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**Pupils as Leaders: The Role of Science, Technology, Engineering and
Mathematics Leadership Qualification in Promoting Pupil
Leadership**

by

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Abstract

There has always been a significant interest in the development of leaders not least in the secondary school sector. However, little research exists on how pupils learn about leadership with a STEM focus. This thesis explores the perceived leadership skills and attributes gained when pupils undertake the STEM Leadership Qualification (SLq). The qualification is based on the leadership framework of 'Personal Capabilities' (Bianchi, 2002). This study uses a qualitative case study methodology utilising a semi-structured interview method to generate data. Interviews were held between May and July 2012.

The findings show that not all 'Personal Capabilities' were achieved. The study concludes with *seven empirical claims* of the findings that are based on; Power, Experiential Learning, Emotional Intelligence, STEM activities, Specific Team Roles, Collaboration and Communication. An emerging theoretical framework is proposed to demonstrate the main conclusions of this study (Figure 5.4).

STEM in secondary school education, as detailed in the Literature Review, is a supporting pillar to deliver the SLq programme. The use of activities and enrichment allowed pupils to contextualise leadership skills and attributes to their everyday school life. Thus, making a positive difference in helping them understand some of the principles of leadership but more important than this is potentially growing leaders of the future.

Dedication

I dedicate this thesis to my late mother:

“A thousand moments that I had just taken for granted - mostly because I had assumed that there would be a thousand more...”

Morgan Matson (2013)

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List of Abbreviations

Advanced Level (A Level)

Department for Business, Energy and Industrial Strategy (BEIS)

Birmingham Chambers of Commerce (BCC)



British Broadcasting Corporation (BBC)

British Educational Leadership, Management and Admin Society (BELMAS)

Building Learning Power (BLP)

Centre for Science Education (CSE)

Confederation of British Industry (CBI)

Department for Children, Schools and Families (DCSF)

Department of Business, Innovation and Skills (BIS)

Department for Education (DfE)

Department for Education and Skills (DfES)

Department of Trade and Industry (DTI)

Disclosure and Barring Service (DBS)

Education and Examination board – Pearson (Edexcel)

Further Education (FE)

General Certificate of Education (GCE)

General Certificate of Secondary Education (GCSE)

Intelligence Quotient (IQ)

Joint Council for Qualifications (JCQ)

Making Learning Better (MLB)

National Curriculum (NC)

National College for School Leadership (NCSL)

National Science Learning Centre – University of York (NSLC)

Office for Standards in Education, Children’s Services and Skills (OfSTED)

Office of Qualifications and Examinations Regulations (OfQUAL)

Personal Capability (PC)

Personal Capabilities (PCs)

Personal, Social and Health Education (PSHE)

Qualifications and Curriculum Authority (QCA)

Qualifications and Curriculum Development Agency (QCDA)

Research Council UK (RCUK)

Research Question (RQ)

Science, Technology, Engineering and Mathematics (STEM)

Science, Technology, Engineering and Mathematics Leaders Qualification (SLq)

Sector Skills Council for Science, Engineering and Manufacturing Technologies (Semta)

Specialist Schools and Academies Trust (SSAT)

United Kingdom (UK)

United Kingdom Commission for Employment and Skills (UKCES)

United States of America (US)

University Technical Colleges (UTCs)

Chapter One - Introduction

1.1 Introduction

This study is entitled '*Pupils as Leaders: The Role of Science, Technology, Engineering and Mathematics Leaders Qualification in Promoting Pupil Leadership*'. Learning key skills is widely acknowledged as a learning method to develop meta-cognitive skills, techniques and self-regulation through a child's development (Sternberg, 1998; Berk, 2008). However, industrial and Governmental reports (CBI, 1989; QCDA, 2009a) suggest that pupils 'must' acquire key leadership skills to improve learning and achievement in education and subsequently later in life. There has been a modest sum of literature on how pupils acquire these key skills (Borland et al., 2001, Morrow, 2002 and Whitehead, 2009). Indeed Whitehead (2009) suggests that key skills can be linked to pupils developing certain leadership skills and attributes in schools. Therefore, effort is needed to investigate the complexities of how pupils are gaining these leadership skills and attributes.

As well as being an explorative study, this work intends to understand pupil leadership associated with Science, Technology, Engineering and Mathematics (hereafter known as STEM). This study will help school leaders and leadership educationalists reflect on pupil leadership to target specific improvement and practice.

1.2 The Focus of the Research

This chapter introduces the research project of how pupils aged between 11-13 years, develop leadership skills and qualities in secondary education in [REDACTED]. This study focuses on the development of pupil leadership in the STEM Leadership Qualification (hereafter known as SLq). This qualification is taught in a secondary school in the [REDACTED] under the BTEC Level 2 Certificate in STEM Leadership Skills Framework offered by the exam board Edexcel (Appendix A). The qualification was developed by the CSE at Sheffield Hallam University.

The introduction of this thesis sets the context for the field of research by proposing three research questions. After which, literature base of pupil leadership is discussed. The research design is then shared giving a philosophical and methodological approach to this study. Following on from presenting and discussing the data collected, the research extrapolates the key themes relating to the proposed research questions and the literature. Finally, conclusions are made and recommendations for further work are given.

1.3 The Context of the Research

1.3.1 STEM in the United Kingdom

“An active Government approach to equipping this country for globalisation means making sure we have the skills that underwrite the industries and jobs of the future. That means skills for the high tech, low carbon, more high-value added sectors that drive the growth that underwrites everything else we want to achieve as a society. These skills are becoming more sophisticated and complex and more vital...” (UKCES, 2009, p.2).

The demand for skills has become a national issue while technological and industrial advancements have influenced the modern economy (Felstead et al., 2002). Governmental and industrial departments such as the DTI, CBI and BIS have recognised the importance of targeting the education sector to help resolve this fundamental problem.

This is not a new idea, the BBC (1998) reported the decline of competencies within schools, suggesting the provision of skills could be introduced and provide ‘transferable personal skills’. Subsequently, the DfEE (1999) indicated that specialist programmes could be implemented to develop skills and competencies in the education sector. However, recommendations from the DfEE to the QCA provide a holistic view of skills that should be covered in curricular subjects such as Personal, Social and Health Education (PSHE) and Citizenship. Although improvements to the NC have been made to develop key skills, the DfEE suggested that teaching ‘skills’ should be incorporated into all curricular subjects rather than adopting additional programmes to rectify the problem of the apparent skills shortage (DfEE, 1999).

In 2001 the physicist, Sir Gareth Roberts (an influential figure in British Science policy) was commissioned by the UK Government to undertake a review into the supply of science and engineering skills in the UK. The report entitled 'Set for Success' (2002) examined the Government's strategy for improving the UK's productivity and innovation performance. The report set out thirty-seven recommendations to the Government, employers and other organisations about how to maintain and develop the supply of people with STEM skills into research and industry. These included providing additional resources for schools, universities and research bodies to promote education and business links. The review also made some specific recommendations to Government and the education sector including the establishment of what would become the NSLC.

As the UK's economy developed in the early 21st century, coinciding with the re-election of the Labour Government in 2005, the Chancellor of the Exchequer Gordon Brown, and the Secretary of State for Education and Skills Alan Johnson developed an agenda to improve the supply of Scientists, Engineers and Technologists. In 2004, the Government published a 'ten-year investment framework' for science and innovation known as the *Science and Innovation Investment Framework 2004 – 2014* (2004) establishing the requirements for the Government to meet the challenges of the skills shortage and the supply of STEM skills to industry. The overall aim was to maintain the UK's global competitiveness and make the UK a world-leader in science-based research and development.

The ambition of the Science and Innovation Investment Framework 2004 -2014 (2004) was to set clear ambitions to achieve a change in:

“...the quality of science teachers and lecturers in every school, college and university, ensuring national targets for teacher training are met, the results for pupils studying at GCSE level, the numbers choosing STEM subjects in post-16 education and in higher education, the proportion of better qualified pupils pursuing R&D careers and the proportion of minority ethnic and women participants in higher education...” (Science and Innovation Investment Framework, 2004, p.33).

In 2007, Lord Sainsbury reviewed the ‘Science and Innovation Investment Framework 2004 - 2014’. The review examined the role of science and innovation to ensure the UK remained competitive in an increasingly globalised economy. The review indicated that there was a lack of support for pupils to develop their skills across all STEM fields. Lord Sainsbury’s review identified:

“The UK is well placed to take advantage of the new markets opened up by globalisation. We have an extraordinary record of scientific discovery and a rapidly growing share of high-technology manufacturing and knowledge-intensive services in the UK’s GDP...” (Sainsbury Review, 2007, p.2).

However, Lord Sainsbury deduced that the numbers of teachers and young people studying science and technology must increase to allow the natural progression from Science and Mathematics GCSEs to A levels. The review also indicated that the UK’s position with enhancing key skills was unlikely to improve by 2020 if nothing was undertaken.

1.3.2 STEM in schools

“We need our young people today to embrace science enthusiastically, to realise that challenges like climate change can only be beaten by motivated and dedicated scientists and to understand that a career in science today is not a life all spent in a laboratory but has the best business and job prospects the modern world can offer.” (CMS, 2007, p.18).

Raising standards in education for a science-based economy has become increasingly difficult (UKCES, 2009). Some of the factors associated with this decline in STEM subjects are attributed to pupils’ negative perception and experiences of STEM and STEM careers (Jenkins and Nelson, 2005; Cleaves, 2005; Murray and Reiss, 2005; Blickenstaff, 2005).

A report conducted by the CSE on behalf of the DCSF highlights the importance of STEM pathways in schools. The report, STEM Programme Report (2006) indicate that STEM programmes in school increase the number of paths that pupils can take by choosing a STEM learning route. Some of the possible pathways allow a natural progression to higher education and employment. However, during 1996-2005, A level entry numbers in STEM subjects were still declining compared with pupils taking Psychology and Sport Sciences (STEM Programme Report, 2006).

The percentage of STEM subjects at an undergraduate level rose by 0.08% (STEM Programme Report, 2006). The increase was small compared to the number of STEM industries and STEM employment sectors that require graduates with key skills (CBI, 2010). The Government attempted to address this issue by introducing a new set of reforms to

qualifications, opting for a different enrichment in STEM. In this case, the UK Government reported in 2015 that there was a surge in pupils taking STEM subjects. Furthermore, compared to 2014, GCSE entries increased in: Mathematics - up 24,827 (3.4%), Computer Science - up 18,641 (111.1%), Science - up 20,523 (5.5%) and Engineering - up 1,882 (37.4%) (DfE, 2015a). Likewise, entries for STEM subjects at A level have experienced significant growth since 2010. There has been a 15% jump in entries for Physics A level, 15% increase in entries for Chemistry and 27% in entries for Further Mathematics (DfE, 2015b). The uptake of STEM qualifications could be due to advances in STEM provisions in schools. However, some schools have had some difficulties such as people within organisations being resistant to change (Veen and Slegers, 2006), emotional and professional experiences about reform can threaten the daily practices of people in an organisation and therefore hinder innovation and creativity.

Evidence published by a previous DfE study (DfE, 2015a), gives estimated gross weekly earnings for STEM graduates in different occupations. The study indicated that those in STEM occupations have earnings that have increased the most, suggesting that the incentive for STEM graduates to go into STEM occupations is growing. Moreover, the DfE (2015a) study suggests that a STEM graduate could expect a higher rate of return for their study. Moor et al. (2006) discussed that STEM provides the opportunities for activities that emphasises the interdependence of the individual subjects. This is iterated previously by Springate et al. (2009) deliberate over the proposed for skills to be 'brought to life' by being contextualised in a realistic project:

“...where pupils begin to see how the subjects are applied together in ‘real-world’ situations and therefore understand the relevance of what they are learning in school” (Springate et al., 2009, p.14).

Recently, with the new Conservative Government, led by Theresa May, has re-affirmed the necessity of STEM indicating the supply of STEM skills to industry would help to contribute towards the UK’s economic prosperity. With the development of new UTCs providing pupils with STEM employability skills, there are substantial opportunities for pupils to work on STEM employer-led projects (Kettlewell et al., 2017). Indeed, with the Government investing £500 million per year on technical education, it would take significant steps towards developing young skilled people that business and the country need (DfE, 2017a). The STEM agenda intends to make the UK a world-leader in STEM based research and help develop the quality of STEM teachers and programmes in every school.

1.3.3 Leadership Qualities – A Holistic Context

Leadership is a subject that is broad and diverse. The importance of leadership is cited in many texts; articles, Governmental papers and leadership journals and the subject is one of the most relevant aspects in an organisational context (Gronn, 1999). Ogawa and Bossert (1995) suggest that many leadership theories are based on the qualities and behaviours of an effective leader. However, Meindl et al. (1985) criticised such leader-centric assumptions tend to romanticise leaders by developing an overly distorted view of what they can achieve. In contrast, post-heroic theories such as collaborative leadership (Middleton, 2007) assume leadership can occur at different hierarchical levels and is an inherently social, collaborative and interdependent process. These processes in conjunction with empowerment (Gronn,

1999), core values (Busher, 2003) and team building (Belbin, 1981) help to develop human interaction in modern civilisation (Taori, 2001).

Taori (2001) suggests communication also plays an essential part in the interaction between people, whether it is verbal, non-verbal, written or visual. Organisations such as schools increasingly use effective management strategies so that staff can be involved in decisions (Busher and Harris, 1999). Importantly communication in teams can also be associated with a particular leadership style; messages must be unambiguous, 'short and simple' and transmitted in a style that is acceptable and understandable (Bell, 1993). Barnard (1938) proposes that there are significant traits to distinguish leaders from their followers. However, some individual exhibiting certain traits of a leader does not necessarily mean that they would be an effective leader (Kotter, 1990). The author remarks that an effective leader's knowledge, personal attributes and behaviour is also a critical factor.

Leaders are found at all levels of society, especially figures who initiate vision, integrate values, facilitate change, as well as brokering, distributing and sharing power (Helland and Winston, 2005). The impact of power and authority in leadership is equally important to mention. The basis of Weber's (1921/1968) distinction between power and authority is that power is the ability to impose will on another, regardless of anyone's wishes, despite resistance. Authority is consequently relational, it requires one person to dominate and the other to submit and assumes that people will comply with or without consent to the domination of the other and this cannot be true of all relationships. Etzioni (1961) is an author who proposes three types of influence regarding power and subsequently views

organisations, such as schools, using other issues that exist when scrutinising complex organisations; including goals, social and cultural integration, environment and charisma. Developing leadership skills in an organisation such as schools will hopefully encourage pupils to take an active interest in leadership and the effect leadership can have on others.

1.3.4 Pupil Leadership – Development of the Pupil

In order to have a general idea about the concept of leadership in an educational organisation. Gronn (1999) suggests that some of the many qualities leaders should possess include self-belief, motivation, self-realisation, potency and the fulfilment of personal skills. By reviewing different theories of leadership and more importantly pupil leadership, this study will be able to place leadership in a wider field - STEM.

Brungardt (1993) mentions that many people make the mistake of thinking that leadership is something that only seniors acquire, but leadership is a key skill that everyone can master. The key question is, how are these skills and attributes formed? Are they developed in the early years of life or can they be developed whilst in-situ as a leader? Inman (2007) examined whether experience in developing generic leadership skills can be centralised from 'life experiences'. Developing experience for leadership may range a from formal educational setting to developing social skills such as communication and teamwork in sports (Whitehead, 2009). On the other hand, pupils acquire leadership skills through various means and test these skills out in activities and interactions with others (Mawson, 2001).

Certain skills are developed throughout a child's formal educational years and similar skills are exhibited in leaders. The NC gives schools standards to improve particular skills such as Literacy and Numeracy. However, the recent development of the NC with PSHE and Citizenship (QCDA, 2009b) has addressed some of the shortfalls in core competencies like teamwork, independent thinking and leadership.

Van Linden and Fertman (1998) remark that leadership is not taught in schools and agree with Whitehead (2009) that this may be seen in sport programs or in social organisations. Whilst, Avolio (1999) articulates that unless pupils are under a structured leadership program, leadership would not materialise. It is important to establish that a well thought out leadership program for pupils is necessary to ensure pupils have the opportunity to understand, develop and demonstrate qualities of leadership.

1.4 The Research Questions

To begin my research, three Research Questions are set out the issues pertaining to the field of study. This study will be compared and contrasted with a framework of leadership proposed by Bianchi (2002), the lead researcher who developed the SLq qualification. Bianchi (2002) is also a senior research fellow at the CSE group who has worked with local authorities in the North of England. The first Research Question addresses how the SLq programme aims to provide certain qualities towards leadership skills and attributes. The second Research Question will investigate the benefits and challenges of the SLq programme to encouraged pupils to use leadership skills. Finally, the third Research Question will

address how pupils are given opportunities to contribute towards leadership in their communities or groups so that they can facilitate conditions for dialogue and teamwork.

The Research Questions are:

RQ1: How does the SLq programme aim to promote the development of leadership skills in pupils?

RQ2: What are the perceived advantages and disadvantages of the SLq programme to encourage leadership in pupils?

RQ3: How does pupil involvement in the SLq programme promote collaboration?

1.5 The Research Strategy

The research approach of the thesis was intended to find emergent themes associated with the perceptions and characteristics of leadership. The methodological approach of the study is in the form of a case study and was conducted using a qualitative approach. The method used semi-structured interviews to produce data according to the research design. The data used was analysed by looking for recurring patterns and emergent themes. After which, the data was contrasted to the relationships of leadership to feature in the literature base. During May and July 2012, the interviews were conducted with senior leaders, administrators of the SLq programme and pupils as outlined below:

- Sir John Holman – the national lead figure for STEM and director of the National STEM centre in York.
- The Headteacher at the research secondary school.

- An Assistant Headteacher in charge of the SLq programme at the research secondary school.
- Two administrative SLq teachers at the research secondary school
- Twenty purposely selected pupils, aged 11 – 13 years at the research secondary school.

The interviews were recorded using a digital voice recorder with interview notes that lasted no more than one hour. Transcripts undertook three stages of data analysis; *Data reduction* – where initial coding takes place with the development of transcription boards to look for common themes, *Data display* – where coding of data, relevance to the theoretical framework (Table 2.3) and developing the categories to be investigated and finally *Conclusion drawing and verification* – where the emergent categories are identified (Miles and Huberman, 1994). Finally, these emergent themes will lead to a better understanding of pupil leadership in the context of the SLq programme. This process is further explored in Chapter Three.

The series of interviews was intended to provide evidence of how leadership is perceived within the SLq programme. The interviews were conducted between May and July 2012. Guidelines set by the British Educational Research Association (BERA, 2011) were upheld to warrant ethical practice and conduct. The contextual details such as age and gender of each participant were kept to a minimum to maintain the required confidentiality of the participants. The educational institution was also not disclosed to protect the identities of pupil participants. Ensuring that confidentiality of all participants was maintained and interviewees were more likely to participate in the study (Denscombe, 2007).

The study used purposely selected participation. Participants were not coerced into research and were reminded they had the right to withdraw. Participants (and their parents or guardians) were informed about the study (Appendix B) and accepted involvement in the interview and consent for participation. Participants were reassured that any identifying information would not be made available to anyone who is not directly involved in the study. Participants were also reassured that there was no preferential treatment. Denscombe (2007) agrees that the data collected is affected by the personal identity of the researcher. As a risk strategy, pupils were recruited by being interviewed by the researcher who has Disclosure and Barring Service (DBS) full check. As the Headteacher has given their consent for the study to take place, this also deems the risk to be low.

The work on the initial research design was started in the Autumn 2010 and was refined during the period 2010 to 2011. During summer of 2011, I undertook a pilot interview. The actual field work was started early summer of 2012 and completed at the end of summer of 2012. However, due to a leave of absence, further research from 2015 to 2017, as set out in Chapter Two, led to the inclusion of more recent literature that enable the findings and conclusions set out in Chapter Five to be tested against current research.

The findings of this study are of particular interest to certain groups in the secondary education sector. Firstly, the NSLC and CSE at Sheffield Hallam University. Secondly, local authorities and secondary school leaders may find the results of this study of particular interest to develop a broader curriculum linking pupil leadership to STEM. This is also of significance to practitioners of educational leadership. The indication of supporting

networks of leadership could change the current landscape of how to develop future leaders. The topic of pupil leadership based upon the SLq programme has not been conducted before. The research identifies particular leadership skills and attributes (Chapter Six) however it also gives some pertinent areas for further investigation.

1.6 Thesis Structure

The thesis is divided into six chapters and then divided into subsequent parts.

- *Chapter One – Introduction.* The initial chapter will address critically, drawing on the main concepts and investigating the subject matter, a backdrop for the thesis, drawing on literature which has developed around the study.
- *Chapter Two – Literature Review.* The second chapter will describe the conceptual framework and identify key literature to support the study.
- *Chapter Three – Research Design.* The third chapter will discuss the methodological approach underpinning the research. Also, ethical issues are touched upon the as participants involved are children who may be in a vulnerable position. The method of data collected is qualitative. Therefore, the analysis is also further explained.
- *Chapter Four – Presentation of Empirical Work.* The fourth chapter allows systematic consideration of the interviews conducted, revealing the concepts connected to the proposed research questions.
- *Chapter Five – Discussions of Findings.* The fifth chapter allows systematic and in-depth examination of the results to be outlined and to be discussed further when compared to the literature.
- *Chapter Six – Conclusions and Recommendations.* The final chapter will draw any conclusions to the results, summarising the findings to be able to make connections to current or previous research.

