facing, areas of forest you could probably live around here and there is a lake for a source or water, poor soil is not really good but the forest may have some good soil

9.05 T yes you would have to cut down your trees first. Why is south facing good ? You said it is southfacing you could build a farm which I agreed with

9.10 RYAN isn't that where the sun rises

9.16 T yes, so if you have a south facing bit of land you have got more sun and that's good because

9.19 ANNIE because the grass grows for the animals so they can eat it

9.29 T so if you have got sun you know that you are going to

9.30 ADAM grow

9.31 T so these are all things you might want to consider when you are playing Minecraft

9.45 T ok SHIV do you want to talk about your picture?

9.45 SHIV you have got a river there and then and then you've got a load of trees around here so you can cut down and then you've got rich soil over there so you can do the farming land and that's gotta be a good thing because the hill is drops and is south facing cos weren't it would be blocking the sun

10.04 T ok

10.05 RYAN yes, but it would get more sun in the evening

10.06 SHIV yes, but you have got the hill top, it's there and it wouldn't get any sunlight but if it is here you will get it this way

10.22 T ok these are really interesting answers you are giving. ADAM and GRACIE what do you think?

10.25 GRACIE well we said that we could build our house here if we had the building materials

10.26 T yes

10.27 GRACIE but we have no trees around so we have nothing to really build a house with and we can't really make it at the rocky hillside but we could get stone but we don't have any water nearby or anything

10.28 T ok these are really good answers

The above extract is where children are looking at some pictures of landscapes – this has not been included in any of the extracts as they were not playing Minecraft at this point – I was also leading the conversation in this part of the lesson

This is followed by 10 mins of teacher instruction on how to use Minecraft and naming of avatars

20.23 RYAN I'm in the shipwreck

20.24 MIA I'm in the castle

20.25 ANNIE oh we should repair this and make this own home

20.26 MIA yes, we need some wood though to make a pick axe

20.27 ANNIE and some stone to replace like the moss

20.35 MIA I don't think we can make stone

20.44 ANNIE yeh but if can make stone we can replace it

20.46 MIA yes, I hope. Is there water nearby

20.46 RYAN we should live in the shipwreck

20.56 ANNIE are cool there are some tools in here

20.57 SHIV where, what?

21.06 MIA there is an axe and sword

21.04 ANNIE have we got stone

21.15 MIA yeh we've got some stone

21.22 ANNIE oh that's awesome shall we make a house

21.23 MIA the first people to

Another pair talking at the same time

21. 10 GRACIE we need to find an area for the house.

21.14 ADAM I thought like here as then you would have the height advantage

21,15 GRACIE are you allowed to take anything from the wrecks?

21.33 on theres a sheep and everything

21.42 ANNIE shall I chop down some tree?

21.42 MIA yes

21.45 GRACIE we have got some wood, stone a stick and some charcoal

22.00 ANNIE noone take over our house

22.00 GRACIE ah you have got a pick axe I saw it

22.11 ANNIE guys you should live in the ship you could repair it a bit

22.17 GRACIE are we, are we like have separate houses?

22.18 SHIV can we change the settings (on Minecraft)

22.22 T listen to GRACIE, what did GRACIE say?

22.23 are we making separate houses or are we making a big one?

22.24 ANNIE I think it is up to us to decide what to do

22.26 RYAN shall we make a huge one and have our own separate rooms

22.30 that's fine. Is that alright with everyone *seeking and agreeing opinions*

22.40 yes, yes sure (everyone)

22.41 ANNIE so, this could be our miniature fort

22.42 MIA yes but we would have to find out where everyone is literally

22. 44 RYAN are you in the fort?

22.46 MIA yeh

Next 15 secs is un-intelligible

23.00 MIA we all need to go to the same area

23.05 RYAN we need to come to your castle

23.06 MIA we are at the castle you should be able to see it

23.14 RYAN where is the castle,

23.20 RYAN where are you?

1 min of talk about Minecraft

24,37 GRACIE we should meet up

24.39 RYAN let's meet at the fortress

25.51 ANNIE what shall we call the island guys?

Video turned off at this point for a short break

Lesson 1 part 2

2 mins of minecraft speaking

04.16. ADAM I've thought of an idea. We could live in the boat and extend the structure – then we would have water all around us

04.21 T what do you think about that idea?

04.21 RYAN its quite a good idea *agreement*

04.21 SHIV yes

4.21 T so ADAM said unlimited water supply

4.23 ADAM yes but you know its the ocean though

4.24 ADAM but you know it is really close to land to we could get to it

4.24 ANNIE yes

4.25 SHIV but we have to build our won settlement basically you have just fixed up a ship wreck which isn't really iron age

4.25 MIA nor is the brick house *difference in opinion*

4.30 GRACIE yes but if you find something in the world that is already there you can think I'll use that to build the house

4.47 RYAN that's probably what I would do I would find a thing and just live in it

4.53 T ok what are you going to do now, what is your next steps?

4.53 MIA I think we should build a house

4.53 GRACIE explore the island

4.55 T yes ok I think you need to go off exploring

5.00 T yes

5.06 ANNIE if we do find some animals could we harvest them of something

5.10 T you could, why would that be good?

5.11 ANNIE so there is food

5.14 GRACIE but we don't really need food do we

5.15 ANNIE but if you hurt yourself it can help you

5.16 MIA I agree

5.27 T think about settlement, you are thinking about Minecraft at the moment, you do need food for a settlement don't you

5.32 yes (everyone)

5.32 T go one then go and explore

5.47 ANNIE where did that cow go, you killed it

5.48 MIA I killed three cows

5.49 T so at just gone 10 to we are going to stop and think about your settlement locations ok

5.50 MIA oh I've seen another house

5.51 RYAN can we start building

5.25 T wait

5.26 ANNIE we're back at the fortress

6.10 ANNIE Hi Steve

6.14 everyone hi

6.15 MIA lets take the bricks

6.14 MIA the bricks are ours

6.33 SHIV right we've got two stacks of wood

6.34 RYAN we've got two and a bit stacks of wood

6.34 MIA so we can protect our house

6.39 ADAM we've found a cave, there's nothing in it (group laughs)

6.40 ANNIE that would be a good place for our settlement though

6.45 MIA yes

6.45 GRACIE yes

6.50 MIA if you think of real life putting a settlement in a forest is not a good idea cos of all the animals

07.03 ANNIE our pick axe is nearly breaking shall we collect some stone

7.04 MIA ok

7.05 SHIV we've got an iron pickaxe

7.06 RYAN look at our pickaxe

7.15 T so are you exploring the island

7.15 yes (everyone)

7.16 ANNIE yes I am just making some tools

7.20 T your task is to be exploring the island

7.22 ADAM we are just checking in the ship wreck for things .."oh, you are shipwrecked (reading sign in game) your task is to build the best settlement possible

7.31 ADAM we need to do the best kind of settlement to survive

7.34 MIA sheep in the house

7,35 ANNIE let's get the sheep so we can pen them

7.40 MIA a brown sheep is heading into the brick out

7.41 RYAN yes so if we explore over there, I don't think anyone has been there before

7.45 RYAN glow stone

7.46 ANNIE oh collect that

7.40 ADAM we've got a two bits

7.53 MIA it is weird in real life would you really create a settlement in a forest where there are animals that could kill you...wolves