Chapter Two - Literature Review

2.1 Introduction to Chapter Two

This chapter examines the relevant literature and theories relating to the aims of the research. The literature review intends to investigate the current landscape and the broader views of leadership; leadership values, leadership qualities, pupil leadership and pupil involvement in school activities. Finally, a contextual framework is developed by exploring themes relating to the research questions and the literature base.

2.2 Literature Search

The search process concentrated on literature mainly in the secondary school sector with some extracts from higher/further education. Consideration was given to the age of the literature as educational leadership theory is extensive compared to pupil leadership which is a 'relatively' new concept in UK education (Jackson, 2004). The research questions gave the literature review a focused outlook to search and examine scholarly research papers. The literature search reviewed many possibilities of search factors e.g. professional journals in educational leadership, to identify core literature relating to educational leadership and pupil leadership. A 'ZETOC' search tool was used to alert and locate scholarly papers that have significance to the research questions.

Initially, a specific journal, 'Educational Management Administration and Leadership' and BELMAS became the leading sources relevant to leadership. The publications are peer-reviewed that prints original contributions on education administration, management and leadership, therefore, giving a strong base from which to start the search. A search of past journals to present provided an orderly exploration of leadership and pupil leadership for the literature review.

The University of Birmingham's electronic library catalogue, *ebrary*, provided another search tool of the literature focused towards pupil leadership. Also, databases such as *Google Scholar* were used to source current papers, both using specific key words and citations generating databases of papers regarding page ranking. Key words used for the search were 'leadership', 'pupil leadership', 'STEM' and 'educational leadership', which gave many academic papers. Searches were extensive, however, to filter searches additional key words such as 'leadership for pupils' and 'STEM' were used to narrow down the field of literature. Additionally, *Twitter*, a micro-blogging search facility, gave up-coming and relevant articles relating to DfE articles and official documentation.

Part One: Leadership

2.3 Introduction

“Leadership is a process that unites leaders and followers in a complex emotional web. Reducing leadership to just the leaders – their special attributes and emotional needs – is half the story. The other half is about the followers, people seeking comfort, stability, direction, challenge and meaning” (Fineman et al., 2010, p.10).

Why is it that some people lead and others follow? This question has led to extraordinary research and theories over the millennia. From philosophers to psychologists and educators, enlightened individuals seek to answer a simple question with detailed and complex hypotheses. However, there is no universal theory of leadership and not at least, understanding what makes leaders who they are – their traits or attributes. This section of the literature review intends to discuss the various past and current theories of leadership to determine the causality of leadership and school leadership.

2.4 Leadership Traits and Behaviours

Ancient Chinese philosopher, Lao-tzu, describes the qualities of effective leaders to be selfless, hardworking, honest, able to time the appropriateness of actions, fair in handling conflict and able to empower others (Heider, 1985). In other words, to be a *wise* leader. Wisdom has been tenuously linked to leadership since the time of Plato’s *Republic*, as leaders used their reasoning to help others seek virtue and skill (Barker, 1959). Indeed, Plato considered only a few with superior wisdom should be leaders. Aristotle asserted "*From the*

moment of their birth, some are marked for subjugation and others for command" (Barker, 1959 pp. 52). However, these traits do not always constitute to moral attributes. As Machiavelli (1954) suggests *slyness* as an attribute that is more legitimate if virtuous means became less adequate to acquire and therefore to be less virtuous than a wise man.

Terman (1904) discusses how the attributes of leadership can fluctuate from non-leaders to leaders in school children. The author describes that attributes such as verbal fluency, intelligence, low emotionality, daring, congeniality, goodness and liveliness as characteristics of pupil leaders in adolescence. Ghiselli and Brown (1955) remark the extent of social situation enacts the manifestation of leadership. The authors remark how under certain sets of conditions, leaders are determined to be *good or bad*. Stogdill (1974) shares how an early theorist attempted to explain leadership through inheritance by identifying characteristics such as initiative and persistence as general qualities of leaders. Differences of opinions are still apparent today in whether leaders are born with talents and attributes that allow and even cause them to be successful leaders or if effective leadership behaviours can be acquired through experiences.

Undeniably, Stogdill (1974) is credited with widely developing research into trait leadership theory. However, psychologist Gordon Allport, suggests a trait as:

"a generalised and focalised neuropsychic system (peculiar to the individual) with the capacity to render many stimuli functionally equivalent and to initiate and guide consistent (equivalent) forms of adaptive and expressive behaviour" (Allport, 1937, p.15).

Therefore, traits could exist in certain parts of the nervous system and even though these specific attributes are not viewable, they could be due to an individual's behaviour. This suggests that motives, passions preferences and personal disposition provide clues to an individual's leaderships personality. However, Stodgill (1974) suggests that Allport's (1937) approach is too confined. Ryckman (1985) remarks:

"traits are restricted in the sense that it recognises the influence of the environment in the development of personality but does not specify the ways in which the environment operates to affect functioning" (Ryckman, 1985, p.20).

Bass and Stodgill (1990) build on Ryckman's (1985) work, concluding with five leadership attributes: *Capacity, Achievement, Responsibility, Participation, Status and Situation*. Yet, as Stodgill (1974) himself points out, there is not a universally accepted list of traits or behaviours.

Nevertheless, West-Burnham (2009a) puts forward that there are three components to leadership effectiveness. Firstly, 'Personal growth' – the recognition of self-awareness and developing the reflective behaviour of how others perceive a leader. Secondly, 'Professional growth' – developing others to a higher standard and thirdly, 'Effective learning' – underpinning development from learning experiences. Subsequently, Goleman (1998) submits that an emotionally intelligent leader can recognise and regulate emotions in themselves and others. The author categorises leadership styles from being coercive to coaching and argues that most leaders can adapt and use all or most leadership styles. Similarly, Macaulay (2008) identifies the leadership styles, qualities, skills and the contextual dimensions support effective leaders. This includes the ability to be politically aware;

prepare and help people, invite and involve the local community, build and develop relationships with the media and have an open door and actively network.

2.5 School Leadership

Understanding educational leadership and management begins by leaders appreciating how learning evolves (NCSL, 2010). Whether it is building staff capacity, behaviour, leadership distribution or involving pupils in school development, all these aspects have improvement as a core aspect of school leadership. This is re-iterated by literature from the NCSL identifying key attributes of successful leadership as:

“...having a passion for learning, excellence and equity to close the achievement gap, creativity and innovation, engaging effectively with the local community, the appetite to work autonomously, passion for the needs of all children, courage, humility, patience, tenacity and resilience” (NCSL, 2010, p.32).

Subsequent research by the NCSL (2011) includes identifying leadership styles and personal skills and attributes of many headteachers and principals of schools and academies. These include accountability, diplomacy and change management skills. These skills are believed to be crucial for effective leadership, highlighting creativity, decision-making and risk-taking to be more important for school leaders.

A recent theory which is receiving much attention and growing empirical support (Gronn, 2000; Spillaine et al. 2001) is the notion of *distributive leadership*. In a review of successful school improvement, Glickman et al. (2001) cite distributed leadership at the top of the list of ‘what makes successful schools’ (Glickman, 2001). Silins and Mulford (2002) agrees that

by having leadership which is distributed throughout the school community, pupil outcomes are more likely to improve. Distributive leadership contrasts to traditional ideas of hierarchic leadership in which people develop expertise by working collaboratively. This distributive view of school leadership requires people to subscribe to the view that leadership resides not solely in the individual at the top, but in every person at entry level who is in one way or another, acting as a leader (Goleman, 2002). Distributive leadership, therefore, allows all members of the school community the opportunity to provide direction and make decisions. Nevertheless, Goleman (2002) suggests that in schools where distributive leadership has been successful, people have not simply been imposed with roles but they have been involved in what roles they have undertaken or received.

2.6 School Capacity

Learning communities are recognised by many as a key indicator to improve a school's effectiveness (Rutter et al., 1979; Spillane et al., 2001). Rutter et al. (1979) suggest that effectiveness is due to the actions and modifications of the members of the organisation, working together for improvement. Fullan (2001) suggest that capacity is the key concept of driving the conditions of change within schools. Although the author also suggests that change in organisations creates unpredictability, the traditional establishment is still a foundation for school improvement. Fullan (2000) agrees that 'Professional Learning Communities' could provide individuals within a school to build and continually develop for school improvement. Hopkins and Jackson (2002) reinforce the theme of 'Professional Learning Communities', building a model between people and the learning environment.

This also extends to the wider community within schools, focusing on how schools and communities can be formed to give alliances externally and internally. It involves pupils in the process to create learning environments.

Hopkins and Jackson (2002) define 'networks' as a pedagogically grounded *Learning Focus*, undertaking collaboration and activities. Hoegl and Gemuenden (2001) depicts the two categories of success in networks (team performance and personal success of team members) to build positive relationships that incorporate six team working facets; *communication, coordination, the balance of member contributions, mutual support, effort and cohesion*. Therefore, the focal point is the quality of a team's collaborative nature rather than the content of tasks and activities.

2.7 Promoting Collaboration

In education, groups working at various levels of co-operation share a vision for a common purpose. However, West-Burnham (2009b) suggests there are some reasons for questioning our historical and cultural dependence on leaders. Organisations focused on learning face many challenges such as reacting to a changing educational landscape as well as a need to develop leadership capacity. Nevertheless, the author suggests that there is an important debate that leaders need to create to emphasis greater team-based working. Networking involves exchanging information and ideas, working together on activities toward goals. Networks in schools are dependent on the size, structure, internal and external arrangement of the organisation whether it is for pupils or staff (Busher and Hodgkinson, 1996). Busher

and Hodgkinson (1996) and Jackson (2004) suggest four different types of networks that could be established in schools (Figure 2.1):

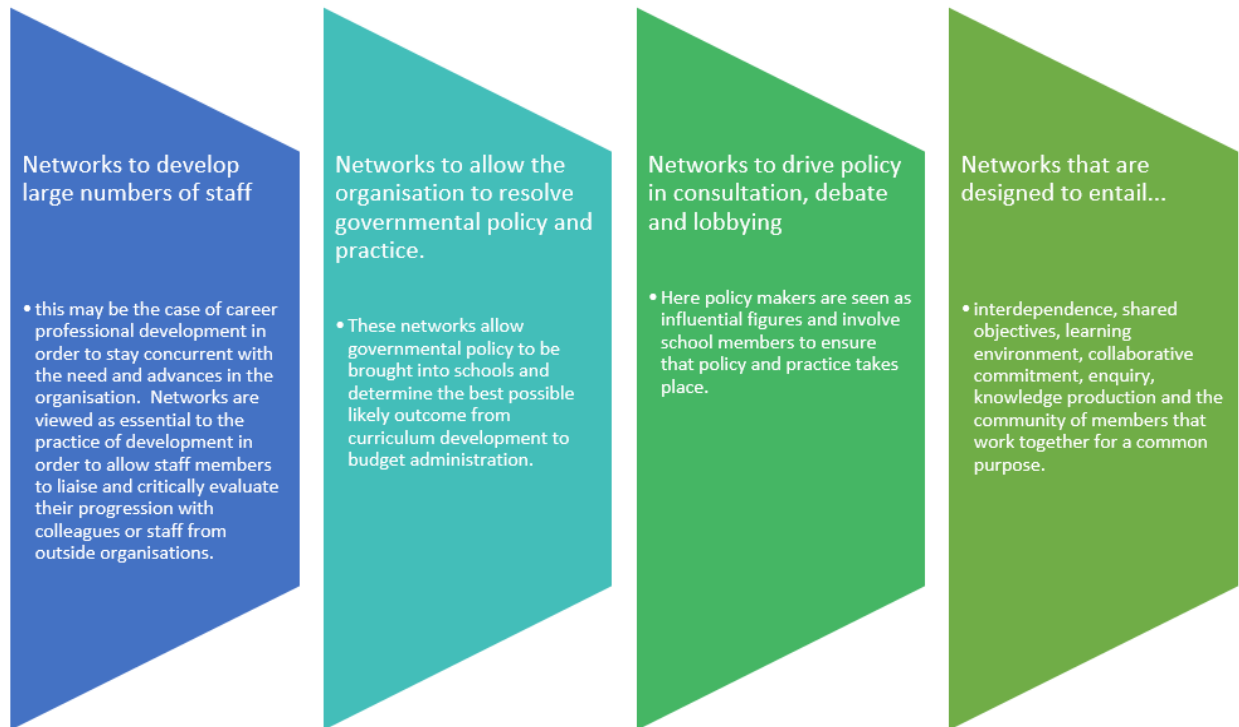


Figure 2.1: Types of Networks that can be established in schools (adapted from Busher and Hodgkinson (1996) and Jackson (2004)).

The fourth type of network is described as a form of a collaboration called a *Network Learning Community* (Jackson, 2004). This network allows people to share resources and engage with each other in an organisation. Recently, Rhodes and Brundrett (2009) implied that Network Learning Communities are just methods to implement leadership for pupils and give prominence to a robust and dependable emphasis on teaching and learning. This may mean that *leadership for pupils* is inherently the focus for networking, with the notion of developing collaboration.

Lieberman and McLaughlin (1992) also say that for an effective network to take place, management structures are needed to facilitate leadership. However, networks in organisations are inadvertently created based on hierarchical structures and can cause problems by altering the authority between individuals. The success of networks is very much dependent on the personal relationships between the members of the group.

The dynamics of effective teams are built upon synergy and opportunities to enable individuals to have a purpose in the group (Belbin, 1981). As discussed, the success of networks has been due to the personal relationships that individuals have when they collaborate with others (Busher and Hodgkinson (1996); Rhodes and Brundrett (2009)). In networks, each individual has their own strengths and social awareness to make networking more efficient. This allows collaboration to be enhanced and proficient (Lieberman and McLaughlin, 1992).

Co-operation in groups requires a much higher level of commitment and trust. It involves sharing resources, knowledge, staff allocation, physical property and reputation (Busher and Hodgkinson, 1996). This paradigm shift is an increase in trust that is available. Conversely, with control, there is virtually no trust, no choices and very few opportunities for independent action. Therefore, realising how individuals interpret their organisational context in groups is critical to the success of a network.

Although Hopkins (2003) suggests that networks may become difficult to administer, the author agrees that networks do provide an efficient system for innovation. Networks have a

common purpose and facilitate the sharing of good practice. The importance of networking allows people to enhance learning, school improvement and implement policies locally and possibly nationally (Hopkins, 2003). However, Sliwka (2003) believe the disadvantage of innovative networks is that they seem fragile. The stakeholders involved in them experience both enriching and frustrating events. Hopkins (2003) counters this by asserting that core values, knowledge creation and clarity allow all stakeholders to be empowered and participate as one. Capacity is therefore used to build relationships between the interconnecting elements of the professional learning community; involving values, moral purpose and social cohesion (Hopkins and Jackson, 2002).

2.8 Pupil Participation for Improvement

“Leadership cannot be taught; it has to be learnt. The most powerful means of developing leadership is to create an organisational culture, which values the sorts of learning most likely to enhance the capacity of individuals to lead” (West Burnham, 2009a, p.3).

Devine (1998) and Roche (1999) suggests that the ‘voice’ of the pupil has a direct impact on the ‘citizen perspective’, enabling pupils to be involved in making decisions. Flutter and Ruddock (2004) identified that improvements in learning and listening to the views of pupils could enhance the best practice for teachers and promote a more democratic school ethos. This is also reinforced by Fielding and Bragg (2007), identifying that pupils can actively promote ‘partnerships’ where they work alongside teachers to mobilise their knowledge and become ‘change agents’. The emphasis is significantly on pupils as ‘producers of knowledge’, where knowledge is mobilised in the pursuit of a cultural shift (Noyes, 2005). Furthermore,

the DCSF (Springate et al., 2009) recommend introducing pupil voice initiatives in schools. OfSTED inspections now include pupil consultation, suggesting that pupil is increasingly forthright for school development (OfSTED, 2006). Subsequently, Mitra and Frick (2004) indicate that school improvement is impacted upon by listening to pupil experiences, particularly the experiences of those who are alienated. If pupils are involved in collaboration and leadership, there are rewards in pupil development and overall growth in school improvement, therefore, meeting the fundamental needs of pupils (Lewis and Burman, 2008; Mitra, 2008).

Davies et al. (2006) suggest that pupil voice can also contribute to the development of emotional well-being. Whitty and Wisby (2007) acknowledge the importance of encouraging pupil voice, the authors also remark that pupil engagement and pupil representation are *“features of effective learning”* (Whitty and Wisby, 2007, p.9). However, real change in schools’ results, as Mitra and Frick (2004) argue, are when schools take risks by offering pupils opportunities to build adult-pupil partnerships. OfSTED recommends involving pupils as partners in their education to strengthen their self-esteem and respect, providing evidence for pupil learning (OfSTED, 2006).

2.9 The Role of Power

One of the barriers to distributive leadership requires the Headteacher, principals and school leaders to relinquish power and control to others. This is not just a challenge to authority and ego but also challenges the structure of educational leadership which is premised on maintaining the bureaucratic and hierarchical structure.

Power is consequently relational; it requires one person to dominate and the other to submit. This assumes that one person will comply with or consent to the domination of the other and this cannot be true of all relationships (Etzioni, 1961). Authority, on the other hand, allows formal hierarchies to develop and permits compliance, structures, supervision, job definitions, policies and detailed procedures to be established (Etzioni, 1961). The basis of Weber's (1921/1968) distinction between power and authority is that power is the ability to impose will on another, regardless of anyone's wishes, despite any resistance. However, Etzioni (1961) proposes three types of influence regarding power; 1. *Coercive*: established on control over sanctions, 2. *Remunerative*: established on control over rewards and 3. *Normative*: a blend of persuasion and manipulation through values and esteem.

Etzioni (1961) sees organisations as using all three types of power, where mixtures of power exist and groups display certain combinations in various amounts. Etzioni (1961) suggests that professional bodies, such as schools, display mainly normative types of power. The author argues that dispossession exhibit a more coercive form of control rather than normative, especially since that alternative involvement is more evident within schools than

in mainstream organisations. Etzioni (1961) also deduces that other issues exist when scrutinising complex organisations, including goals, social integration, environment and charisma. Weber (1921/1968) on the other hand, considers charisma to be a driving force which imposes established rule. The foundation of charismatic authority is the recognition or acceptance of the claims of the leader by the followers. The literature of leadership and the relationship to authority reinforces long-standing historical and cultural perspectives leaders who wield power. The literature centres on the role of the person in charge – the leader. West-Burnham (2009a) remarks that ‘the boss’ who is usually identifiable through the trappings of power and status. The author says that our culture also celebrates the individual as a leader and we defer to the hero leader, the person endowed with superior qualities and that our history is often presented as a succession of heroic people who singlehandedly changed the course of time. The author also describes that most organisations are structured as hierarchies with one person at the top and everybody else in descending levels of authority and responsibility. However, it is possible that organisations are set up to construct elaborate structures with clearly delineated levels.

West-Burnham (2009a) describes structures within organisations to explain how individuals interact. Firstly, control is illustrated when one-person is responsible for all decision-making, where power and authority are exercised without consultation. There are circumstances when this is appropriate, for example in an emergency or crisis, but over time it usually serves to create dependency, passivity and alienation. Secondly, delegation is how most organisations work. Individuals are given limited amounts of authority and responsibility within highly defined levels of tasks and outcomes. Thirdly, empowerment means that high

levels of power are devolved to those who have the responsibility. This implies control over resources, methods and decision-making. Finally, subsidiarity is when that power is distributed across the organisation. Just as in a federal state (like Germany or Australia), a wide range of powers are discharged at a local level without reference to the centre (West-Burnham, 2009a).

To fully appreciate school transformation and change, all teachers must recognise the importance of ownership for pupil success. When teachers accept ownership for the progress of pupils then the conditions for distributive leadership and pupil success are established (Valentine, 1999) and leadership becomes central to the work of all teachers and pupils.

2.10 Summary of Part One

It is apparent that leaders are critical to how a school operates and succeeds. This section of Chapter Two has briefly explored literature underpinning Research Question One: How does the SLq programme aim to promote the development of leadership skills in pupils? The analysis of this section so far has shown that leadership; leadership skills and attributes, values, vision, capacity for improvement and the role of power are significant contributors to successful school leadership. The next section now aims to explore the role of STEM and the backdrop to the SLq programme.

Part Two: STEM Significance and SLq

2.11 Introduction

The demand for skilled people arises for two main reasons: replacement demand to replace individuals who retire or leave the sector for any reason and expansion demand to fill new roles created by business growth (UKCES, 2013). The UKCES consistently reports that shortages in STEM skills is linked to a decline in innovation and that STEM skills are more likely to be 'hard to fill' (UKCES, 2013). This section of the literature review intends to discuss the significance of STEM in schools and the relevance of the SLq programme to promote leadership with a STEM context.