8.00 T well that's for you to think about isn't it, would you? Is that the best place?

8.08 MIA not really

8.08 ok

8.10 ANNIE we have two brown sheep we just need one more to make a bed (beds are made from wool)

8.23 RYAN we don't really need to sleep

8.28 ANNIE lets go exploring

8.31 RYAN I'm on the island you told me to go to (addresses SHIV)

8.45 SHIV we could go into the sea

8.45 RYAN I can see the edge of the world

8.50 SHIV no you can't

8.51 RYAN yes it is it is over there

8.52 MIA we should put some stuff in the chest

8.53 ANNIE ummm (in agreement)

8.54 GRACIE we should explore over there

8.55 ADAM we could grow some sugar cane.. (rest of sentence unintelligible)

9.05 T I think you want to go in the other direction

9.06 ADAM I am

30 secs of quiet speaking ...hard to pick up

9.41 ANNIE I don't think anyone has been over there yet

9.47 GRACIE behind you, over there

9.53 MIA maybe we should have a look in the tall grass and get seeds and grow stuff

9.56 SHIV we have already got 10 seeds

9.59 RYAN oh yeah we've been here

10.00 ADAM I'm just exploring

10.05 ADAM this bit has a lot of sapling its looks like someone has already been here there is alot of saplings

10.18 MIA we don't want to go anywhere anyone else has been

10.24 GRACIE there's some nice flat land *agreement*

10.26 ADAM yes that is quite flat and it is next to something like a lake

10.30 GRACIE yes, a beach kind of thing

10.31 ADAM yes, that's quite good we could start it from along here and move on..

10.38 ADAM and GRACIE we've found something

10.43 GRACIE we have found like a flat land part

10.43 ADAM with a lake and a tree and it is not that far away

10.44 ADAM so you just have to go up a bit

10.57 T ok let's pause a minute, what did you say ADAM?

11.04 ADAM uumm we found like some flat land and we could put some umm stuff on it and it is right next to a like so we can get water supplies from it and it is near trees as well you only have to walk up liker eerr a little hill, it's really flat, it's quite flat

11.18 T where are you?

11.19 ADAM we are at the edge of the world

11.22 T can you just show me

11.25 MIA we are next to them

11.21 SHIV never build a settlement next to the edge of the world

11.24 T why is that?

11.28 SHIV cos it messes up your settlement say you wanted to build a block, it would just go into the edge of the world and you can't get any animals

11.53 T so can we all stop again please just one person keep your finger on the screen so we don't get disconnected from the server, we have been doing quite well at getting disconnected and everybody's eyes on me..RYAN...that's it fantastic. 12.31 GRACIE well we do have cobblestone nearby and sand for glass and there is lots of flat land and a lake and there is trees not far away so we could make a house there

12.57 SHIV but I don't think we should build at the edge of the world

13.05 SHIV we have found quite a good settlement

13.05 RYAN it is tiny

13.10 RYAN it is a really small island..

13.12 SHIV no not that one its near to the sea and there is plenty of water, we could flatten the land out and there's a load of grass there

13.20 ANNIE why would that be good?

13.27 SHIV cos you can have a lot of stuff, you can have a lot of farmland and there is quite a lot of trees around and right next to use there's some stone

13.34 RYAN there's quite a lot of stone actually

13.35 ANNIE yes there's loads

13.36 T what does anyone else think do you think that is a good idea?

13.44 ANNIE I kinda like this place a bit more because it is nice and flat

13.47 T why?

13.47 ANNIEwell, it is like a beach with a little lake in the middle and there is loads of like...there is a massive wall of stone and it has got lots of rock and it has got water, it has got hills and it has got flat land, its got like a good amount of dirt to farm and stuff and I think it is really quite good

14,18 T what does anyone else think about that?

14.21 GRACIE yes, that is we we are

14.21 ADAM yes

14.21 GRACIE and we find it pretty nice we could be a house and make it quite big

14.35 GRACIE so we can fit everybody's room in

14.38 T ok

14.38 ANNIE and we can fit storage

14.43 why storage, why do you need storage

14.54 ANNIE to storage armour, tools and food and all of those essentials that you need to keep safe

14.48 T ok, ok so how many settlements have you found

15.04 ANNIE 3 I think

15.04 MIA I've found a wood house, fort, shipwreck, farm

15.06 RYAN 5

15.06 ADAM 5

15.06 T out of those five, so there was a brick ,house, shack a shipwreck, a castle

15.13 ADAM and there was that mini that you found (points to RYAN and SHIV)

15.24 T and so did anyone find a wooden house that had some fences by it

15.25 ANNIE and MIA yes

15.28 ANNIE I think if it would have been repaired it would have been a really nice place as it had farming land and it had a little roof and walls and, not much was actually wrecked and it is easily repaired with wood

15.54 T what does anyone else think about that farming area?

15.59 RYAN it could be quite good if we repaired up the whole thing

16.00 ummm

16.04 RYAN and we could all live in it cos it was an ok size

16.11 T what about these things we talked about at the beginning

16.20 GRACIE we need trees and stuff

16.21 T ok

16.24 GRACIE for wood so you can collect wood and everything

16.24 MIA saplings?

16.31 ANNIE there's some trees over there on the top of the hill guys

16.32 GRACIE and we have got saplings so we can place some down

16.33 ADAM yes we have 4 oak and three birch

16.34 ANNIE we've left some at the fortress

16.34 ADAM we've got some things we could use for our house cos we have got cobblestone, some wood, a door that we used for something, a chest a furnace and a crafting table