2.12 STEM Education in the UK

The Education Reform Act (1988) established, amongst other things, the idea of a NC for England, Wales and Northern Ireland. The NC set out to promote the spiritual, moral, cultural, mental and physical development of pupils at the school and of society and also prepare such pupils for the opportunities, responsibilities and experiences of adult life. Standardised testing was also introduced with the NC for schools in England and Wales in 1988, including pupil assessments for English, Mathematics and Science from key stages 1 – 4 (5 – 16-year olds) (STEM Learning, 2017). Standardised testing in Key stage 2 science was scrapped in 2009 (Guardian, 2009), which was supported by some who thought that testing did not best measure a child's scientific ability and risked putting them off science and

subsequently STEM related subjects (Score-Education Report, 2010) as well as limiting teachers' flexibility in the classroom. The Score-Education Report also argued that the removal of testing provided little incentive to stimulate an interest in science at primary level.

The need for investment in Science and Technology education has also been the topic of discussion in some significant Government reviews from the Roberts Review (Set for Success, 2002), the Leitch Review (2006) and also the Sainsbury Review (2007) on innovation. During the reform under the coalition Government, some policies have emerged with potentially negative impacts on STEM. For example, many within the STEM community are concerned about the possible impact of new curricula in Science and Mathematics with the number of pupils pursuing STEM subjects in higher education. The lack of specialist teachers across key subjects such as Mathematics, Physics, Design and Technology and Computing continues to be a major concern. Furthermore, qualification, assessment, school accountability and grading reforms measures focusing on a narrow set of academic subject risks having adverse consequences on the uptake of other more practical subjects, such as Design and Technology, Art and Design, which are also important in creative engineering disciplines.

While there was evidence of an increase in STEM subject uptake at secondary and higher education, the Royal Society's report *The Scientific Century* (2010) emphasises that our investment in Science and Technology is falling behind our competitors at the risk of losing talent abroad and ultimately economic prosperity. The Royal Society argues that without

continued investment, Britain potentially faces a situation similar to that which confronted the scientific community in the mid-1980s where an impact on facilities and infrastructure and destroying employee morale drove top scientists abroad and affected the nation's ability to remain at the leading edge of the technological and scientific frontier.

The educational white paper – *The Importance of Teaching* (2010) indicated that all children have the opportunity to acquire essential knowledge in the key subject disciplines. The intention was to introduce new curricular pathways, such as vocational education to develop a diversified and alternative curriculum (DfE, 2010). Key reforms include the introduction of the English Baccalaureate (EBacc), which is a performance measure introduced retrospectively by the DfE in January 2011, aimed to increase the number of pupils receiving a broad education in core academic subjects, while providing a more accurate view of the overall academic performance of schools. The EBacc is currently awarded to pupils achieving six or more A*-C grade GCSEs in English, mathematics, science, a language (other than English) and a humanity. In February 2013 the Government also proposed two additional performance measures for schools and of several new models of school, including academies, free schools and UTCs. However, in addition:

- The National Curriculum Review proposes to revise programmes of study to increase rigour in English, mathematics and the sciences, while 'slimming down' the curriculum in other subjects (DfE Reform, 2013).
- The Government makes the AS level a standalone qualification and introduce a system of assessment for A Level reform with exams being taken only at course-end (DfE, 2015c).

- The Government reforms GCSEs to include more challenging content and rigorous assessment, with teaching from 2015 onwards (DfE, 2015c).
- Increase in participation age: mandatory participation in education or training will increase from age 16 to 17 in 2013, and to 18 in 2015 (DfE, 2015c).

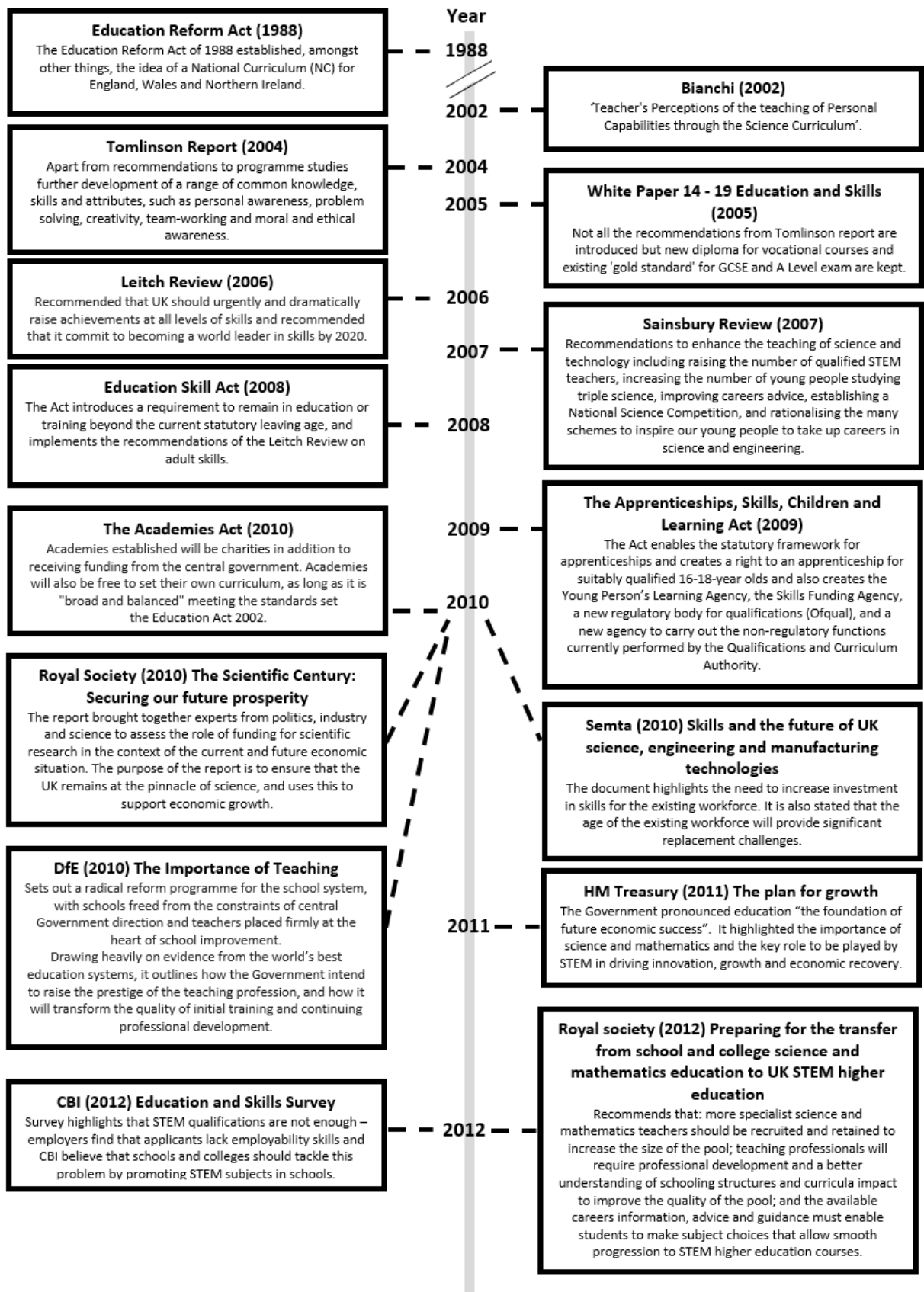
The secondary school curriculum (DfE, 2015c) aimed to provide a framework for STEM related careers and study. The framework includes developing challenging stereotype, discrimination and cultural/social barriers to STEM subjects. The framework also includes how rapidly career opportunities are changing to meet the needs of industry and how to make informed decisions about learning provisions and programmes (DfE, 2015c). The DfE (2015c) shared:

“Employers, universities and colleges are often dissatisfied with school leavers’ literacy and numeracy even though the proportion of young people achieving good grades has gone up in recent years. Around 42% of employers need to organise additional training for young people joining them from school or college.

We believe making GCSEs and A levels more rigorous will prepare students properly for life after school. It is also necessary to introduce a curriculum that gives individual schools and teachers greater freedom to teach in the way they know works and that ensures that all pupils acquire a core of essential knowledge in English, Mathematics and Sciences.” (DfE, 2015c, p.12).

STEM skills are seen to be critical in the move to rebalance the UK economy and improve productivity (HM Treasury, 2015). As well as ongoing economic growth, a sufficient supply of individuals with the right skills underpins this rebalance.

Over a number of years from 2015 to 2017, there have been considerable efforts by successive Governments, industry and education sectors to develop a range of diverse and innovative initiatives to raise awareness and stimulate interest in STEM among children and young people. Initiatives include website, education and career resources aimed at teachers and parents, as well as sciences fairs and festivals. The Government has contributed to other initiatives, including STEM Ambassadors, the Inspiring Science Fund and contributing to CREST awards (BEIS, 2017). Encouraging students from an early age to have an understanding of science needs to be a priority if the UK is to stay at the forefront of research and innovation. While there have been extensive reforms in the national curriculum, which will be difficult for teachers and students alike to absorb, it must be kept relevant for students' STEM skills needs as they enter a continually evolving workplace. Continuing reforms will need to be evidence-based, however, to reflect not just what employers need but also the evidence on what initiatives—many at a local scale—are most effective in increasing and sustaining young people's interest in science and what really influences their study subject choices (Industrial Strategy Science and STEM skills, 2017). Figure 2.2 presents an overview of key policies and Government reforms in regard to this study of STEM education in the UK.



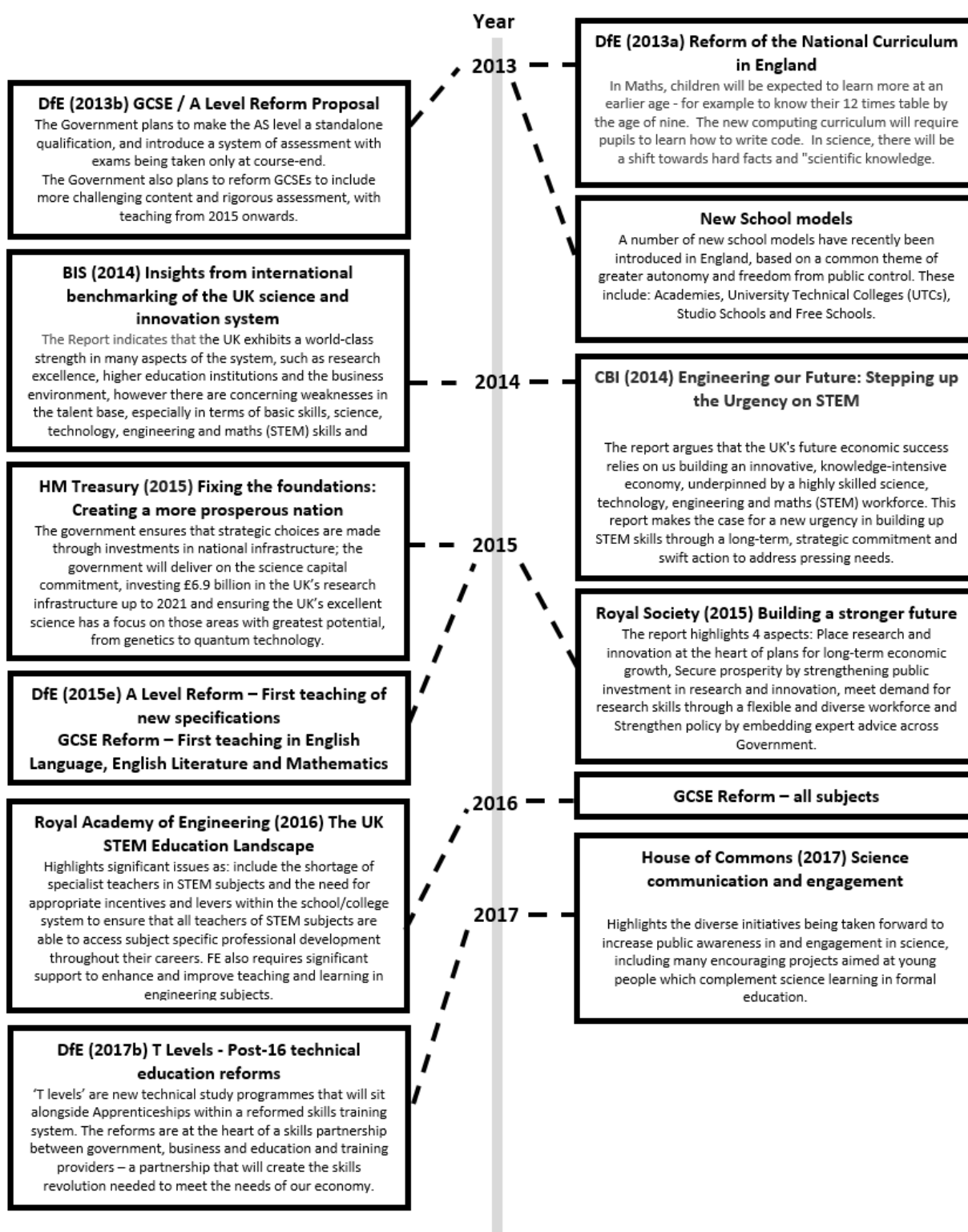


Figure 2.2: Timeline of key policies and initiatives in STEM education.

2.13 Personal Capabilities

The *capability* of an individual is considered by Bianchi (2002) to demonstrate a range of leadership skills and attributes (Bianchi, 2002). The relationship between behaviours and attributes is the level of proficiency that the individual demonstrates (Barrow, 1987). However, as Eraut (1994) suggests the quality of skill that a person possesses is related to proficiency and performance. Indicators of the performance of personal skills, as Ashworth (1992) describes is to identify the concepts of knowledge and understanding and underpinning these concepts to a wide range of situations. Also, some of these factors may be dependent on social, individual or professional influences that may enable people to manage their own life, cope with their environment, profit from their experience or to master their skills to make sensible and reasonable decisions (Ashworth, 1992).

Developing these leadership skills and attributes in pupils are deemed a Personal Capability (PC) (Bianchi, 2002). The term is derived from the author's theoretical work which discusses the association between characteristic, traits, behaviours, skills and attributes which may be influenced by the personal, professional and social development of children in secondary schools. However, personal skills such as a practical ability is judged by Barrow (1987) as the method of assessment being that of knowledge, value, emotive and contextual free manner and therefore can be skilled in an isolated environment. Bianchi's (2002) framework extends with the aid of literature from; Honey and Mumford (1995), Bayliss (1999), Goleman (1998), QCA (1999) and DfEE (1999). Table 2.1 indicates the combination of these authors

contributions to reveal that competencies and skills could be categorised alongside Bianchi's PCs. However, it is important to note the role of intelligence when discussing personal skills.

Thorndike (1920) suggested three distinct types of intelligence: (1) abstract or scholastic intelligence, defined as the ability to understand and manage ideas; (2) mechanical or visual spatial intelligence, defined as the capacity to understand and manipulate concrete objects; and (3) social or practical intelligence, defined as the capacity to understand others, manage people and act wisely in social contexts. However, with Gardner's work, the debate regarding the plausibility of multiple types of intelligence was re-ignited, spawning a series of new scientific enquiry to general intelligence theory - considering the range of intelligence to further develop the understanding of personality and performance (Gardner, 1983). The author helps to identify the concept of intelligence and develops an understanding of academic performance and behaviours that contribute to interpersonal and intrapersonal interactions.

Specifically, to this study, Gardner's (1983) elaboration of Thorndike's (1920) social intelligence theory is linked with two distinct traits, interpersonal intelligence and intrapersonal intelligence, providing the content domain for emotional intelligence. Bianchi's framework takes its research base to much of Gardner's (1983) work on multiple intelligences, establishing the importance of the range of interpersonal and intrapersonal skills that people can possess and acquire. However, critical to Gardner's work is the illusion it implies that anyone can be 'intelligent' in some way or another, even if he or she is not lucky enough to possess a high IQ (Visser et al., 2006). Also, there is the issue that personal

qualities, such as motivation and social skills matter a great deal to one's success in life (Locke, 2005). What is questionable is describing any ability that happens to be regarded as a distinct 'intelligence'. In this case, a 'skill' is used to describe how well a person can apply their abilities and knowledge in a given area of life (Locke, 2005). As Locke (2005) infers, most people are capable of developing a variety of skills but this does not necessarily mean they require a different kind of 'intelligence' for each skill, so using the term 'intelligence' is arbitrary and confusing.

PCs present a framework to span across ten skills and capabilities that are identified from research across curricular and non-curricular activities. However, Bianchi (2002) relates PCs to how pupils develop these leadership skills and attributes from the involvement of educational activities and evidence from a range of studies and theoretical work. Meanwhile, Van Linden and Fertman (1998) comment that understanding and appreciating the complexity of leadership is a prerequisite to supporting and challenging teenagers to be the best leaders they can be. However, DesMarais et al. (2000) indicate certain elements are necessary for the development of pupil leadership. These authors describe the critical elements as; pupil/adult partnerships, granting young people decision making power, responsibility for consequences, a broad context for learning and recognition of young people's experience, knowledge and skills (DesMarais et al., 2000). A regular occurrence with all these scholarly articles and journals is the 'lack of formal leadership training'. Very little research and even fewer applications of teaching pupils' leadership development have been conducted (Scherer, 1992).

PCs are used to give generic life-work skills and characteristics that are considered influential to the social, academic and professional lives of individuals (Bianchi, 2002). These refer to individuals to demonstrate the behaviours associated with the skills and characteristics as mentioned in the author's framework (Table 2.1), which are:

- **Positive self-image:** Valuing oneself and one's achievement.

Individuals with a strong sense of self-belief in their abilities that show competence in their behaviours are more likely to succeed in highly demanding environments. Positive self-image within personal development emphasises the value and influence of positive self-esteem, self-efficacy and self-image. A positive self-image is, therefore, a contributory factor in developing the concept of personal capability for individuals to exhibit personal knowledge, skills and understanding of their capability (Bianchi, 2002).

- **Self-motivation:** Being able to motivate oneself to do what needs to be done.

Bianchi (2002) suggests that motivation is influenced by intrinsic and extrinsic contributors. These factors are affected by challenge, choice, competition and autonomy in activities – which can lead to creativity and self-esteem. Fulfillment and achievement are dependent on the wider social impacts that the individual will experience. However, during some pupils' learning, as Smith and Spurling (1999) highlight that motivation inclinations decline during secondary education. The delicacy of intrinsic motivation must be addressed as these are constraints of social controls and contexts (Smith and Spurling, 1999). Self-motivation is, therefore, an important characteristic to enhance and ensure that pupils take control of their achievements. This may not only develop personal efficiency but more importantly, it

harnesses the broader opportunity for success in a wider context, intrinsically and extrinsically.

- **Problem-solving:** Being able to analyse a problem and form strategies to work towards a solution.

Bianchi (2002) emphasises that problem-solving strategies are an essential skill that could be developed through first-hand experience - by investigating problems as an activity. The ability to investigate, understand, generate strategies and solutions to problems is an outcome of an individual's capability when not confined to particular restrictions like linear thinking (Watts, 1991). This can open the ability to think analytically and strategically while incorporating cognitive processes – these are higher order skills of problem-solving (Bianchi, 2002).

- **Creativity:** Being able to think of and share new novel ideas.

The DfEE (1999) suggests that creativity is linked to being imaginative towards a sense of purpose to produce outcomes that are original and of value. The term creative is used in a variety of contexts, applied to different environments, people and products. Imagination is synonymous with creativity however imagination is without form or purpose however it opens to enhance the creative process (Bianchi, 2002). Individuals attempting to be creative are considered to be able to expand on situations and look at new perspectives (DfEE, 1999). The relevance to the person and their environment enables opportunities to be explored and stimulate the thought process towards open ended situations. Creative thinkers have a

broader skill and characteristic profile – developing the opportunity to explore the implications of self-image and self-motivation (Bianchi, 2002).

- **Verbal communication:** Being able to communicate one's opinions and feelings appropriately, using the spoken word.

Effective communication reinforces personal and interpersonal relationships, whether it is to express thoughts, views and feelings to share common meanings. Communication is influenced by social environments, cultures and contexts. According to Bianchi (2002), this is an essential skill understood to be developed at an early age. Many educators model effective communication skills and have been influential in young pupil's development (DfEE, 1999).

- **Critical thinking:** Being able to critically review and evaluate practice to improve.

Higher order thinking skills involve the processes of reasoning and reflection. Critical thinking describes the processes of analysing, classifying, inferring, observing, evaluating, synthesising and hypothesising across a wide range of contexts (Bianchi, 2002). Critical thinking is considered to be a form of thinking undertaken for specific reasons and therefore directed towards a goal. This is a sequential process, drawing enquiry and reflection towards reasoning skills. Taube (1997) suggests that individuals may be required to test generalisations to extract and apply principles before offering suggestions. These higher order processes imply that critical thinking is largely dependent on the logical reasoning that takes place. These skills encourage reflectivity to complement the overall capability of the

individual, enabling problem-solving to lie within a framework towards improving their practice (Bianchi, 2002).

- **Social intelligence:** Being able to respond appropriately to different situations and people.

Gardner's (1983) work into multiple intelligences recognises that differing contexts may affect the level of social intelligences. This may be acquired through education or training. The ability to understand and manage people, in human relations has been defined as a key factor in social intelligence (Thorndike, 1920). Being aware of others and reacting to their feelings, beliefs and ideas are features of this form of intelligence. To use this intelligence, individuals should be able to reason and critically judge situations, to know when, where and how to alter their behaviour. The skills of verbal communication, positive self-image, teamwork and critical thinking are influential in the use of social intelligence. These characteristics incorporate the ability to be socially aware and adapt to an individual's environment. This will promote a sense of respect and have the capacity to adapt to different contexts (Bianchi, 2002).

- **Teamwork:** Being able to work well in teams.

Collaboration between individuals reflects the nature of how group work or teamwork enables participation. Teamwork describes the action of members to work towards a specific goal, where contribution involves to cooperation to fully exploit a member's strengths and work on their weaknesses.

- **Self-management:** Being able to take charge of one's learning.

Self-management is the process where pupils ensure their behaviours and effects work towards measured attainment or goals (Bianchi, 2002). This is dependent on self-regulation and the reflection of the individuals' practice to improve. Target setting, self-monitoring and controlling measures are an effective route to determine self-management. This is linked to motivation, enthusiasm and generating interest in one's work. The pupil will, therefore, acquire the skill to manage themselves, others and their environment – in the pursuit of personal improvement. This self-regulation is by developing personal, intrapersonal skills to enhance and capitalise opportunities for self-advancement and work collaboratively. Targets, deadlines and self-awareness are an acute skill within the culture of 'long-life' learning (Bianchi, 2002).

- **Tenacity:** Being able to persevere at a task to meet deadlines.

Bianchi (2002) suggests that maintaining tenacity relate to the motivational perspective and disposition of individuals and their ability to cope, understand and face into challenges. However, Goleman (1996) proposes that the ability to be personally effective, self-assertive and being able to be confident in one's ability, without being frustrated, immobilised or becoming 'stressed', enables individuals to persevere to an intellectual potential. Committing to a task and maintaining commitment endorses a sense of personal responsibility. This reinforces the purpose and direction of the goal to the individual and to make that goal achievable.

Developing leadership for PCs 					
Honey and Mumford (1995)	Goleman (1998)	Bayliss (1999)	QCA (1999)	DfEE (1999)	Bianchi 'PC' Framework (2002)
Positive Self Image independence	Self - confidence Optimism		Self-awareness (inherent within all Key Skills units)	Developing confidence and responsibility and making most of their abilities, feel positive about themselves	Positive Self Image
	Achievement drive		Improving own learning and performance		Self- motivation
	Building bonds Collaboration and cooperation Team capabilities Leadership	How to work well in teams	Working with others	Take responsibility Developing healthy relationships between people Participate	Teamwork
	Communication	How to communicate effectively with others	Communication	Communicate confidently with peers	Verbal Communication
Tenacity Adaptability Flexibility thoroughness	Adaptability Conscientiousness Commitment	How to cope with change	Related skills including dealing with difficulties		Tenacity
				Problem Solving	Problem Solving
Innovativeness Initiative	Innovation Initiative	How to make the best out of creative talents	Mainly higher level key skills units		Creativity
Critical information seeking Conceptual strategic and analytic thinking		How to evaluate and appreciate information	Mainly higher level key skills units	Find information and advice	Critical Thinking
Interpersonal awareness	Adaptability Influence Understanding others	How to deal with other people and value them	Working with others	Developing healthy relationships between people Recognise good will is essential for positive relationships	Social Intelligence

Table 2.1: Summary of commonality between competency frameworks forming PCs (Adapted from Bianchi, 2002, p.36).

2.14 Pearson's SLq Framework

The education group, Pearson (Edexcel), along with the CSE at Sheffield Hallam University have developed the SLq, with the aid of Bianchi (2002) PCs (Appendix A and Table 2.2). The accredited Level 2 BTEC Certificate in Leadership Skills are designed to support the development of leadership skills within schools and colleges and to allow the integration of STEM skills into the Edexcel (2009) 'Work Skills' suite of BTEC qualifications. The SLq is a 13-credit qualification where pupils must take five mandatory units to 'establish key leadership skills'. The course intends to develop and challenge pupils' leadership abilities through practical, self-driven activities, developing their collaborative and thinking skills in a chosen context, such as STEM and enhancing their self-awareness and self-belief. The mandatory units are:

- **Unit 1:** *Developing Personal Skills for Leadership*

The ability to understand and use effective personal leadership skills is often a desirable aspect of employability. Whether using these skills formally as a team leader for a project or activity or informally to lead a small group of people or convey instructions to others, it is important that pupils are able to develop and reflect upon their personal leadership abilities. In this unit, pupils gain an understanding of the main features of leadership and how to prepare themselves to demonstrate their leadership skills in an appropriate leadership activity (Edexcel, 2009). The unit features the following learning attributes:

1. Understand the main features of Leadership

Main features of leadership: having responsibility for others, making sure the team work together and achieves goals, providing support and guidance, helping someone deal effectively with a difficult situation, encouraging someone to persevere in solving a problem; giving instructions, allocating work to the team, giving and receiving feedback, telling someone they have done something right or suggesting that something could be done differently, listening to feedback from others and acting on it and making decisions, deciding on what a group of people need to do (Edexcel, 2009).

Own skills and qualities: carry out a review of personal development, identify areas of strength and those areas which you are unsure of and ask others for their feedback on your leadership skills (Edexcel, 2009).

2. Plan how to demonstrate leadership Skills

Putting a range of skills into practice: giving support to others, motivating and encouraging others, providing advice and guidance, discussing problems, identifying and understanding others' feelings, allocating tasks and activities, assessing strengths and interests of team members, considering deadlines, deciding who is best suited to carry out tasks, discussing and agreeing tasks with team members, giving and receiving feedback, feedback to team on performance of task and deciding on the best way of doing something (Edexcel, 2009).

3. Prepare for a leadership activity

Selecting a suitable activity: considering strengths and weaknesses, using information and knowledge about own particular skills to decide on an appropriate activity, discussing with a

tutor and agreeing on suitability and choosing an activity they can complete appropriately (Edexcel, 2009).

Why the activity was selected: matches experience to skills or interests and allows pupils to demonstrate a skill they feel confident in (Edexcel, 2009).

- **Unit 2: Practising Leadership Skills with Others**

Working alongside others provides invaluable opportunities for learning how to lead. In this unit, pupils will be able to practise their leadership skills with other members of a group. Pupils will gain an understanding of skills such as giving feedback, decision making and allocating of tasks and responsibilities within a leadership context. In addition to developing pupils' leadership skills through working with others, the unit considers how pupils can evaluate their ability to lead others and suggest areas for improvement (Edexcel, 2009). The unit features the following learning attributes:

1. Understand how to lead a group Activity

Group activities: in a school or a group project (cross-curricular project) and an assignment within a vocational or subject based area (Edexcel, 2009).

Leadership skills in a group activity: leading in a way that is appropriate to the requirements of the situation and people involved (giving support to others), allocating tasks and activities, considering deadlines, using personal skills and qualities to lead effectively (using problem solving skills to make effective decisions) and using sense of humour to get people's attention when giving instructions (Edexcel, 2009).

2. Demonstrate effective leadership skills with others

Giving support to others: motivating and encouraging others, providing advice and guidance and showing regard for well-being, health and safety of team members (Edexcel, 2009).

Allocating tasks and activities: assessing strengths and weaknesses of team members, prioritising tasks to deadlines, deciding who is best placed to carry out tasks and discussing and agreeing with team members (Edexcel, 2009).

Giving and receiving feedback: formal feedback such as written reports, appraisals; informal feedback (verbal feedback to individuals) and feedback to a team on the performance of the task (Edexcel, 2009).

Making decisions: making a decision to solve a problem, to find a way forward with a task or activity, deciding on the best method of doing something and deciding when a task has been completed appropriately (Edexcel, 2009).

3. Evaluate their leadership performance

Carrying out an evaluation: different types of evaluation of leadership (formal evaluation assessment), checklists (discussion with tutor), using feedback from different sources when evaluating your performance, identifying what went well (successfully explained purpose of team task to the group) and identifying what did not go so well (Edexcel, 2009).

Suggesting areas for improvement: based on their own assessment (feedback and suggestions from all team members before deciding on a solution to the problem in the team task) (Edexcel, 2009).

- **Unit 3: *Learning with Colleagues and Other Learners***

Colleagues and other pupils are a valuable resource in the learning process and this unit introduces pupils to the importance of this resource. Pupils will have the opportunity to demonstrate that they can work as part of a group in a learning and development context, understanding learning goals and interact appropriately with their peer group. Pupils will also reflect on their experience of learning with a group of colleagues or other pupils (Edexcel, 2009). The unit features the following learning attributes:

1. Understand the importance of learning with colleagues or other pupils

Importance of learning with others: finding more effective answers and solutions to tasks or problems through interaction with other pupils (solving a problem by using ideas from several people rather than just own ideas) and developing interpersonal skills through learning alongside others (patience, empathy, tolerance, flexibility, loyalty, reliability) (Edexcel, 2009).

2. Plan the learning they will undertake with colleagues or other pupils

Learning goals: identifying an aspect of their learning they can undertake with other pupils, identifying a goal they can work towards or that is relevant to development in their field of work or study (attend a course to learn new skills for future employment) and work in a group to do research for school assignment (Edexcel, 2009).

Working towards the learning goal: attend a training course and attempt all tasks given on course, complete assigned part of a group or team project and compile a list of questions to ask visiting speaker during the question-and-answer session (Edexcel, 2009).

3. Be able to interact appropriately with colleagues or other pupils in a learning situation

Responding appropriately to advice from others: thanking someone for their advice, asking an appropriate question about the advice offered and being polite in expressing that you don't agree with the advice (Edexcel, 2009).

Expressing beliefs and opinions: preferences and dislikes and relevance of an aspect of learning, how useful the learning was (Edexcel, 2009).

Giving helpful feedback: feedback to other pupils on how useful learning was and what could be improved or changed (Edexcel, 2009).

4. Review the learning they have undertaken with colleagues or other pupils

Examples of learning with others: informal learning situations e.g. team-building activities or development activities, day-to-day working with a group of people at the same level and formal learning situations (training courses, induction days, classes, workshops) (Edexcel, 2009).

Reviewing the learning with others: deciding whether the experience of learning with others was successful (whether the group task was achieved), whether the pupil found out new information from others or acquired new skills from being with others and considering

anything that could have been done better (the pupil should have paid more attention to the suggestions and ideas of other pupils in the group) (Edexcel, 2009).

- **Unit 4: *Communicating Solutions to Others***

Being able to solve problems and share solutions with others is a valuable skill for learning, employability and life in general. In this unit, pupils will find out why a problem requires a solution, how to communicate possible solutions to others in an appropriate way and how to deal with responses to what has been presented. Additionally, pupils will review the effectiveness of their performance in presenting a solution to others and suggest possible areas for improvement (Edexcel, 2009). The unit features the following learning attributes:

1. Understand why they need to solve a Problem

Possible problems to solve: differences of opinion, new situations, misunderstandings, poor instructions, lack of communication, inadequate management, unforeseen events or emergencies, changes in situation or environment, need for new processes, need to improve or change a current situation, need to test or check new ideas, need to find information (Edexcel, 2009).

Reasons why the problem requires a solution: for example; inadequate management or knowledge means quality of work would not be so good, project cannot be undertaken unless sufficient resources are available, changes in technical equipment could lead to problems in producing a project and pupil cannot complete project on climate change without first finding out why climate change is occurring (Edexcel, 2009).

Ways to solve problems: investigate possible effects of changing technical equipment before implementing changes (Edexcel, 2009).

2. Communicate the solution effectively to others

Methods of presentation: verbal presentation either formally or informally and a written presentation (by email, project, portfolio or letter) (Edexcel, 2009).

Appropriate information: background research, evidence of where the solution has been used before successfully, what has improved since the problem was solved or what could improve once the problem is solved and who was contacted to provide support, guidance or advice (Edexcel, 2009).

3. Provide appropriate responses to questions or objections

Possible questions: wanting more detail about the solution, having a different view from that presented, not agreeing with the view presented, finding problems with the proposed solution (Edexcel, 2009).

Responding appropriately: give clear and accurate information; provide full information to offer to provide further information and deal with questions politely and tactfully (Edexcel, 2009).

4. Evaluate their performance

Carrying out an evaluation: discussion with tutor either formally or informally using a checklist or appropriate evaluation form and identifying what went well and what did not go well (Edexcel, 2009).

Suggesting how to improve on own performance: for example; not interrupt those who are asking questions about the solution, speaking more slowly when explaining how the problem was solved (Edexcel, 2009).

- **Unit 5:** *Learning from More Experienced People*

One of the key ways in which people learn and develop is by interacting with others who are more experienced in a particular field of work or study. These may be visiting experts, colleagues who are senior, or others working at a similar level who have spent longer in that particular field. In this unit, pupils will find out how to recognise what they have learned from senior or more experienced people, evaluate the usefulness of what they have learned and put these skills into practice for themselves (Edexcel, 2009). The units feature the following learning attributes:

1. Understand situations where they might interact with more experienced people

More experienced people: more experienced team members or pupils (heads of department, tutors; people in other teams) (Edexcel, 2009).

Situations of interaction with more experienced people: receiving advice, instruction or teaching from more experienced people in formal and informal contexts (classes, presentations, activities, workshops) and working alongside more experienced people (working in a team with more experienced colleagues or pupils, observing more experienced people for activities) (Edexcel, 2009).

Benefits of learning from more experienced people: application of skills to the learning environment (experience of dealing with tutors or peers, skills and knowledge of how to adapt to the different working conditions) (Edexcel, 2009).

2. Understand how more experienced people work effectively

Examples of effective ways of working and why they are effective: doing things effectively has positive impact on individuals and the organisation, meeting deadlines for handing in an assignment keeps people on track for a given schedule or timetable, producing high-quality work raises the person's self-esteem, participating in meetings or group activities helps others learn or do their work effectively and modelling good personal conduct has an impact on a class by setting high standards for behaviour and work (Edexcel, 2009).

3. Understand how they can improve their performance by learning from those who have more experience

Skills or processes learned from a more experienced person: how to manage personal finances and how to set a goal (Edexcel, 2009).

Using what has been learned to improve own performance: using new skills in personal finance to save money for a specific purpose and using new knowledge about a microscope to use it more easily and quickly in next science experiment (Edexcel, 2009).

4. Review what they have learned from more experienced people

Assessing the skills, knowledge or understanding learned from more experienced people: how easy or difficult it was to learn something new from someone with more experience, knowledge or understanding has been learned (Edexcel, 2009).

Unit 1:	Developing Personal Skills for Leadership
1 Understand the main features of Leadership	1.1 Describe the main features of leadership 1.2 Explain how their own skills and qualities relate to the main features of leadership
2 Plan how to demonstrate leadership Skills	2.1 Describe the range of skills they will use to lead others 2.2 Explain how they will put these skills into practice in order to lead others
3 Prepare for a leadership activity	3.1 Select a suitable activity to demonstrate their leadership skills 3.2 Explain why they selected that activity and how it will enable them to demonstrate an appropriate range of skills
Unit 2:	Practising Leadership Skills with Others
1 Understand how to lead a group Activity	1.1 Explain how their leadership skills will contribute to a given group Activity
2 Demonstrate effective leadership skills with others	2.1 Give support to other members of the group 2.2 Allocate tasks and activities appropriate to other members of the group 2.3 Give and receive appropriate feedback 2.4 Make decisions about tasks and activities appropriately
3 Evaluate their leadership performance	3.1 Carry out an evaluation of their leadership performance 3.2 Suggest areas for improvement of their leadership performance
Unit 3:	Learning with Colleagues and Other Pupils
1 Understand the importance of learning with colleagues or other pupils	1.1 Explain why learning with their colleagues or other pupils is important for their own development
2 Plan the learning they will undertake with colleagues or other pupils	2.1 Describe a learning goal which they will be able to undertake with colleagues or other pupils 2.2 Explain how they will work towards achieving the learning goal
3 Be able to interact appropriately with colleagues or other pupils in a learning situation	3.1 Respond appropriately to advice from others 3.2 Express beliefs and opinions to others appropriately 3.3 Give helpful feedback to others
4 Review the learning they have undertaken with colleagues or other Pupils	4.1 Give examples of how they have learned with colleagues or other pupils 4.2 Reflect on their experience of learning with a group of other colleagues or other pupils
Unit 4:	Communicating Solutions to Others
1 Understand why they need to solve a Problem	1.1 Describe a possible problem to solve 1.2 Explain why the problem requires a solution 1.3 Describe a way to solve the problem

2 Communicate the solution effectively to others	2.1 Using appropriate communication methods, explain to others how the problem was solved 2.2 Use appropriate information to support their explanation
3 Provide appropriate responses to questions or objections	3.1 Identify possible questions or objections to their solutions to a problem 3.2 Plan how to deal with feedback and questions from others in the group 3.3 Respond appropriately to questions or objections from others
4 Evaluate their performance	4.1 Evaluate how effective their performance was 4.2 Suggest areas for improvement
Unit 5:	Learning from More Experienced People
1 Understand situations where they might interact with more experienced people	1.1 Describe situations in which they might interact with more experienced people
2 Understand how more experienced people work effectively	2.1 Describe an effective way of working demonstrated by a more experienced person 2.2 Explain why this way of working was Effective
3 Understand how they can improve their performance by learning from those who have more experience	3.1 Describe an example of skill or process they have learned from others with more experience 3.2 Explain how they can use what they have learned to improve their performance
4 Review what they have learned from more experienced people	4.1 Carry out an evaluation of the skills, knowledge or understanding they have learned from more experienced people

Table 2.2: SLq learning attributes/Framework for SLq mandatory units (Edexcel, 2009).

The incentive for pupils and educational organisations is to use BTEC qualifications to gain the equivalent GCSEs in relevant subjects. The Wolf Report (Wolf, 2011) gives a positive and explicit endorsement of the validity of vocational education both pre- and post-16. In her ‘Executive Summary’ Professor Alison Wolf states: *“Good vocational programmes are... respected, valuable and an important part of our and any other country’s educational provision”* (Wolf, 2011). BTECs are consistently praised and endorsed throughout the report, particularly at Level 2 and 3 and are singled out on several occasions for the degree to which they aid progression both to university and employment. The report recognises that there is much high-quality vocational provision already occurring in schools and that these examples should be highlighted and built upon for the future.

However, Professor Wolf does point out that there is also poor-quality provision taking place that limits future opportunities for pupils. The SLq has been developed to give opportunities for pupils to gain a nationally recognised vocationally specific qualification in the field STEM. This is embedded in content, knowledge; understanding and skills pupils need to develop leadership skills and attributes within a STEM context. Pearson (Edexcel) intend to develop these opportunities for wider key skills, such as improving own learning and performance, problem-solving and working with others.

2.15 Contextual Framework

This literature review indicates the varied subject of leadership and leadership development that is established in adults and pupils. This review indicates the possible problems of developing pupils for leadership (Rhodes and Brundrett, 2008) while having an impact on school improvement. By understanding the problems of leadership development, there is a likely route to develop leaders for the future and develop curricular activities to address the STEM skills shortage (UKCES, 2013).

The SLq programme intends to address this need and to help develop leadership not just for the future economy but the prosperity of the participating school. Bianchi (2002) proposes criteria of skills and attributes that pupils need to acquire for a STEM-related career. However, Bianchi's (2002) framework for pupil leadership builds on prior research in the field of educational leadership (Linden and Fertman, 1989; Stogdill, 1974; DesMarais et al., 2000). These scholarly reviews discuss similarities and differences of their concept for

leadership skills and attributes. Subsequently, many leadership authors (Kolb, 1984 and Bennis and Nanus, 1985) have also conceptualised leadership regarding group process, personality, interpersonal and intrapersonal relationships to name a few. As this study examines the perceived relationship aimed at leadership skills and attributes in the SLq programme, it is important to note that Bianchi's (2002) work will be used to measure and analyse participants' leadership perceptions. All of the items in Table 2.3 will be used to identify skills and attributes discussed in the interviews. As greatly discussed in the next chapter, the framework will be used as a 'matrix' to compare and contrast against the perceived leadership skills and attributes that pupils gain and administrators observe to ascertain evidence toward the research questions.

2.16 Summary of Part Two

The development of the SLq programme is intended to help establish leadership skills and attributes within the context of STEM. This dual pronged approach is designed to help counter the shortfall of young pupils having vital STEM and leadership skills for the future. This section of Chapter Two has briefly explored literature underpinning Research Question Two: What are the perceived advantages and disadvantages of the SLq programme with encouraging leadership in pupils? The analysis of this section so far has briefly explored literature underpinning the SLq programme to develop pupil leaders. In turn, the benefits and challenges of the SLq programme uncover how pupils are using leadership skills and attributes to encourage, participate and be actively involved in leadership. This section now leads to explore the role of pupil leadership and encouraging leadership for the future.