16.47 ANNIE and we have got some bricks

16.52 T ok so do you think people would have taken things from other places to make settlements?

16.57 RYAN if they found them yes they probably would

17.00 ANNIE, yes if it was abandoned

17.00 MIA they would take it anyway

17.01 T they would probably take it?

17.05 RYAN even if someone was living there they would probably take it

17.06 T ummm

17.10 SHIV on the island over there there is a lot of trees

17.12 ANNIE umm but it doesn't look that big a piece of land, there is only a small amount of land that is quite flat

17.17 RYAN well we could always level it off and build steps

17.28 GRACIE ummm, well we could always meet up here to see if everybody likes it and if not we could have a look around and see more places where you have been
suggestion

17.32 MIA yes ANNIE yes SHIV nods

17.35 MIA I think we should return to the fortress and grab our stuff

17.39 ANNIE yes, and then set up camp here I guess

17.39 T Ok have you got a plan then?

17.40 MIA yes, I think we probably have

17.42 T what are you going to do now then?

17.45 GRACIE we are going to meet up where X is

17.46 MIA we are just going to get our stuff

17.50 RYAN we found a massive mass of iron

17.56 ANNIE I'm going to the fortress and collect our stuff then I'm going to come back

17.58 ADAM I'm just filling in some holes

17.59 ANNIE shall I grab some brick

18.03 T ok, have you got a plan as to how you are going to go forward

18.03 yeah (everyone)

18.04 MIA if we put sugar cane there we can make sugar, paper. Books

18.05 ADAM yes, we've got sugar

18.14 ANNIE shall we put the sugar cane down then

18.17 RYAN but we have got (unintelligible) *build on*

18.19 GRACIE yes, so you can get provisions

18.20 RYAN and we got 99 pieces of wood

18.21 T ok so listen to what RYAN has got to say

18.26 RYAN we have got like 3 stacks of wood and some iron tools

18.42 T ok so I am going to let you play again now for another 10 mins

18.51 SHIV near the shipwreck there is quite a lot of places

18.52 ADAM I've just planted some sugar cane

18.55 SHIV there's some really good places near the ship wreck

19.00 MIA go to the ship wreck and head that way (points behind)

19.01 SHIV go to the shipwreck and head left

19.05 MIA you can see us

19.06 MIA keep going the way you are going, keep walking in that direction

19.09 ANNIE yeah and you will find it, you have got to swim as well, I think it is just over there

19.29 GRACIE oh I'm going to collect some flowers

19.42 SHIV there is quite a good place here but its kinda on the edge of the world

19.45 ADAM yes, that's where...

19.46 RYAN yes, that is a good idea *agreement*

19.48 Shiv yes, that is a good place

19.51 RYAN I think we should build a house

19.54 SHIV why did you make a stone sword

19.57 RYAN I collected the wrong stuff

20.04 ADAM turn around and come over here and see the settlement that we thought of

20.06 SHIV we need to be near water

20.09 ADAM it is near water, it is near quite a lot of water

20.17 GRACIE if you come in here you could build you settlement along here cos it is quite big

20.20 SHIV yes but look its the edge of the world

20.21 ADAM yes we know

20.22 SHIV there's not much space to build a settlement *exploratory*

20.23 RYAN why would you build a settlement at the edge of the world

20.25 GRACIE well its not...

20.26 ADAM we could extend it

20.29 RYAN we could dig into the side of the mountain

20.30 ADAM yes and extend it

20.31 MIA yes

20.31 SHIV look at this, I thought of this place here

20.40 SHIV come here

20.42 T is SHIV asking you to do something

20.42 SHIV come and look at this place

20.45 ADAM ok

20.46 ANNIE we'll come

20.50 MIA shall we grab our ladders and our torches

20.57 SHIV I will start digging out the land, you can help if you want to, we will need to add some farm land

21.04 SHIV can someone grab a load of dirt for out farm area

21.06 MIA we can grab some dirt

21.07 SHIV yeah grab some dirt

21.13 RYAN yes this is definitely not enough area to build a settlement on

21.18 ANNIE guys we have got some ladders as well

21.19 MIA yeh, so we can create upper floors

21.18 RYAN why does it have to be square?

21.18 SHIV is doesn't

21.27 MIA anyone got any torches

21.28 RYAN yes we have got one

21.33 SHIV one of us could go mining

21.35 MIA we need to put all our stuff down

21.53 SHIV anyone else got any dirt

21.56 RYAN well we'll get some in a minute

21.59 ADAM i've got some stone cutters

21.9 MIA wow

22.07 MIA we need to collect some wood

A cow appears in the world and everyone laughs

22.41 T where are you all

22.41 we are on an island (everyone)

22.46 GRACIE this could where the farm is then

23.17 SHIV anyone got some more dirt

23.18 MIA we've got some dirt

23.25 ANNIE guys I can see you

23.32 MIA this is who?

23.33 ANNIE that is X and X

23.37 MIA I can see two people X and X

23.42 ANNIE guys we have got another chest and another crafting table

23.49 ADAM ok so we can make a double chest and a double furnace and a double crafting table

24.40 SHIV we can make farm land and stuff

Players get temporarily disconnected from game and there was discussion about why this had happened

26.27 T so have you decided where to build you settlement

26.28 yes (everyone)

26.37 SHIV there's a load of water nearby, there's dirt that we can put on top of the sand which I am doing now, there is a lot of building material , there is loads of trees around and also if we run out of trees we can use....and we can use sugar cane for growing, there is a lot of farm land

27.15 T thank you, what else

27.23 GRACIE ummm wheat

27.24 T why wheat?

27.25 so we can get food

27.27 RYAN and bread

27.27 T ok

27.32 RYAN animals

27.34 T what do we all think?

27.43 RYAN cos we need food and leather

27.50 T are you working as a team

27.21 yes everyone

27.53 we are building one big settlement

27.56 T ok do you want to start building

27.57 yes (everyone)

27.58 T do you think you are ready to start building, do you think you have explored enough, do you think you have got all those natural factors in there, because at the end of this you are going to have to write down what you have done ok. So there is there is not test, it is not an exam but you will have to justify your reasons. So I just want you to make sure that you are happy with your settlement. So let's go now to spend the last 10 minutes building, but don't

get lost in the play of Minecraft I want you to think about the bet settlement for you to survive. Remember you have got to survive on this island, so you've got to think how is your settlement sustainable

29.33 RYAN I think we should make a three high, three thick wall so nothing can get through it

29.35 T ok

29.35 GRACIE or we could put fences all the way round our house

29.40 SHIV we need fences so we can build them up so they are high

29.20 ANNIE but creepers are suicidal

29.26 T ok but think about if you would be in an early settlement you would not get creepers you would be getting invaders, so how would you protect yourself

30.09 RYAN big walls

30.09 T ok

30.16 SHIV have a boat of if you were attacked you could jump in a boat and row off

30.20 ADAM or you can get an iron door instead of a basic wooden door so you need a lever to get in

30.44 GRACIE well what we could do if we only have wood doors we could put one behind the other to make like a porch and we could have fences going around so it is like really secure

30.59 RYAN yes, well we could have a piston door

30.59 T why is that good

31.00 RYAN ummm cos it is just a door where part of the wall slides back

31.14 SHIV we can't so that on this game

31.14 T yes, we can't do that. Alright we have 10 minutes to go so you can all start thinking about the building

31.31 ADAM so what materials shall we build it out of

31.36 SHIV wood we have got a load of wood so I was thinking of building a round house

31.43 SHIV we could build a really good round house, someone has to collect a load of dirt for the flooring

31.47 ANNIE we have got a load of cobble and wood and brick

31.52 SHIV we need dirt for like the farm

31.54 MIA we've got some ladders

31.54 ADAM there is a massive dirt bit

32.00 RYAN yes we could make it two storey but maybe next time we could build that

32.03 ADAM whoops *lots of suggestions but talking in parallel*

32.03 ANNIE for the time being me and MIA have been like making a little cave in the wall

32.08 SHIV for the house make like a round house which are easy to build and then you could put like two floors on it and then you could put a fence round it which are easy to build

32.19 ADAM right we need to extend this bit

32.25 GRACIE I suppose what we could do is we could like get some wood with some little windows

32.29 SHIV but they didn't really have windows though did they *difference*

32.29 RYAN they just sort have had holes

32. 29 SHIV they were just dark with a fire in the middle *difference*

32.25 RYAN they might have had a few holes here and there

32.30 MIA I've got some dirt

32.42 ANNIE yes but it doesn't have to be exactly

32.55 ADAM I've just extended it a bit

33.04 ANNIE ohhh

33.06 MIA who knows how to drop stuff?

33.10 MIA oh you just press and hold

33.20 GRACIE if we are about to start build we could do the outline of the house to see how big it is

33.21 ADAM yeah, yeah

33.25 GRACIE so who has the most wood

33.28 umm (everyone)