Bianchi 'PC' Framework Bianchi (2002)	Leadership Attribute		Leadership Skills		
	Van Linden and Fertman (1998)	Kirkpatrick and Locke (1991)	Van Linden and Fertman (1998)	'Skills and Quality' DesMarais et al. (2000)	'Skills and Quality' Stogdill (1974)
Positive Self Image	Awareness of personal leadership	Leadership Motivation	Leadership attitude	Power and responsibility	Power and responsibility
Self-motivation	Vision Competence Working towards goals Managing the self	Drive	Leadership Attitude Stress Management	Knowledge and Skills	Achievement
Teamwork	Group expectation Group dynamics Learning to assess needs of self and others Experiential learning	Honesty and integrity	Leadership Information	Pupil leadership partnership	Motivation
Verbal Communication	Processing thoughts and feelings effectively Written and verbally Using active listening Distinctions made among aggressiveness, assertiveness and passivity	Cognitive ability	Communication Skills	Knowledge and Skills	Art of compliance Persuasion
Tenacity	Working towards goals Assertiveness	Drive	Leadership attitude		Influence
Problem Solving	Beginning to see all of the alternatives and consequences when making decision and being aware of their uncertainties	Cognitive ability	Decision-making Skills	People decision making	Differentiate role
Creativity	Trying out new way to cope vision	Creativity/Originality	Stress Management	Broad context for learning and service	
Critical Thinking	Regularly evaluating decisions already made Practicing using a decision-making model	Cognitive ability	Decision-making Skills Leadership Attitude		Differentiate role
Social Intelligence	Being kind and fair to others Acting ethically and sensitively	Self-confidence	Leadership attitude	Recognition of peer's experience	Acts of behaviour Initiation of structure

Table 2.3: A Contextual framework (Bianchi 'PCs' (2002), Van Linden and Fertman (1998), Stogdill (1974) and DesMarais et al. (2000)).

Part Three: Pupils as Leaders – Encouraging Leadership

2.17 Introduction

“Leadership is a social process it involves interactions with other people. It occurs in groups of people; therefore, using educational groups – groups focused on skill acquisition – in leadership development allows teenagers the opportunity to learn and practice their skills in a safe yet realistic environment.” (Van Linden and Fertman, 1998, p.9).

Why is it important to develop leaders from a young age? The purpose of this section of the literature is to look at the how leadership is used in schools for pupils and the possible pitfalls with developing such models. This section intends to discuss the various points of encouraging pupil leadership in schools and connecting leadership with pupils.

2.18 Teams in Schools

Learning relationships are essential to building a shared commitment to learning and growth. Interpersonal skills developed have a clear and shared purpose for performance by giving regular feedback and reviewing practice (Van Linden and Fertman, 1998). One of the most significant characteristics of a learning relationship is the way that individuals share and reflect on practice. Reflection is the means by which we make sense of the world and allows us to clarify to analyse, to prioritise and crucially to understand (Maeroff, 1993). Reflection is also the bridge between theory and practice and how experience is understood and converted into knowledge. It is the crucial process of moving from shallow to deep

learning and is central to the learning process for an individual, team or an organisation (Lawson, 2003).

However, team success also depends on social factors, school environments, local services, families and pupils working collaboratively (Anderson-Butcher and Ashton, 2004). Collaboration is described as the shared responsibility, relationships with people and working together to communicate, co-operate and co-ordinate (Gardner, 1999; Lawson et al., 1999). Educators are also conscious of the outside influences that affect collaborative environments and learning relationships. Children become interdependent so they work together to improve results. For this study, collaboration is greatly used as a partnership organisation and could be interpreted as *learning communities*.

In a collaborative environment, people communicate and co-operate. They share information and resources, harmonise operations and activities and enhance capacity (Gardner, 1999; Lawson, 2003; Lawson et al., 1999; Mattessich et al., 2001). As discussed in section 2.9, they also share power and authority, where individuals often view themselves as equals. Consequently, individuals may realise that they are interdependent. Lawson (2003) suggests that without collective contribution from others, people cannot achieve their missions and goals. For this reason, collaboration is characterised by lasting relationships and by a function of investment, focus, trust, mutual commitment and a strong sense of joint ownership (Lawson, 2003).

The idea of building an effective school with an efficient team at the helm seems to be a logical step to improve a school. An article from the Guardian Educational Supplement (2002), captioned "*We built the school from scratch as a team*", highlights the progression and development of teams to ensure the school is functioning and share goals. Consultative leadership (the involvement of staff and pupils) should theoretically enable everybody to have responsibility. However, problems may arise in understanding the fundamental elements for effective teams to succeed. Beckhard (1969) remarks that the goal of an organisation is to develop open communication, mutual trust and confidence between levels of staff. This certainly creates support but also active participation and synergy between leaders and managers, improving performance and results.

Leaders and teams working together is not a foreign concept. Etzioni (1961) and Wallace (2001) suggest synergy in teams is possibly outweighed by complexity and miscommunication (Hartley, 2007). Communication in teams can be thought of as an essential requisite of a leader's leadership style. Bell (1993) remarks communication should be clear, unambiguous, short, straightforward and must be transmitted in a style that is acceptable and understandable. The issue can be about how teams can ensure effective communication without disrupting synergy.

2.19 Communication

“Good Leadership is 10 per cent action and 90 per cent communication” (Dunford, 2012, p.4).

Human interaction is complex and integral to modern civilisation (Taori, 2001). Communication in society plays a vital part for interaction between humans, whether it is verbal, non-verbal, written or visual. How an organisation is managed depends on the level of interaction among participants, whether it is a school or a multi-national organisation, staff must be involved in decision making (Busher and Harris, 1999). However, the process of communication is vital for sharing knowledge, information and understanding with participants (Taori, 2001).

The way in which two individuals communicate to each other could be described in various forms. Taori (2001) describes these forms as *linear*, the flow of information is in one direction, interactional and dynamic. Two directional is described as *multidirectional* communication where both individuals are giving feedback simultaneously. Bell (1993) acknowledges that communication in groups is *“...often used to give information about changes, up to date events or particular arrangements”* (Bell, 1993, pp.97). Taori (2001) describes certain patterns as ‘networks’ where *“...effectiveness, efficiency and member satisfaction contribute to communication channels”* (Taori, 2001, pp.35). To allow networks to exist, communication is determined to be free flowing, restricted or having the right for information to be divulged. If members communicated in a *chain* messages would only be passed through immediate members of the group instead of the entirety of the team. As

information in the method would be likely to be confused, information would subsequently be distorted, rising to the annoyance of the group as a whole.

Questions which arose in Taori's (2001) review have great significance to support how groups communicate. Understanding main features of group work may give light to how groups use people to maximise team effectiveness, making them high performing (Blanchard, 1992). The suggestion of high performing teams implies that individuals are actively taking responsibility for their involvement in communication, where people become more self-aware and successful by learning about the dynamics of a team (Blanchard, 1992).

Belbin (1981) articulates that members of a group have a certain dynamic which exhibits characteristics as *action orientated*, where people have roles to implement, shape and analyse a situation. *People orientated*, where people use authority and co-operation towards a group. Finally, *cerebral orientated* is where as people use intelligence to solve problems and evaluate strategies for progression. However, Blanchard (1992) develops Belbin's (1981) model further to how groups can perform, therefore maximising the group dynamic rather than just the individual. Blanchard (1992) calls attention to the idea of group theory to build 'high performing' groups are aware of their roles but take an active engagement in strategies, ideas and solutions. If this is true, then group dynamic has an influential position of how well the group performs and how its outcomes are executed. One measure of maximising the potential of a group is to measure how a group is communicating.

Groups become high performing teams when members have a balanced range of characteristics as well as having a specific goal or a sense of mutual accountability. However, Van Linden and Fertman (1998) suggests that communication in groups is highly problematic. Teenagers often come into conflict with adults as they develop their individuality. They begin to voice their opinions through communication between their peers and adults. Van Linden and Fertman (1998) remark that adults often interpret this communication as argumentative behaviour, whereas, pupils sometimes assume that adults are objecting to the fact that their opinions are different, not to the quality of that opinion. The author comments that this results in one of two behaviours: they stop voicing their views or they become even more vocal than before. The author remarks that there are group expectations and rules such as accepting others' feelings and thoughts; speaking for yourself, avoiding *put-downs*, taking responsibility, respecting confidentiality and being open to participation.

However, this not a one-sided story as adults also need to be aware of their communication with pupils. Adults must recognise that their communication may cause pupils to feel patronised, defensive, belittled or embarrassed. Accepting pupils ideas and opinions, learning to understand their emotional well-being helps to foster patience and allows them to communicate effectively (Van Linden and Fertman, 1998).

2.20 Leadership for Pupils

McGregor (2006) infers that pupils are actively choosing to become pupil researchers or as 'co-researchers with teachers'. This conveys that pupils are becoming savvier about their learning, building their own professional development. Frost et al. (2009) reveal pupils process how they can be actively involved in leadership and learning, just as leaders take an interest in their personal development and succession (Gronn, 1999; Gunter and Ribbins, 2003). However, Rhodes and Brundrett (2009) suggest that pupil leadership contributes to school improvement but presently remains *"...limited within the confines of the established policy, social and cultural environments in many countries..."* (Rhodes and Brundrett, 2009, p.2). Subsequently, Day et al. (2007) recommend pupil outcomes are increasingly seen as an instrument to promote learning for staff and pupils. This is not limited to secondary education, research by Collinson (2007) in the FE sector, implies that pupils could be involved in *"...curriculum, learning to learn, workforce development, assessment for learning, organisation and design, new technologies, pupil voice, advice and guidance and mentoring"* (Collinson, 2007, pp.15). Still, the schools sector remains underdeveloped (Rhodes and Brundrett, 2009) towards promoting pupil leadership for school improvement. How pupils acquire skills and attributes for leadership and learning are still questionable. While some notable authors recognise the importance of group collaboration and independence (Black et al., 1998), others suggest that problems arise between teacher or pupil centric theories of learning (Brundrett and Silcock, 2002).

Leadership in schools is recognised as second only to classroom teaching and learning (Leithwood et al., 2006). Teachers have a direct influence to empower, engage and improve the lives of pupils beyond the school gates. In the classroom, teachers can inspire, create and lead lessons effectively, enabling them to showcase best practice and be leaders themselves. Nevertheless, Rhodes and Brundrett (2009) allege that school leaders still impose their strategy of school improvement by their measure and their measure alone.

Collaborative leadership may give pupils the ability to share in the sense of a *learning community* (Rhodes and Brundrett, 2009). Yet looking forward, schools may use leadership models to connect leadership to pupil development. This aspect may enhance how pupils appreciate the skills and attributes they gain and also provide positive outcomes for school success. Leadership models, in respect of *leadership for pupils*, could be a process to help pupils develop leadership skills and attributes in school.

2.21 Models for Leadership for Pupils

Van Linden and Fertman (1998) suggests fostering a culture of learning; empowerment, development and collaborative learning between leaders and pupils to improve outcomes. An organisation may introduce change by creating a 'pupil culture' however, change is often met with resistance (Fullan, 1999). To avoid this situation, an organisation must be committed to building a "*...collaborative culture must be innovative not just provide support, but also because they recognise the value of dissonance*" (Fullan, 1993, pp.53). Day et al.

(2007) and Davies et al. (2006), suggest that innovative leadership can be nurtured to allow pupil learning and facilitate different perspectives of personalised leadership. In whatever manner, pupil centred leadership or leadership for pupils encourages learning communities and empowerment. Van Linden and Fertman (1998) advocates that the role of involving parents, teachers, communities, employers to nurture pupil. The author suggests that the difficulty with fostering pupil leaders is that they often spend their time with their peers. Ianni (1989) comments that pupils are anxious whether they will be ready when the time comes for them to assume adult responsibility in society. However, over time pupils become secure in their environments to appreciate receiving and giving feedback.

Deakin-Crick (2006) and Black et al. (2006) proposes that pupils taking fuller responsibility would enhance their lives and learning. Claxton (2006) share that pupils need to develop an understanding of how they have learnt something, as well as what they have learnt, encouraging a dialogue based on four major learning dispositions: *Resilience*, *Resourcefulness*, *Reflectiveness* and *Reciprocity* – the 4R's. Claxton (2006) has coined this BLP. *Resilience* is the ability to persevere, manage distractions, be absorbed in their learning and noticing links or patterns in their learning, *Reflectiveness* is being able to plan to learn, revising ideas, distilling facts or information and meta-learning, understanding themselves as pupils, *Resourcefulness* is being able to make links, imagine what the end product will be, reason their ideas and processes and question to extend learning, as well as capitalising by drawing on the resources available and *Reciprocity* is being empathetic, collaborating, imitating good learning practices and being interdependent.

Claxton (2006) goes further to say BLP encourages pupils to understand themselves as pupils through personal reflection, therefore, enabling teachers to adapt and change their method of teaching. Gornall et al. (2005) propose that developing learning to be more reflective and evolving the language of both pupils and teachers can help teachers to pay attention to how pupils pursue learning (Claxton, 2006). Mollison (2010) reflects that learning capacity through the introduction of BLP is linked to both leadership and learning. Learning dispositions involve both an individual and a social process in which learning behaviours can be changed or developed.

There are many traditional approaches to pupil participation and leadership, through prefect systems, pupil librarians and school councils. Jones (2004) advocates that only a small percentage of pupils that responded in the author's research held 'formal' leadership positions across a school. However, participation rates for in-class leadership activities were much higher as most pupils have opportunities to exercise leadership but rarely recognised outside the classroom (Jones, 2004). Although pupils may participate in leadership roles within their educational setting, acquiring these learning dispositions is equally important (Claxton, 2006).

Role models are also valuable. Kimble et al. (1990) refer these people as 'protective shields' to help children withstand the difficulties of a stressful world. Just as in the family arena, the level of caring and support within the school is a powerful predictor of positive outcome for the pupil. According to Werner (1990) *"...only a few studies have explored the role of teachers as protective buffers in the lives of children who overcome great adversity"*. These

few studies provide evidence of this phenomenon and as Werner (1990) discovered the most frequently encountered positive role models in the lives of the children, outside of the family circle, was a favourite teacher. As Werner (1990) writes, for the resilient pupil, a teacher was not just a facilitator of academic skill but also a confidant and positive model for personal identification. While the prominence of the teacher cannot be overemphasised, it is imperative that schools provide the opportunities to develop caring relationships with both adults and pupils.

2.22 Summary of Part Three

The recognition of many different programmes to help pupils develop an understanding of leadership to encourage the topic of leadership in schools. This section of Chapter Two has briefly explored literature underpinning Research Question Three: How does pupil involvement in the SLq programme promote collaboration? The analysis of this section so far has discussed how pupils are given opportunities to effectively contribute towards leadership in their communities or groups. In this case, they can facilitate conditions for dialogue and teamwork where adults understand how to develop pupil leaders.

2.23 Summary of Chapter Two

From the first term falling after the 5th birthday, compulsory school children in the UK enter the formal education system and progress through a series of stages and transition points. They will remain in some form of formal education, or training until at least the age of 16. During this period, they will take a journey of education and personal development through which they will be exposed to a range of social and educational influences or experiences. At the same time, they will pass through key gateways and decision points – the choices they make will be a key determinant in their future life and career opportunities.

This chapter intends to highlight the diverse range of literature available the key concept pertaining to this thesis. STEM subjects are seen as critically important to the UK's economic success. Science, Technology, Engineering and Mathematics underpin the whole economy, from power generation, electricity distribution, utilities, the food chain, healthcare, transportation to information and communications infrastructure (Royal Academy of Engineering, 2015). Engineers and other STEM-qualified people are also pervasive in the wider economy and can be found in arts and entertainment sectors, sports, education and financial services. Some are employed in STEM roles in non-STEM sectors, others are in non-STEM roles but recruited because of their STEM background.

The literature review has revealed different aspects of pupil leadership, developing successful leaders and pupil leadership. In reviewing 'Research Question One: How does the SLq programme aim to promote the development of leadership skills in pupils?', the

literature has shown some insight into personal traits of leaders and has shown that leadership; leadership skills and attributes, values, vision, capacity for improvement and the role of power are significant aspects of successful school leadership.

Furthermore, 'Research Question Two: What are the perceived advantages and disadvantages of the SLq programme with encouraging leadership in pupils?' explored the SLq programme and how pupils are using leadership skills and attributes to encourage, participate and be actively involved in leadership and leadership for learning.

Finally, 'Research Question Three: How does pupil involvement in the SLq programme promote collaboration?' reviewed how pupils are given opportunities to effectively contribute towards leadership in their communities or groups. Within a group environment, they can promote conditions for dialogue and teamwork so that they can capture the skills and attributes of leaders, as discussed earlier in this chapter. This literature review asserts that inclusion is an important element for developing leadership, enhancing active pupil contribution and nurturing skills and attributes for leaders for the future (Bianchi, 2002).

Chapter Three - Research Design

3.1 Introduction to Chapter Three

The purpose of this chapter is to provide information, critically evaluate and justify the research design of this study. Cohen et al. (2000) remark that the viewpoint of the researcher and research paradigm can influence the direction and the nature of the enquiry. Therefore, it is important to note the social context and the philosophical stance that research may take. Consequently, this chapter describes the focus of the study, critically explaining the justifications of the research questions and the wider frameworks of the research in light of my positional stance in this 'field of study'. The research strategy, methodology, methods and interview mechanisms is explored. We then move on to evaluate and justify the interview process, access, sampling and the data analysis. Finally, this chapter outlines the strengths and limitations of the research design by considering the reliability, validity and ethical considerations.

3.2 Research Focus

The research focuses on pupils looking to gain leadership skills and attributes. The research questions underpinning the study are:

RQ1: How does the SLq programme promote the development of leadership skills in pupils?

RQ2: What are the perceived advantages and disadvantages of the SLq programme to encourage leadership in pupils?

RQ3: How does pupil involvement in the SLq programme promote collaboration?

The inspiration for this study initially came from the growing need for STEM related skills and leadership in the UK (CBI, 2014) and looking at how the SLq programme could provide leadership skills with a STEM context. Bianchi (2002) proposes that the SLq programme gives an opportunity for pupils to develop leadership skills, however, in schools, this *may not* be the case. The Literature Review reflected the importance of STEM in schools to pupil outcomes (Figure 2.3). However, there is a gap in the literature for developing leadership skills with a STEM focus. My research will help me to have a deeper understanding of leadership as a secondary school Physics teacher and more importantly a senior leader.

3.3 Positionality

The reason for selecting the research school within the area of the [REDACTED], was for their recognised participation in delivering the SLq programme. Also, the school is a relatively large state comprehensive secondary school, assigned a science specialist school with pupils that have a wide range of academic abilities. During my research, I was not able to obtain any literature outlining the overall impact of the SLq qualification in secondary education in different areas of the UK.

Interviewing senior leaders gives the study a holistic understanding of developing leaders in STEM education. Adult participants were purposely selected participants who would provide a view of STEM and leadership. However, the sample does not represent the wider field of participants that take part or administer SLq activities and the SLq qualification.

[REDACTED]. Denscombe (2007) suggests that data collected is affected by a researcher's identity. In this case, all pupils and four out of the five adult participants were based at the same school. None of the pupils interviewed had come into contact with the research before the interview and none were told of each other's interview, thus avoiding any possibility of interviewees discussing any of the questions. Nevertheless, all twenty pupils were purposely selected to meet the requirements of targeting the potential sources of data – being on the SLq programme. Finally, as mentioned previously, being a Physics

teacher and a senior leader, it is of personal importance to me to help understand and develop pupil leadership programmes in schools and extend leadership experiences to all.

3.4 Wider Frameworks

“...the key is understanding...” (Thomas, 2009, p.75)

Masterman (1970) considers the ‘essence of paradigms’ as the mode of enquiry which is situated within a broader context. The nature of the interpretive viewpoint is to understand and describe the world of human experiences (Gunter and Ribbins, 2003). Hartley (2010) describes how knowledge domains are divided into a typology of ‘paradigms of knowledge’. As Appendix D indicates, this typology comprises of eight *Knowledge Provinces* (Hartley, 2010), which are sociologically categorised into four groups. The *conceptual* and the *descriptive* (understanding meanings), the *humanistic* and the *aesthetic* (understanding experiences), the *critical* and the *axiological* (working for a change) and the *evaluative* and the *instrumental* (delivering change) (Ribbins, 2006). Likewise, Ribbins and Gunter (2002) also develops a typology (Appendix C) to describe leadership in education as *Conceptual, Critical, Humanistic, Evaluative and Instrumental* (Ribbins and Gunter, 2002, p. 378). In this case, my research is concerned with the humanistic domain, drawing on the participant’s lives and experiences and as a result, providing a factual report to understand leadership and leaders further.

3.5 Philosophical Approach and Research Strategy

The nature of research is “...*a systematic, critical and self-critical enquiry which aims to contribute to the advancement of knowledge*” (Bassey, 1990, p.1).