33.28 MIA we put ours in a chest

33.25 ADAM we have 21+ birchwood

33.36 GRACIE how many did you say you had

33.38 RYAN a stack and a half

33.46 GRACIE so if we make the outline of the house then work on then work on making it big

33.54 SHIV start placing the dirt all in here....don't put sand there

34.02 ANNIE guys I'm just wondering if me and MIA could go out adventuring cos I don't think we've explored all of the world

34.09 ADAM I'm just extending this bit for the house

35.15 GRACIE well, while you are exploring you could always get some wood for the house

35.16 RYAN and ADAM yes

34.18 ANNIE I want to make sure we do that

34.22 ADAM ok i have made like a corner part of it

34.38 T so in 8 mins time I am going to come and see what you have done and come down to you and see how far you have got

34.45 ADAM lets go and chop down those trees

34.49 RYAN are we going to make a makeshift house for just now

34.50 MIA ok

34.56 GRACIE what have you done with this dirt then, is this going to be the farm

35.09 RYAN who can keep hold of the dirt ADAM do you want to keep hold of the dirt

35.12 ADAM ok

35.15 RYAN I'm throwing you the stack

35.30 RYAN the house for now is just going to be over there in this cliff

35.35 MIA we are exploring so

35.44 MIA ok we now have three more, the rest are in the chest

35.48 RYAN this should be big enough for now it is just in the cliff by the edge of the world and it just literally a hole in the mountain

35.57 MIA how much more wood do we need

36.07 GRACIE well bring the wood over and we will make the outline of the house

36.11 MIA ok

36.15 RYAN has anyone got any wool?

36.03 MIA yes we have got one wool

36.29 ANNIE guys why don't we steal a bit of wool from the sails of the boat

36.35 ADAM we are going to have to get rid of some things

36.40 RYAN has anyone got 2 iron

4 mins of minecraft speaking to build the house

41.56 T so what have we learnt today

42.01 ADAM that by umm to live by water umm and to make sure that you have all your supplies to live

42.09 T ok to live by water, why is it important to live by water?

42.13 ADAM so you can have a water supply for a drink

42.17 T what else have you learnt – thank you SHIV if you just put that on the table now, lovely

42.23 ANNIE that surviving with a team is better than surviving on your own as we would probably get injured a lot if we were without each other

42.32 T oh that's an interesting idea do you agree with ANNIE?

42.37 everyone yes

42.37 T that is an interesting idea, SHIV what have you learnt

42,43 SHIV I've learnt that...

42.46 T sure do you want me to come back to you, do you want to have a think about it anyone else. GRACIE what have you learnt

42.50 GRACIE I've learnt that well when you are building houses you always need to have the supplies around you instead of going to far away and not having them round you

43.07 RYAN not having to walk you don't want ot have to walk cos then you would have to walk back with all the heavy supplies

Appendix H: Examples of written work

Exemplar written work produced at Hambrook School

QD. List the natural sight factors that have to be considered when making a settlement.



Water is needed for cooking, hydration, growing and washing but if there is too much of it danger may start.



Trees are needed for honey, wood and leaves.



Food is needed for hunger, energy and animal taming.



Flat land is important as it is easier to build on and is a good place to plant crops.



Rich soil is important as it can grow crops like carrots, wheat and potatoes for food for you and animals.



Warmth is important so that you do not get an illness from lack of heat.

The natural advantages to my site location are the good amount of trees for wood which is one of the key things of survival. Food is also provided by the big amount of animals near good land. The natural disadvantages of my site locations are the flooding that can be caused by the ocean we live near. Also it would be hard to protect from the large amount of high ground which is easier for attackers.

 = Water so you can grow crops and also so you can drink.

 = Flat land to build your house on and to have a vast, empty place to grow crops.

 = Sun to help crops grow and so you can easily see your surroundings.

 = Trees that you can chop down for the wood to build a shelter with.

 = animals for the meat so you don't starve. Also, Sheep give you wool so you can build a bed to sleep in.

 = Tools and weapons so it is easier to mine and defend yourself.

 = Good soil for growing crops on and helping things live.

Learning objective:

To develop a greater knowledge of the site factors that early settlers looked for.