Bassey (1990) reveals that researchers work with a range of beliefs but are often unclear about the appearance of enquiry and where the concepts of reality can change from person to person. Cohen et al. (2000) suggest that research views the ‘social world’ in light of literature and theoretical viewpoints. These views of social science represent different means of examining the *world* within which research takes place. The observed *world* can be easily defined as being *out there*.

Cohen et al. (2000) consider the ontological assumption of a social reality and what it could impose on the conscious form or that of the product of the conscious to an individual. Ontological perspectives referred to as *entities* are dependent on the observer perception of reality and truth (Bassey, 1999). The research explores the relationships, lives and experiences of an individual and how that individual perceives their reality. Therefore the number of realities experienced by some people are based on personal opinions, interpretations, points of view, emotions and judgment (Thomas, 2009). Experiences are established when individuals observe the ‘world’ that they see (Denscombe, 2007). However, Denscombe (2007) also suggests that research can fall into another research ontological viewpoint, phenomenology – designed with the approach of understanding human interpretations of personal experiences. Essentially, this research is intended to increase the knowledge and understanding by making better sense of perceptions.

Cohen et al. (2000) suggest that epistemology is a process of understanding and conceptualising our reality and our image of the world on the foundations of knowledge. Exploring 'how researchers can establish fundamental questions?' is the basis of knowledge (Bassey, 1999). Therefore, it is important to understand how truth, belief and propositions can differ and generate knowledge. Trochim (2002) remarks that at one end of the *philosophical spectrum* knowledge is hard, real and capable of being transmitted in a tangible form. Experience and insight are also domains of knowledge on the *philosophical spectrum* (Trochim, 2002). This approach is typically researched using a qualitative method, where reasoning is inductive and data is *soft* (Denscombe, 2007). As this study explores the depth, intricacies and richness of pupils' and administrators' experiences with the SLq. Knowledge is interpreted and constructed, determined by experiences and perceptions, therefore grounded in the *interpretive paradigm* (Newby, 2009).

In considering the theoretical perspectives and the location of my research based within the research 'social world' by creating vivid reconstructions of the culture or entities being studied (Cohen, et al. 2000), my philosophical stance will be that of an interpretivist (Hartley, 2010). This will help me to understand the characteristics, essences and description of meaning to individual experiences. This will provide deeper insights into human interactions, focusing on the development of leadership in pupils. This stance recognises the ontological perspectives, where truth and reality are the product of an individual's perception based upon experience and insight (Denscombe, 2007) and as Denzin and Lincoln (2003) suggests that beliefs about ontology, epistemology and methodology shapes how the

qualitative researcher views the world and continually reviews and reflects on how they see the world and how that impacts on how they interpret what is seen.

3.6 Research Methodology

Strauss and Corbin (1998) discusses interpretivism as an approach to gain insights through discovering meanings. The authors remark that the underlying assumption of interpretivism is to understand a phenomenon. Likewise, Robson (1993) discusses that a case study is used to investigate 'soft' data especially about the relationships between variables or the explanation of the social phenomena. This was initially thought as a valid methodology for this study to give a rich description and deeper understanding of perceptions of events. However, Denscombe (2007) remarks that this creates limitations, a notable lack of systematic handling of data and a weak basis for scientific generalisation. In this case, my research intends to keep the accuracy and honesty of the responses and having a purposive sample of participants to ensure that the data collected will represent an inclusive sample (discussed in 3.10).

After my initial research, it became apparent that access to a wide range of data would be likely but unfeasible. Pupils and administrators in the study are not only influenced by their social surroundings but also by their family members and peers outside of the school environment. To counter this, the amount of time to collect data was limited and concentrated with collecting data pertinent to a case study. Therefore, my study uses a case study as a methodological approach, obtaining the experiences of participants in the study.

Although this research strategy is mainly used in large scale quantitative research, Denscombe (2007) suggests that data like this could also be used for small scale qualitative research. Indeed, methodologies in the qualitative paradigm indicate that personalising data collection is important as individuals are likely to alter their answers (Denscombe, 2007). In this case, the validity of the study is tested by two different means, firstly by participants' answers which are more likely to be accepted as being *truthful* and *accessible* to incorporate a broad and inclusive source of data (Cohen, 2000) and secondly through the analysis of PCs from Bianchi (2002).

3.7 Research Method

As the aim of the research is to gain knowledge and understanding about pupil leadership and leadership development, it is appropriate to consider the perceptions of how pupils 'feel' they are gaining leadership skills and qualities. Therefore, it is essential to have a qualitative research approach to investigate the emotional context of participants (Denscombe, 2007). In this case, the study used semi-structured interviews with twenty participants who were only taking the qualification, aged between 11-13 years (known as participant 1-20), from the school, three senior leaders and two administrators (known as participant 21-25). Semi-structured interviews provided an opportunity to explore and adapt, freely and openly, the possibilities of diverging questions to answer the specific questions than from a scripted, structured interview. This allowed participants to answer questions and give explanations to explore a particular viewpoint (Newby, 2009). Denscombe (2007) acknowledges the relaxing nature of interviews, eliciting the enjoyment

of conversation and reflection in a non-critical environment, obtaining narratives of individual experience stories. The interview process was supported by an interview schedule of pre-designed questions, providing a suitably structured approach to ensure data collected is focused and relevant. This also supported guidance to look for themes in the interview and to provide clarification hence avoiding the opportunity to stray away from fixed questioning.

The use of semi-structured interviews can encounter difficulties. Interviewing and transcribing conversations is time-consuming yet recording the interview may affect the interviewees by overwhelming them with some of the early dialogues in the interview process. The presence and perceived 'power' of the interviewer could potentially prevent an honest account from being obtained from the interviewee (Denscombe, 2007). It was important to address these issues before commencing the interviews. Therefore, the interview technique was vital. By asking appropriately worded questions the interviewees were at ease which allowed them to respond openly and honestly. Denscombe (2007) suggests that using this method gives participants the opportunity to answer questions openly and develop ideas in a general context. Although making the process of analysis more challenging, semi-structured interviews provide a source of "*rich data*" (Newby, 2009, pp.342) to clarify any misunderstanding for the participant. This approach was also carefully established early in advance of the interview by using a participation letter (Appendix G and Appendix H).

As there were effectively two interview groups, an interview format for adult participants differed to the interview with pupils. In this way, participants were able to develop a broad range of concepts from the interview schedule (Denscombe, 2007). Piloting the qualitative method uncovered some problems that could have affected the research process. Peat et al. (2002) identify some of the shortfalls in interviews. These may be difficult or ambiguous questions, assessing whether each question would give an adequate range of responses, establish that replies can be interpreted in terms of the information that is required, check that all questions are answered, re-word any questions that are not answered and revise and if possible pilot again (Peat et al. 2002, pp.123). Consequently, two pilot interviews enhanced the structure of most interview questions, allowing the opportunity for refinement (discussed in 3.8).

3.8 Interviews Mechanism

The design of the interview schedule must consider the variables of the subject matter allowing the interviewee to answer in a manner that is open and honest (Cohen et al., 2000). These variables were dependent on the relationships, level of responses and the insights from that specific interview. Pilot interviews helped with this process as participants were not involved with the participant sample, providing the opportunity to practice and develop my interview technique. In this case, it was imperative to use words that made sense to the interviewees. Certain words were sensitive to the participant's context and the ontological viewpoint. Therefore they needed to be short and devoid of jargon (Appendix E and Appendix F). Probing allowed responses to deepen, increasing the richness of the data

(Appendix E and Appendix F). This was done through direct questioning of what has just been said, for example, "*Could you say something more about that?*"; "*Can you give a more detailed description of what happened?*", "*Do you have further examples of this?*". Alternatively, a "mmm" or a pause allowed to the subject to go on with the description. Repetition of significant words to an answer was a technique utilised to encourage them to elaborate and strengthen the richness of data collected (Kvale, 1996).

The interview schedule was constructed to provide open-ended questioning. "*Do you feel...*", "*Why is it so...*" and "*Can you give me examples of...*" questions ensured answers did not stray far from the research topic. Leading questions were not used to ensure participants did not give speculative answers. Participants did receive some information prior to the interview (Appendix G and Appendix H) to give some context.

The interview questions were selected from the literature, more specifically based upon the three Research Questions. Research Question One focused on the development of leadership skills in pupils. Therefore, the interview questions became directed towards gaining insight into the skills and qualities suggested by the contextual framework and literature of Bianchi (2002):

- Which skills do you think are gained in SLq?
- What is your view of a leader and more importantly about leadership?

Research Question Two based questions focused on the advantages and disadvantages of the SLq programme with promoting leadership for pupils. The interview questions are

framed towards *how* pupils are using the SLq programme for leadership development, especially compared to the literature of Bianchi (2002):

- Do you think that any skills gained in SLq are transferable towards leadership?
- How does STEM provide experiences that enable pupils for leadership development?

Research question three discussion points were focused on the perceived pupil involvement with SLq to promote collaboration. The interview questions were used to explore how pupils are developing collaboration and networking in SLq programme:

- Are there any examples you could suggest e.g. projects that STEM has provided these skills that you have mentioned?
- What do you consider in the SLq programme that is the same as in the school curriculum?

As previously discussed, my research acknowledges that these questions may not necessarily be asked using these exact words and in this particular order during each of the interviews. Questions were asked at the appropriate time, ensuring enough time was given to provide detailed information for the study.

3.9 Conducting the Interviews

The use of semi-structured interviews invariably creates limitations, especially building on relationships in an educational context. Denscombe (2007) agrees that data collected is affected by the personal identity of the researcher. This could have affected the interviewer-interviewee relationship such that the interviewees may have assumed prior

knowledge in some areas or be less likely to divulge some incidents for sensitive reasons. It is vital to explore issues surrounding the relationships that may occur in research.

All participants remained at a professional distance from the researcher as the twenty pupils were not taught by myself or had any interaction in or out of the learning environment (school). This allows research to be conducted proficiently, although these participants incline the research topic. Participants did not have details surrounding the research thus preventing participants to *brush-up* on their knowledge or understanding and attempting to extract the perceptions and feelings of their experience.

Semi-structured interviews provided an opportunity to interview participants in their natural surroundings. Interviews were conducted at the participant's place of work/pupils' school. As one participant was at a different geographical location (NSLC), complications of organising an interview at their convenience were experienced. Being a full-time teacher proved problematic as participants and timetables clashed. The interviews were arranged by contacting participants directly by telephone or by a personal visit to agree suitable dates, times and locations. Interview data was collected using a digital voice recorder and through field notes. Denscombe (2007) also suggests that relying on memory alone is unreliable and may lead to error in data analysis.

The duration of interviews was between 20-30 minutes for pupils and between 40-50 minutes for adults. The decision to reduce the interview time for pupil was a conscious choice. As an educational practitioner in secondary schools, in my experience with pupils

aged between 11-13 years have relatively limited responses to classroom questions unless probed, even if participants have strong listening and literacy skills (Powney and Watts, 1987). However, Powney and Watts (1987) suggest that pupils are also more likely of giving responses to their personal development and personal perceptions. For many pupil participants, this was the first time that they had given feedback on the SLq programme. Subsequently, the quality of the responses varied between pupil participants, depending on their personal experience of the SLq programme. This may have been influenced by their approach to leadership. However, the data collected yielded wealthy and insightful reflections for this study.

3.10 Access, Population and Sampling of Participants

It is important to note that there was no contact between the researcher and the participating pupils in the study. Adult participants were recruited by using a top-down approach, contacting secretaries at the relevant institutions to ask permission to interview. This may have been problematic as some adult participants were in high demand as senior leaders have a hectic schedule which could cause the process of project management to fall behind schedule.

The selection of adult participants evolved from their involvement with SLq, from a position of headship to teaching assistants working with pupils every week. The national leader for STEM was also chosen to give an overview perspective of leadership development for pupils and to deliver a broad perspective of STEM leadership development of pupils. As discussed

in section 3.7, the sample of pupil participants were chosen as the only pupils undertaking the SLq, however, this does not represent the wider field of participants that take part in SLq activities and SLq programme throughout the UK. As Cohen et al. (2000) suggest the sample is deemed to be selective and generalisations will not be made to the perceptions of leadership. As the sample is purposely selected, the sampling approach is not drawn by equal probability of sampling, therefore not originating to any conclusions about other factors that may affect the sample. The sample was intended to ensure that there was an equal gender split to ensure there was no gender bias to the study, however, the ratio of female to males was 1:3, the cohort of pupils undertaking SLq in the school were predominantly male. From the adult participants, three were female and two were male. Out of the all the participants requested to be interviewed, there were no refusals for their involvement and assistance in this study. In this case the sample is deemed to be a convenience sample Newby (2009) where the size of the sample is relatively small and the locality of the sample is at the convenience of the research and researcher.

Letters were sent to the purposely selected administrators, pupils, parents or guardians highlighting the aims of the study. I conducted the interviews at [REDACTED]. Access to pupil data (names, curriculum subjects, attainment and progress data) was in accordance with my professional standards as a teacher (forms a part of the DBS safeguarding procedure). Abiding by the University's 'code of practice' (discussed in 3.11), full and proper consent was given for these pupils to take part. This was agreed by both the parent or guardian and myself for the research to take place. Letters (Appendix G) state that the interviews took place in a location familiar to the pupils with

myself. A modified letter, changing 'parents/guardians' to the adult's name, was used to inform participants, who are administrators (Appendix H). Following the success of the pilot interview, the letters were sent before September 2011. The researcher conducted the interviews between May and July 2012.

3.11 Ethics

"Ethical researchers need to inform those in the study whether the research is anonymous, confidential or neither. Research is anonymous when the researcher is not able to identify the participants in the study. In a confidential study, the researcher knows or could know the identity of the participants but does not reveal who they are" (Bailey, 1996, p.8).

Ethical issues in social science research pose intermittent and important issues about the reflective nature of research itself. Robson (1993) indicated the differences between ethics and morals in research but highlights that these distinctions can be interchangeable in context. Kelly (1989) suggests that researchers must develop a special awareness of ethical considerations which take place. Equally, Robson (1993) agrees on this as the presumption of keeping a distance from direct ethical involvement such as emotional attachment. The question remains *"How ethical was it that the viewpoints or voices of the research participants were not heard in the reports?"*. The study used voluntary participation and did not coerce participants to take part in interviews. Ethical guidelines were adhered to by BERA (2011), ESRC Framework for Research Ethics (ESRC, 2010) and the University of Birmingham Code of Practice for Research. Participants had the right to withdraw and interviews were conducted by the researcher – with valid DBS certification. Consent forms

had also been signed by interviewees and by parents for those who are under the age of parental consent. Interviews were conducted in a safe environment. For pupils, letters were handed to their corresponding tutor and informed the tutor of that particular pupil's withdrawal at a specific time.

This study made no connection with the participants to outside disclosure. Special consideration was taken into account, as many of the participants are school pupils. The contextual details such as age and gender of each participant were kept to a minimum to maintain the confidentiality of the participants. The educational institution was also not disclosed to protect the identities of pupil participants. Ensuring confidentiality of all participants was maintained and, in this case the interviewees were more likely to participate in the study.

3.12 Validity, Reliability, Triangulation and Trustworthiness

Denscombe (2007) suggest that the data collected is unique, owing to the specific context and the specific individuals involved. Sliverman (1993) infers that reliable research takes into account the characteristics of the researcher, who must be responsive and adaptable to changing circumstances. In this case, my research uses a range of techniques to ensure thoroughness. A pilot study was used to pre-test or try out a particular research instrument – semi-structured interviews (Baker 1994). One of the advantages of conducting a pilot study is that it might give a warning about where the main research project could fail. In this case, amendments were made to the original interview schedule resulting in an accurate and

meticulous interview, improving reliability. Piloting revealed that the questions asked had been worded to achieve a desired effect, but some questions were vague and amendments were necessary:

What does leadership mean to you?

- Probe – how does your practice of leadership differ from others?

This was amended to:

What does leadership mean to you?

- Probe – how does your practice of leadership differ from others?
- Probe – can you give an example of how a leader acts around others...?

Another example indicated that certain instructions to interviewers were not sufficient to help generate answers, as:

What are the difficulties with promoting leadership?

- Probe – how do pupils identify leadership?

This was amended to:

What are the difficulties with promoting leadership in SLq for pupils?

- Probe – how do pupils identify leadership?
- Probe - what possible problems do pupils encounter with identification with leadership?
- Probe – what possible problems do pupils encounter in general?

Guba and Lincoln (1981) discuss participant checks as a continuous process during data collection to aid researchers with verification of the overall results. While it is an attractive idea to return to the results for verification, this was not a valid verification strategy as

transcriptions of interviews provided the opportunity for eliminating error and inaccuracies. I was aware that transcription would not provide an “*objective record*” (Mason, 2002, pp.77) of the interview. However, my research was conducted at the point of direct contact at the interview, removing some of the inaccuracies discussed.

Validity can also be verified by participant triangulation, in this case, by administering similar questions to pilot participants in the same way as in the main study. This allowed participants to give feedback and to identify ambiguities with difficult questions. Denscombe (2007) recommends that data can be checked with other sources from the same data sample to provide the level of consistency. In the process of transcribing interviews, themes relating back to the research questions were checked to increase the credibility of responses.

Guba and Lincoln (1981) also denote that trustworthiness of a research study is necessary to evaluate its worth. Trustworthiness involves establishing; *Credibility* (confidence in the 'truth' of the findings), *Transferability* (showing that the conclusions have applicability in other contexts), *Dependability* (showing that findings are consistent and could be repeated) and *Confirmability* (a degree of neutrality or the extent to which the results of a study are shaped by the respondents and not researcher bias, motivation, or interest) (Guba and Lincoln, 1981).

In my research, *Credibility* and *Confirmability* are covered by triangulation. Upon analysis of the data, current themes emerged from different participants to confirm this phenomenon.

Guba and Lincoln (1981) put forward that by using converging data sources; methodological triangulation inconsistencies are minimised. In this case, using different senior leaders from the research school ensured that the correct methodology was employed. Participants answered the same questions and gave similar evidence. My research does cover *Transferability* as a phenomenon where I can evaluate the extent to which the conclusions drawn are transferable to other times, settings, situations and participant groups, from pupils to adult participants. However, this study does not include *Dependability*. In this technique, external audits are not carried out due to the nature of the study only being used in some schools across the country. As the study intends to find the perceptions of leadership development about the SLq programme, it remains unique to the field of research and therefore an opportunity may arise for this aspect to be a following field of research.

As Thomas (2009) discusses, bias is inherent in a particular research method. This is eliminated by not discussing the research with participants. However, due to the nature of my role, as a teacher and senior leader, the issue of unconscious bias is certainly a point of discussion. Thomas (2009) remarks that bias can assume the role of researchers making judgments about people and situations without us realising. As I am aware of the effect of unconscious bias, the use of language towards participants was fair and non-judgmental and interviews followed the interview schedule as closely as possible.

The work on the initial research design was started in the Autumn 2010 and was refined during the period 2010 to 2011. During summer of 2011, I undertook a pilot interview. The

actual field work was started in summer of 2012 and completed at the end of summer 2012. However, due to a leave of absence, further research from 2015 to 2017, as set out in Chapter Two, led to the inclusion of more recent literature that enable the findings and conclusions set out in Chapter Five to be tested against current research. However, as figure 2.2 signifies, key polices and Governmental report only strengthen the need for key skills and STEM education in the UK.

3.13 Generalisability

Thomas (2009) explains the difficulties of generalisations in social science, where good generalisations provide accurate predictions. The extent of which research data can be generalised to another situation can be difficult. Trochim (2006) suggests that a small-scale research project would allow similarities to be transferred to another project to improve validity. Newby (2009) advises that due to the sampling process whether it is a purposive or convenience sample, the criterion for selection is at the discretion of the researcher and therefore so are the results from the sample. Therefore, investigating the main features outlined by the aims of the research, should not be generalised. Nevertheless, this creates limitations such as creating a *small picture* that is dependent on the local and temporal context of when research is carried out. As a result, the validity of a larger field could be saturated and misinterpreted (Denscombe, 2007). This study is therefore not generalisable but will be of value for those wishing to reflect on their educational practices for pupil participation and leadership development.

3.14 Data Analysis

A systematic approach was used to analyse the data starting with categorising of the raw data; then comparing the emerging categories, after which these were checked against what is in the literature. Finally generating concepts for a better understanding of the perceptions in the study (Denscombe, 2007).

One method of analysis, grounded theory, is used to inform the researcher to find the answers in interviews data. A theory is then developed from the data rather than imposed upon it. However, in grounded theory, the answers come from repeatedly coding, reviewing and refining the coding process. The analysis aimed to resist from editing as the process concentrated on the indication and identification of themes of the relationships in the interviews. The researcher is aware of the nature of this research being small-scale and taken at a specific point in time. As Strauss and Corbin (1998) suggest, grounded theory of data analysis is achieved by repeating the collection of data and re-analysing. However, this was not feasible due to being a small-scale research study.

The use of the analytical methods described by Miles and Huberman (1994) is adopted so that information gathered can be "...consisting of three concurrent flows of activity" (Miles and Huberman, 1994). A matrix (Table 3.2) was created to display data and place themes into organised and accountable conclusions towards answering the research questions:

1. **Data reduction:** to sharpen, sort, focus, discard and organise the data in a way that allows for “final” conclusions to be drawn and verified. Data can, therefore, be reduced and transformed through such means as selection or a summary process to reduce the size of a data set (Miles and Huberman, 1994).

After the pilot interview had been transcribed, the addition of probes and prompts were refined and added to the interview schedule and the interview process began. The interviews were divided into two groups, Participants 1-20 (pupil participants) and Participants 21 – 25 (adult participants). The research interviews are grouped by themes outlined by the research questions; this entails the research focus and literature. Table 3.1 illustrates how grouped interview responses for the initial data reduction as specified by Miles and Huberman (1994). The analysis involved piecing together the categories to create a display which helped to complete the initial round of data reduction. While constructing the display boards, memos and notes were taken as an intermediate step towards the second round of data analysis – axial coding. These memos, as described by Charmaz (2009), helped to record emergent themes from the transcripts.

2. **Data display:** taking the reduced data and displaying it in an organised, compressed way so that conclusions can be drawn easily (Miles and Huberman, 1994).

The second round of data analysis utilised axial coding, where categories are related to their subcategories to form more precise and complete explanations (Strauss and Corbin, 1998). Coding was used as a process of creating grounded theory (Strauss and Corbin, 1998). As discussed in the previous chapter, the contextual framework (Table 2.3) was coded so that an effective analytical tool would most likely guide my interpretation of the data towards legitimate answers (Table 3.2). The matrix (Table 3.2) involves analysing each data reduction

(Table 3.1) and sorting the data into their relevant section headings. I then extrapolated the key themes from the participants' answers. A systematic approach was used to assist in analysing transcriptions, by selecting relevant key sentences and combining these into groups and sub-categories. As the coded categories were directly linked to the interview data, they did provide a logical sequence to identify themes in the research quickly. This was a continuous approach to closely compare and contrast the first round of data analysis, data reduction. Table 3.3 illustrates, this process of coding. Data relating to the contextual matrix are given a code and the frequency of aspect relating to the SLq qualification course content was measured, for pupils or adults, to reveal further meanings towards leadership development in the SLq programme (shown in Table 4.2 and Table 4.4).

Understanding Leadership	
Definition Leadership	Identification
that leaders are people that who provide, like er..., kind of like an inspiration for everyone first and people will follow them and look to be like them and er... with leaders are the sort of people to who make big decisions and have to like make generally decisions based around everyone else.	with the one where we went to the space centre, there was kind of different kinds of leaders within their groups and then there was a main leader person who would relay messages and such. Because then there was not a person who could like try to keep control with everything that was happening while you was there, there was also different people within their little groups who had to sort out specific things to others.
Leadership is when you have a mind of your own and you know what to do and you could tell other people what they need to do because not everyone knows how to be a leader so having a leadership quality means that you can do things right cause you can think independently.	A specific leader like, a leader would take in mind what other people say I think but he would think for himself and he would know what's best and he would do what's best usually.
It's like an important role because you're the leader and you help other people and trying to support them and help them out	some people are more dedicated to what they are leading, they have better skills and some people have extra skills like listening and understanding because if you can listen and understand you can take in what people are saying and you can adapt that to make it better some people but leaders can control people and keep everyone together and help everyone work in a team
well sometimes we can show leadership in our work, like in English we have a dragons Den project and I'm the team leader and I think that this STEM qualification has helped me become more confident	they would be confident and wouldn't be hesitant about anything and would listen to everybody, what everybody wanted and get everyone's opinions in

Table 3.1: Extract of the first round of data reduction for pupil participants.

3. **Conclusion drawing/verification:** noting regularities, patterns (differences/similarities), explanations, possible configurations, causal flows and propositions. Where the extrapolation of certain conclusions from the data enables any discrepancies to be found (Miles and Huberman, 1994).

After the second round of data analysis, I was able to determine the relevant themes from the data. The third and final round of data analysis, centralised theoretical themes in an organised manner to draw out the relevant ideas and concepts. The analysis collated correlating data and emergent themes. However, as Miles and Huberman (1994) explain, the last round of data analysis involved going back to the interview transcripts (Appendix I) to seek out the participant's interpretations and comparing the interview data with the reduced data which was then compared to literature and relevant theories as discussed in Chapter Two. This is where conclusions were made to determine how the data could explain the thematic findings into a conjugant and succinct evaluation of the research questions to draw conclusions and recommendations for further work.

<i>Bianchi 'PC' Framework Bianchi (2002)</i>	<i>Pupil Leadership trait Van Linden and Fertman (1998)</i>	<i>Skills and Quality Van Linden and Fertman (1998)</i>	<i>Skills and Quality DesMarais et al. (2000)</i>	<i>Skills and Quality Stogdill (1974)</i>
Positive Self Image 1a	Awareness of personal leadership 1b	Leadership attitude 1c	Power and responsibility 1d	Power and responsibility 1e
Self- motivation 2a	Vision 2bi Competence 2bii Working towards goals 2biii Managing the self 2biv	Leadership Attitude 2ci Stress Management 2cii	Knowledge and Skills 2d	Achievement 2e
Teamwork 3a	Group expectation 3bi Group dynamics 3bii Learning to assess needs of self and others 3biii Experiential learning 3biv	Leadership Information 3c	Pupil leadership 3di Partnership 3dii	Motivation 3e
Verbal Communication 4a	Processing thoughts and feelings effectively 4bi Written and verbally 4bii Using active listening 4biii Distinctions made among aggressiveness, assertiveness and passivity 4biv	Communication Skills 4c	Knowledge and Skills 4d	Art of compliance 4ei Persuasion 4eii
Tenacity 5a	Working towards goals 5bi Assertiveness 5bii	Leadership attitude 5c	5d	Influence 5e
Problem Solving 6a	Beginning to see all of the alternatives and consequences when making decision and being aware of their uncertainties 6b	Decision-making Skills 6c	People decision making 6d	Differentiate role 6e
Creativity 7a	Trying out new way to cope 7bi Vision 7bii	Stress Management 7c	Broad context for learning and service 7d	7e
Critical Thinking 8a	Regularly evaluating decisions already made Practicing using a decision-making model 8b	Decision-making Skills 8ci Leadership Attitude 8cii	8d	Differentiate role 8e
Social Intelligence 9a	Being kind and fair to others 9bi Acting ethically and sensitively 9bii	Leadership attitude 9c	Recognition of peer's experience 9d	Acts of behaviour Initiation of structure 9e

Table 3.2: A contextual framework for coding PCs and leadership traits (Van Linden and Fertman (1998), Stogdill (1974) and DesMarais et al. (2000)). (Van Linden and Fertman (1998), Stogdill (1974) and DesMarais et al. (2000)).

Interviewee	1	2	3	4	5
Leadership	1a/1b/2bi/ 4a/5b/5c 8c/9bi	1a/1d/3biii/ 4a/4bii/4c/ 4eii/5bii/ 8ci/	1b/2biv/5e/ 9a/9bi/9bii/	1b/2bii/3e/ 4ai/5bi/	1b/1d/1e/ 3a/3e/6bii 4eii/5e/6b 6c
Identification	3bi/4bi/6b/ 9bi	4bi/6b/ 9bi	4biii/6b/3a/ 1c/ 9bi	1c/4biii/4c	1a/4a/6b/ 3biv/ 9bi
Identified STEM skills in course (Bianchi's PC's)	8a/3a	2a/3a	9a	1a	1a/3a
Advantages with promoting leadership in STEM	9a/9bi/9c 9d	1b	1b	2bii	1c

Table 3.3: Example of coding against Table 3.2 for the second round of data reduction.

3.15 Summary of Chapter Three

This chapter provides an overview of the research approach for this thesis to justify that the design is fit for purpose. By explaining how the sample was generated, collected and analysed, this chapter examines the relevant methods, methodology and its suitability for this study. I believe that the epistemological, methodological and ontological positions are considered to explain the study of the three research questions. Chapter Three also explained the research strategy and justified the corresponding method for collecting data, semi-structured interviews. Relevant issues were discussed such as the ethical issues, validity, reliability and triangulation of qualitative research and particularly the topic of extracting data about developing leadership.

I believe that the research design chosen to consider the three research questions appears to be appropriate. It includes an element of analysis and a significant amount of fieldwork using semi-structured interviews to create sufficient data for analysis and drawing conclusions. The interviewees had direct involvement with the field of study, having first-hand experience of the impact of the SLq programme. I have considered the many practical and philosophical issues relating to my research but it will only be through the completion of my field research and in analysing the data and reaching a conclusion in the final chapter of the thesis. I will then be able to evaluate whether the research strategy was effective in enabling me to address my three research questions. As a Physics teacher and senior leader, this research has particular relevance to my professional work. It will enable me to be better informed of pupil leadership, STEM and leadership as a whole. The outcomes of the study will be of relevance for the NSLC, The CSE at Sheffield Hallam University, local authorities and secondary school leaders to develop a broader curriculum linking pupil leadership and STEM.

Chapter Four - Presentation of Findings

4.1 Introduction to Chapter Four

This chapter outlines the findings emerging from the twenty semi-structured interviews conducted with pupils and five semi-structured interviews with administrators, four of which were also based at the school and one administrator who is a national leader for STEM education in the UK. The researcher has used a number representation to differentiate between pupils (now known as participants); 1-20 for the pupils and 21-25 for the administrators. As discussed in the Research Design chapter, grounded theory allows the analysis of text from data collection, to inform the researcher to find the answers in interviews data. A theory is then developed from the data rather than imposed. This chapter will reveal each research question and the subsequent evidence for themes that have been discovered. The first Research Question: How does the SLq programme aim to promote the development of leadership skills in pupils? explores the following interview questions:

- understanding leadership
- understanding the importance of leadership others
- the skills and attributes attained by promoting leadership in SLq

The second Research Question examines What are the perceived advantages and disadvantages of the SLq programme with encouraging leadership in pupils? explores the following interview questions:

- advantages and disadvantages of acquiring leadership skills in the SLq programme

- how the participants demonstrate leadership skills and attributes in SLq when leading
- the importance of SLq to the participants.

The third Research Question examines: How does pupil involvement in the SLq programme promote collaboration? explores the following interview questions:

- building capacity in different areas of SLq including communication
- developing inter/intra personal leadership skills in networks
- improving leadership network skills within the SLq programme.

4.2 Presentation of RQ1 – How does the SLq programme aim to promote the development of leadership skills in pupils?

4.2.1 *Introduction Presentation of Research Question 1 – For Pupils*

This section outlines pupil responses to components of the first Research Question. This first section details how participants define, understand and identify leadership in their school or social context. The subsequent sections directly applies to how participants acquire, view and demonstrate leadership skills and attributes whilst on the SLq programme.

4.2.2 *Understanding Leadership*

Each participant was asked to define leadership in their capacity as pupils and from their experiences in school and the SLq programme. Participants gave relevant answers that

would suggest their true reflection of leadership. Most participants expressed that a leader was someone who uses communication to deliver effective teamwork, for example:

“...that you be able to communicate well within a team, you need to make sure you are doing everything with a team” (Participant 14).

Participants described that leadership was inherently about making decisions and being able to organise and instruct others towards group work. Some of the participants suggested that being ethical and evaluating others allowed them to show strong leadership qualities:

“When I think about leadership, it’s about something about leading people. They will be understanding, mature and a good role model so that they can set an example for everybody else. They have to be trustworthy and honest as well because you can’t follow somebody that is not honest with you” (Participant 12).

When recalling their experiences, most participants spoke of the broader terms of being kind to others and treating others ethically, by having *“trust and faith”* (Participant 19), highlighting the importance of working together:

“I think it is the way that they work with people. Leaders are people’s people and other people are not. So, the way that leaders act around others and how they treat other people that matter” (Participant 11).

Only a few participants proposed that leadership was a learning process and that a decision-making approach was systematic to the role of being a leader:

“...leadership is how to learn, how to communicate with others and to be a part of a team” (Participant 6).

The participants mentioned other experiences and opportunities to develop leadership, *“...well sometimes we can show leadership in our work, like in English we have a ‘Dragons Den’ project, I am the team leader and I think that this STEM qualification has helped me become more confident...”*(Participant 6). Indeed, participants explored how leadership skills

are transferable in different subjects. However, not many participants discussed how they utilised leadership skills in their personal life at home or at school.

Many participants were visibly passionate about role models. They have experienced first-hand or through the media a role model they could 'look up to'. The US Presidential election demonstrated that leadership is something that they could relate to and admire.

"...that you have to listen to everyone and you have to have self-esteem and to be confident, like Obama, he is very confident when he speaks and he always has a loud voice and he likes to speak to the public a lot and to the people who he represents. Some act like they are above other people but some people don't, I don't think that Obama is like that and I think that I would feel comfortable around him because he has a good personality, kind and I respect him for that" (Participant 17).

Others spoke of the ability to solve problems with their peers and being able to understand that they communicate with each other, *"It depends on the different skills that they have if they did not have listening skills..."* (Participant 20). Many participants suggested that a leader has a position of authority, therefore, being able to establish their authority towards others:

"Leadership is when you have a mind of your own and you know what to do and you could tell other people what they need to do because not everyone knows how to be a leader so having a leadership quality means that you can do things right because you can think independently" (Participant 2).

However, it is important to note that some participants had discussed the role as being 'bossy' and that this trait can have a detrimental effect when being a leader:

"Well, some leaders can over the top and boss others around and sometimes they can be really helpful and tell you what to do..." (Participant 7).

However, participants remarked that leaders have their importance too. Some participants discuss that leaders give feedback to show and instruct others towards a common goal.

4.4.3 Leading Others

When recalling their experiences, most participants had led on activities such as *making jelly bath bombs, textiles advertisement displays* and *dragons den activities* to name a few and shared that they were keen to lead. The majority of the participants said that they worked well as a part of a team rather than as individuals. Consequently, when asked if they had any experience of leading activities the typical response was “*no not really*” (Participant 15). Nearly all participants suggested that the qualification provided them with the opportunity to possess new knowledge and skills in aspects of the SLq. As participant 2 remarked:

“...we had to talk to each other to spread ideas... but you tell people your opinions and communication just it brings out the best ideas on top” (Participant 2).

This was a familiar trend for most participants, they recalled certain activities vividly and related to certain skills and qualities of the SLq. Even though pupils have a broad range of experiences from dealing with issues to working in groups, they had encountered problems. There was one suggestion that stress could be an issue, a participant described that they “*felt unconfident*” (Participant 4). However, some participants mentioned that being able to talk to others, especially to facilitators, helped them to discover different solutions to how they interacted with others.

4.2.4 Leadership Skills in SLq

Participants were asked about how they developed leadership skills and attributes in the SLq programme. In their accounts, most participants stated teamwork as being an important factor in forging leadership skills. They also gave clear answers about activities, tasks and enrichment programmes that they have attended, indicating how it has helped them to improve in working with others:

“...if it is to do with science, technology, engineering or mathematics we try to group things that will bring everything together. So sometimes you will have something that is more science based and then you are put in separate groups to do certain things, but if you were with people that didn't know what to do, the group work helps you to talk to other people and to carry on with the task” (Participant 18).

When asked about their experiences in school, the responses highlighted an understanding of leadership that provided them to *“...get all of the ideas together and sorting them out* (Participant 8) *and helped them to bring people together to reach a common goal:*

“...like where you're in a certain situation where something might happen, as a leader, you have to think about it and discuss it with the team that you're in and discuss it with your peers to get a general idea than making a decision on what you know. So that you're trying to think in a way about how it would affect other people and how you will deal with it and trying to make the right decision on what other people think” (Participant 1).

Most participants could recall certain activities where they gained leadership skills, as participants demonstrate an understanding of others. Participant 6 remarked that working in teams helped them to assists others and to understand a specific task.

4.2.5 Leadership Attributes in SLq

Although it is not the purpose of the study to investigate the SLq’s unit content, it is diligent to present the units covered in the programme to appreciate how pupils build leadership attributes and skills. Table 4.1 display the five learning attributes of the SLq programme (as discussed in Chapter 2).

Unit	Mandatory units
1	Developing Personal Skills for Leadership
2	Practising Leadership Skills with Others
3	Learning with Colleagues and Other Learners
4	Communicating Solutions to Others
5	Learning from More Experienced People

Table 4.1: Learning attributes from SLq Edexcel Level 2 Specification (Edexcel, 2009).

Learning attributes from SLq Edexcel Level 2 Specification (2002)	Respondent																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Learning with Colleagues and Other Learners	1	4	4	4	4	4	4	5	2	1	4	3	4	4	4	3	2	4	4	4
Communicating Solutions to Others	2	3	5	5	1	2	3	3	5	2	3	5	3	3	5	5	3	3	5	2
Practising Leadership Skills with Others	3	5	1	2	5	3	5	2	3	4	1	1	2	2	1	4	4	5	3	3
Learning from More Experienced People	4	1	2	3	3	5	1	1	1	3	5	4	5	5	2	2	1	2	2	5
Developing Personal Skills for Leadership	5	2	3	1	2	1	2	4	4	5	2	2	1	1	3	1	5	1	1	1

	Ranking				
	1st	2nd	3rd	4th	5th
1	4	2	1	3	5
2	2	2	2	13	1
3	1	4	8	0	7
4	4	4	5	3	4
5	5	5	3	2	5
8	5	5	2	2	3
T	20	20	20	20	20

Table 4.2: Frequency of responses from Participants 1-20.

1st	Developing Personal Skills for Leadership
2nd	Learning from More Experienced People
3rd	Communicating Solutions to Others
4th	Learning with Colleagues and Other Learners
5th	Practising Leadership Skills with Others

Table 4.3: Ranking of responses from Participants 1-20.

The participants were asked to rank the key learning outcomes of the SLq course in order of relevance to their perception of leadership. Table 4.2 displays the frequency of responses to rank the SLq learning attributes. From this, it is evident that the attribute of the highest importance to the participants was 'Developing Personal Skills for Leadership'. They explained how they learnt from others to develop their sense of personal leadership, putting their communication skills into practice to enhance their leadership style:

"...well you need to learn well with others and you have to communicate with other people as they need to know what to do. This is more important than practising leadership skills as some of these skills will have to be developed first then practised" (Participant 10).

Secondly, participants shared that learning from more experienced people would be beneficial in their development of leadership skills and attributes. Participants expressed that having the ability to be adaptive in activities gave them a wide range of experiences to understand leadership:

"...learn with people who are at the same level as you and it is probably easy to focus on yourself rather than on others then at least you will know you will have more experience than them..." (Participant 6).

This recognition of experience, not just from people whom they view as leaders but from their peers, was a favoured insight for most participants. However, 'communicating solutions to others' was frequently ranked lower than others (Table 4.3). Participants suggested that communication was essential within groups as their experience was not broad enough towards larger groups, *"...if it only a small problem and a small solution, you do not really need to speak to anyone about it"* (Participant 16). Those participants agreed

that communication in larger groups was something that they needed to attain to enhance their leadership attributes.

4.2.6 Difficulties with gaining Leadership Attributes

Most participants discussed that the difficulty with gaining leadership attributes tended to be that they regarded leadership as a 'foreign concept'. Coincidentally, some participants cited certain inhibitors to leadership attributes such as, *"I think that some people may not have those skills but others do..."* (Participant 11), as with another who stated, *"...if you're not brought up on them then it can be difficult to be a leader"* (Participant 10). Some participants felt that exposure to experiential leadership was necessary to provide an opportunity to build on their leadership:

"...I would like to go more places where leaders are more in their element."
(Participant 20).

The ability to understand different perspectives and others was evident to see from the participants who discovered that learning about leadership attributes and how leaders demonstrated these attributes are two separate skills. Participants had an element of confusion with the term 'leadership attribute' and often cited conflicting viewpoints especially when discussing the skill of communication. Some commented that communication was a key facet of leadership they have seen in role models who have *"...confidence to help them speak in groups"* (Participant 8). However, Participant 13 pointed out that it depended on the peer relationship, *"Different people have different skills so they gain skills differently"*.

4.2.7 Summary of Research Question 1 – For Pupils

Questioning how they gain leadership skills, attributes and qualities in SLq gave an insight of their experiences, knowledge and attitudes. Participants commented that some virtues associated with leadership are teamwork, honesty, understanding and self-esteem. Some participants identified a high-profile person e.g. US President Barack Obama, as an influential figure who demonstrated leadership skills and attributes that they could replicate. However, most participants asserted that their understanding of leadership is not that of a boss but that of one who has empathy and understands others.

Participants spoke of how they attained leadership skills while on SLq activities and they were able to reflect on the importance of teamwork and collaboration. Group work was a common mechanism for this to happen. Participants described many subject-specific activities, mainly Science and Engineering, where they demonstrated certain skills like problem-solving, communication and critical thinking. They reflected upon how they envisioned leadership and the role of power.

Participants proposed feedback on the advantages and disadvantages of the SLq programme. Many participants enjoyed the opportunities to build leadership skills while collaborating and working in groups. The perceived disadvantages of building leadership skills whilst on SLq included difficulties with pupil roles in groups and interpersonal problems with others.

Finally, participants explained how the SLq qualification framework related to their learning in SLq. Most participants mentioned that learning from others gave them real experiences and that the preferred peer-learning experiences rather than through authoritative leaders i.e. teachers or administrators. Some participants thought that communication with others was not important, commenting that they preferred not to talk to others about any difficulties. Indeed, participants reflected that they have more experience of how leadership is used in the real world and linked it to developing their leadership, where role models are used to help them further develop these skills and attributes.

4.3 Presentation of RQ1 – How does the SLq programme aim to promote the development of leadership skills in pupils?

4.3.1 *Introduction Presentation of Research Question 1 – For Administrators*

This section details the administrators' responses to SLq promoting leadership attributes. Namely understanding leadership, the skills and attributes attained by encouraging leadership. This first section describes how participants define, understand and identify leadership in their school or social context. The remainder of the sections directly applies to how participants acquire, view and demonstrate leadership skills and attributes while on the SLq programme.

4.3.2 Understanding Leadership

Each participant was asked about how to define leadership in their capacity as school leaders, from their experiences in and out of school. Most participants said a leader was someone who can manage themselves and be aware of the own personal leadership:

“...then obviously, walk the walk yourself, so in other words, if there is a policy that you embed yourself, let’s say teaching and learning, well unless you utilise that policy yourself and lead from the front with it” (Participant 21).

“It means showing others the way, showing them, leading them, leading by example and what you can do and what you can show as an example to others” (Participant 22).

Some participants remarked that learning to assess others was about where a *“tangible sense of serving other people”* (Participant 21). As expected, when asking different leaders of their leadership characteristics, there are common frames of reference, from their daily practice in their career to their personal experience. However, some commented that the collaboration and vision are as important:

“...not too authoritarian and to get the best out of people,..., but someone who has a persona who stands out and they instil confidence in people who work with them. Being approachable is essential” (Participant 23).

Subsequently, this relationship was a distinguishing mark as participant 22 suggests *“I think sometimes people are too pushy and be arrogant with their leadership”* and participant 23 said *“again not too authoritarian”*. Participants experience of their own leadership and leadership of others gave them experiences to share with pupils. However not all participants had shared their experiences with pupils. When recalling their experiences of how they identified leadership, many spoke of the broader terms of collaboration:

“I think it is to know what a good leader is and to have discussion about what makes a good leader” (Participant 23).

“I think by dialogue around their peers, whom they may aspire to...” (Participant 22).

“...the amount of extra-curricular work that is done and clubs and teams goes on which is needed; it’s essential to developing leaders of the future” (Participant 21).

Participant 24 suggests that:

“... not everyone wants to be a leader and I think it is a big mistake that people presume that everyone wants to be a leader... my fear is that in any qualification that is called a leadership qualification it assumes that you don’t want to be a leader you have failed but in fact we need far more team players than we need leaders.” (Participant 24).

Again, this is re-iterated by participant 25, relating to how pupils develop their leadership:

“...I’m not sure that they can always can. I think some of them can and they can identify what leadership means and others aren’t very confident with being leaders and they like being part of a team but they don’t actually want to be the leader of the team” (Participant 25).

It is important to note that some participants did mention direct links for leadership identification, participants used the analogy of playing sports to convey their leadership and in recognising leaders:

“They would think of it in terms of it being the most likely model would be a sporting team so they would think of the leader as the captain of the football team,..., that’s their nearest model or they might think of it as an adult role, my teacher is my leader” (Participant 22).

This is an interesting analogy and used by some participants to discuss how leadership skills and attributes are associated with pupils when working towards goals. Participant 24 suggested that the pupils in the SLq could be aware of the problems of leadership *“...if*

everyone who is going to clambering to be the leader, who are going to be the people to collaborate and quietly do the task”.

4.3.3 Leading Others

Most participants believed that when leading others, teamwork was an important skill instilled whilst on the SLq programme. Participants shared that a variety of enrichment activities enhanced aspects of working with others towards a common goal:

“...most effective way of doing it would be group work around some kind of practical activity but it has to be something that requires active participation on the part of the pupils” (Participant 23).

“...by being part of a successful team and by giving pupils opportunities within that team as they only lead a part of a team for a short time” (Participant 25).

At the same time, participants stated that this led establishing the idea of self-leadership:

“...being a part of a successful team did give pupils opportunities to assess the needs of others” (Participant 22).

It is important to note that Participant 21 used the phrase *“STEM principles”* to suggest the skill or quality that pupils were demonstrating. In this case, activity involving teamwork. This could be thought as a clear indicator as to how facilitators were introducing the specific terms associated with acquiring skills of each activity:

“STEM residential trip, one day we went for a map reading trip and at one point we switched around who was going to be leading the group from the front. Some pupils like to be the leader...” (Participant 25).

Participant 23 proposed the attributes of technical skills in STEM:

“...fundamentals of numeracy, perspective, precision and analytical approaches are the things that schools need to give pupils for a modern work place” (Participant 23).

The participant suggests that working in teams gives a sense of purpose as it shows how teams could be led. This opinion is reinforced by participant 24, implying that pupils may find that the *“job is meaningless”* (Participant 24) so it is important to remind pupils to understand the value of activities:

“...so, they know what the less tangible meaning is so it gives more meaning to the more tangible idea. You accredit everyone in the organisation to attribute the product in the long run, therefore to be more motivated in the set of tasks they have to do” (Participant 24).

This idea of constant reinforcement is also illustrated by participant 21 suggesting that long term outcomes especially when related to the field of employment is something of a clouded issue when discussed with pupils:

“...it ebbs and flows really in the world of work where you have great months and you have months where you tread water and think we are not going anywhere with this.” (Participant 21).

However, this does drive pupils to approach certain tasks, as participant 24 states:

“...that means that someone in that group has to say ‘what do we have to do? How are we going to do it?’ this provides children to go to other members of staff and we have the staff that can support the education of it.” (Participant 24).

4.3.4 Leadership Skills in SLq

Participants were asked about how they thought leadership skills in the SLq programme were developed. In their view, most participants talked about positive role models, such as teachers in their school:

“You are a combination of your upbringing, I am the youngest of seven children and your character is formed by your experiences and my household, I always had to be the peacemaker and as a leader I carry that characteristic which on many of occasions is very beneficial” (Participant 23).

However, Participant 22 suggests that issues arose from how pupils see role models *“...as they go through life they will see a bad leader, they can identify what problems they have”* (Participant 22). When participants remarked how pupils envisioned leaders, they pointed out how pupils used skills developed from activities and their enrichment. Participant 25 describes how these activities help pupils develop skills in school *“...they have done something that they are a more rounded pupil than pupils who have studied a bit of Science, Technology and Maths.”* (Participant 24).

Some participants implied that STEM leadership would *“...allow those pupils to have the advantage to go into the job market”* (Participant 23). This corresponds with Participant 21 suggesting *“...they then have some of these key skills to actually have to access different jobs and different careers as you go through.”* Most participants shared how pupils viewed leaders using certain skills to build their understanding of forming and working in groups, enhancing their opportunities to work with others. Participant 23 discussed pupils are understanding about leadership, how organisational leadership is developed and *“and why*

people make the decisions that they make...” As Participant 21 stated, developing the right behavioural patterns creates relationships with others for pupils to appreciate different viewpoints:

“...but also I think it is important for youngsters to understand, in terms of citizenship and PSHE areas, about organisational leadership and why people make the decisions that they make and often when they come in and they have acted dysfunctional, I will talk to them about the organisation, the school as a whole and their place in it so that they can have a try of some understanding of about why the rules need to apply to them so from that point of view children need to understand about leadership” (Participant 24).

4.3.5 Leadership Attributes in SLq

Unit	Mandatory units
1	Developing Personal Skills for Leadership
2	Practising Leadership Skills with Others
3	Learning with Colleagues and Other Learners
4	Communicating Solutions to Others
5	Learning from More Experienced People

Table 4.1: Learning attributes from Edexcel specification (Edexcel, 2009).

Learning attributes from SLq Edexcel Level 2 Specification (2002)	Respondent					Ranking				
	21	22	23	24	25	1st	2nd	3rd	4th	5th
	Frequency									
Learning with Colleagues and Other Learners	4	3	3	3	3	0	0	4	1	0
Communicating Solutions to Others	2	1	2	4	2	1	3	0	1	0
Practising Leadership Skills with Others	3	5	4	1	5	1	0	1	1	2
Learning from More Experienced People	1	2	1	2	1	3	2	0	0	0
Developing Personal Skills for Leadership	5	4	5	5	4	0	0	0	2	3
	Total					5	5	5	5	5

Table 4.4: Frequency of responses from Participants 21-25.

1st	Learning from More Experienced People
2nd	Communicating Solutions to Others
3rd	Learning with Colleagues and Other Learners
4th	Developing Personal Skills for Leadership
5th	Practising Leadership Skills with Others

Table 4.5: Ranking of responses from Participants 21-25.

The participants were asked to rank the key learning outcomes of what pupils were demonstrating on the SLq programme. Table 4.4 displays the frequency of responses to rank the SLq learning attributes. It is evident that most participants suggested that the highest importance was ‘Learning from More Experienced People’. Of note are many participants thought that having the ability to develop the STEM skills from others gave a greater likelihood to develop open mindedness to STEM characteristics that people would use in industry:

“...developing those skills from people around them and building characteristics that are potentially leadership characteristics” (Participant 22).

For most participants, they regarded ‘Communicating Solutions to Others’ as the next highest attribute that pupils would exhibit. Participants frequently suggested that by questioning and working with others, pupils would be able to engage with different people to relate their ideas to a larger group. Participant 21 stated that pupils have the opportunity to demonstrate this attribute whilst working alongside primary school pupils:

“...they are asked to re-enforce a scientific principle over a period of 20 minutes and they enjoy that. They tend to get involved quite deeply into that kind of work” (Participant 21).

Participant 21 related this type of attribute to gain satisfaction when that a teacher shows knowledge and understanding to others. However, some participants ranked ‘Practising

Leadership Skills with Others' and 'Developing Personal Skills for Leadership' lower in their key learning attributes. Many participants felt that this attribute requires pupils to have a personal context to relate their leadership to, as most pupils did not have enough experience with leadership, therefore they would not be able to relate their experiences to a specific leadership skill or quality:

"...actually, if you don't practise leadership, you don't lead it and you don't learn about each of those responses – you can't develop strategies" (Participant 24).

4.3.6 Difficulties with gaining Leadership Attributes

Most participants described leadership as a foreign concept. Participant 25 indicated that pupils have difficulty differentiating between managing and leading:

"The problem they see is that they think that leadership is about being the boss and they don't quite get the difference between bossing everybody around and leading them." (Participant 25).

Participant 24 commented that to pupils having a lack of experience and were unable to work effectively in teams:

"...this will get more difficult the more challenging backgrounds that pupils come from. The less emotionally secure they come to us, the more difficult they will find to work in teams" (Participant 24).

The issue of teams was also mentioned by Participant 23 where most pupil *"do not want to be a leader"*. The role of BTEC qualifications, in light of the Wolf Report (Wolf, 2011) was also an important issue:

"...if you look at the very nature of how pupil schools are set up, it's all based around gaining leadership skills i.e. the amount of extra-curricular work that is done and clubs, teams and sports and the funding and the emphasis that goes on with that and

the time that is needed, is far greater at developing leaders of the future.”
(Participant 21).

Participant 21 described that a blend of vocational and academic qualifications allows pupils to have a rich and diverse experience. As a result of the reforms to the vocational pathway, as participant 21 importantly shares:

“... we are going back to what it was 20 to 25 years ago” (Participant 21).

4.3.7 Summary of Research Question 1 – For Administrators

Questioning how pupils gain leadership attributes, skills and qualities in the SLq programme gave an insight of their experiences and attitudes. As shown Figure 4.1, the presentation of RQ3 is summarised in a diagrammatical form where the relevant themes emerge. Participants remarked that some facets of being a role model, service to others, communication and self-esteem were being gained by pupils. Sporting analogies were used to convey how leadership skills were transferable.

It was evident that group work was important and how participants had seen pupils ‘reasoning why leaders make certain decisions’. Participants commented that pupils could share their personal experiences; however, this is mainly done on a one-to-one basis. Some participants talked about the current climate of vocational pathways compared to school measures against GCSE outcomes.

Most participants reasoned that pupils learned from more experienced people, mirroring characteristics from others. Some participants regard communication to others was as

important as they thought pupils preferred to talk to one another about their common experiences. Participants remarked that the term 'leadership' would cause confusion as pupils did not have enough experience to differentiate between managers and leaders.

4.3.8 Diagrammatical Presentation of Research Question 1

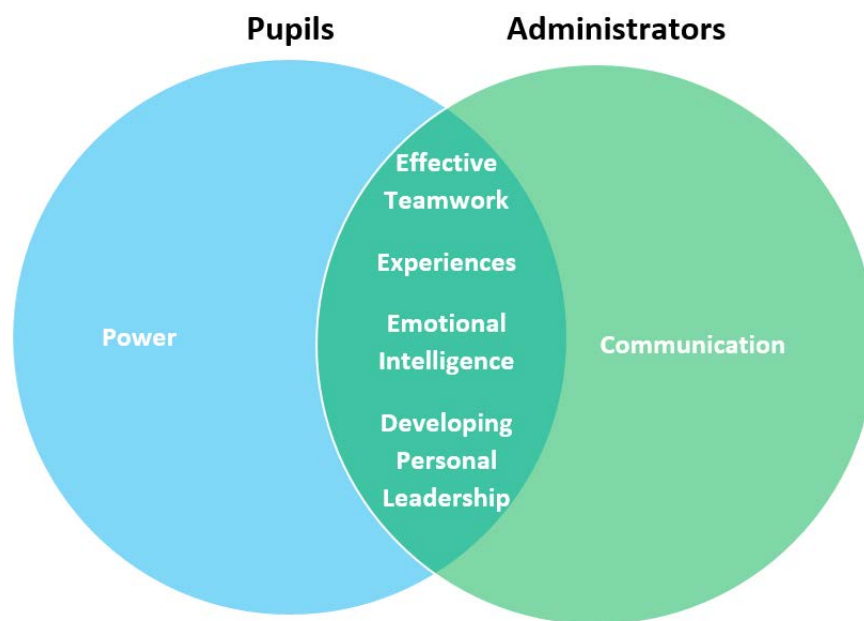


Figure 4.1: Presentation of empirical work for RQ1: How does the SLq programme aim to promote the development of leadership skills in pupils?

4.4 Presentation of RQ2 – What are the perceived advantages and disadvantages of the SLq programme to encourage leadership in pupils?

4.4.1 Introduction to Presentation of Research Question 2 – For Pupils

This section details pupil responses to the perceived advantages and disadvantages with encouraging leadership. Firstly, the findings relate to the advantages and disadvantages of acquiring leadership skills in the SLq programme and overcoming difficulties while leading others. Secondly, the findings share how pupils engage in STEM. Finally, this section discusses the improvements that pupils would make to the SLq programme.

4.4.2 Advantages of Promoting Leadership in SLq

Many participants spoke of the opportunities to build their leadership skills with others, developing personal leadership. The majority of the participants stated that developing leadership skills and attributes would help them in their future and to get ‘good jobs’. However, some participants suggested that “...to work together in a team, somebody has to be a leader” (Participant 6). Some participant proposed that by being in groups they have more resolve to complete tasks.

Some participants commented that the SLq programme allowed them to be more “*confident and outgoing*” (Participant 4). However, a specific example arose of how pupils demonstrate empathy towards others:

“...to say things straight not to think about harming people’s feelings and give them points in ways that they can improve” (Participant 8).

Emotional intelligence allowed participants to critically review their communicative skills to forge strong relationships. Participants suggested that the ability to be more outspoken gave them confidence – leading to positive relationships.

4.4.3 Disadvantages with Promoting Leadership in SLq

Most participants suggested that all participants should be clear what their specific role was during activities, whether it was a leader, team worker or an organiser. Participants inferred that without this, there was a conflict with certain roles:

“...I suppose it just doing more group activities where you do projects, ..., and certain people are chosen to be leaders and different people have to adapt to working with different people” (Participant 1).

A participant stated that there could be a need to develop a forum so administrators could help them directly. The participants initially believed that the opportunity to develop leadership skills and attributes would be a simple process but along the way the participant realised that more time was needed to help them with their own needs.

4.4.4 Overcoming Difficulties with Leading Others

Participants were asked about how they overcame difficulties while leading others. Participants related this to how they managed to deal with unexpected problems:

“...usually people who I would work with would mess about and not normally do the task but it’s taught me to go with other people who I wouldn’t work with so that I rather get the work done” (Participant 8).

Nevertheless, most participants were able to talk to other people irrespective of their age:

“I wouldn’t like talk to them or anything if it wasn’t for this qualification so it’s helped me to talk to more people in different years” (Participant 4).

“...I have just got used to different people, we have been working with some adults and some pupils so it is like understanding how to deal with certain situations, we share experiences” (Participant 20).

Being socially aware of others was an important aspect of the qualification and developing the skill to understand others was regarded as an essential skill:

“...it’s helped me to listen to people and to listen to their ideas and even though they are still our friends you still have to tell them what they had to do” (Participant 7).

4.4.5 Demonstrating STEM Skills and Attributes when Leading

When asked about how the participants were involved in SLq activities, many participants had alluded that the programme helped them to develop alternative strategies to problem solve:

“...if ever I came across a problem then I could, as with picking options, I know that I have these skills and I know it will be easier to communicate with people in a new class rather than without these skills. I find it easier to find the answer to questions and if I don’t know the answer I have the ability to find the answer” (Participant 6).

However, some participants suggested that they felt *“...more confident about talking about things to adults and people younger to me”* (Participant 14). Most reflected how the SLq course had enhanced their confidence with their peers and teachers. The course had given an opportunity for participants to build rapport with different people. The programme

helped Participant 1 to *“...advance as a person rather than just thinking about how I think about things I look at it, as for how I would think about a problem and how other people might feel about it as well”*. Many felt that the SLq had helped them to engage with others: *“just getting to know about different people, it helped me to work with different groups. I never used to listen and SLq has helped me to listen to other people”* (Participant 17).

Participants shared how the programme helped them in their curricular subjects, *“...its helped me in understanding Mathematics and I have found that I have gone up a level in Maths since starting SLq”* (Participant 12). This helped many participants to enjoy and progress in their curricular subjects.

SLq activities help cultivate leadership skills by *“doing experiments especially the shampoo one, we created the label and stuff and the trips which we would not have the opportunity to go on”* (Participant 8), *“...we worked with the DNA laboratory, we worked with adults to help other people understand about DNA structures”* (Participant 17). Also:

“...well we have worked with different age group and with different people, like with the old people in the community so that we just have to be a bit more patient and that and with the young people as well, we work with the primary schools and just with your peer, you talk normally and responsibly as well” (Participant 15).

“...they are entertaining and you get to learn about how stuff works, like when we went to Ogwen, we got to learn about rock climbing stuff and engineering and mechanics” (Participant 15).

“...when we were doing the technology one, I had to instruct people where to go, who to work with and get people to work with other people” (Participant 14).

This indicates the special circumstances that were offered to pupils enriching their curriculum 'diet' to develop experiences that they would not have gained in normal lessons.

4.4.6 Improvements to SLq

This question was intended to see the drawbacks the SLq programme. Some participants commented that their activities had been solely focused with Mathematics and craved more Engineering sessions:

"...just doing more group activities where you do projects because there are somewhere we do just as I said a couple of things but instead we could do a long project where different people are put in different groups and certain people are chosen to be leaders and different people have to adapt to working with different people." (Participant 1).

"...the range of things that we do as we mainly do maths and science but I would like to do some Technology and Engineering" (Participant 14).

Few participants implied that leaders could be brought from other schools and talks would help them to understand leadership in a wider context. Participants proposed that they could have 'first-hand' experience of how leaders use skills in different scenarios. They also wanted to ask them what skills are important to them and how could they develop to be *better* leaders. However, most participants proposed that the group sizes played a major role in how they were taught. Larger group sizes were not favoured. Participants described that *"not being in the same groups all the time"* (Participant 6) was an issue that was hindering their development of the interpersonal relationships.

4.4.7 Summary of Research Question 2 – For Pupils

Participants remarked they had developed leadership skills associated with the SLq. While some participants did not favour leading, few commented that while leading others they often experience some sort of stress. Participants often talked to their peers to resolve their differences. Many participants suggested that the SLq programme had helped them to talk to others from different age groups and to develop their communication skills.

Participants discussed a range of engagement with STEM initiatives from problem-solving to understanding others and enhancing their subject knowledge. Many participants suggested that the activities helped them to be more confident with their peers and teachers, giving a *real* contextualised context with the application of STEM. Participants found most activities engaging and helped them to test their newly established skills.

Finally, participants had the opportunity to voice how they would improve the SLq programme. Many participants commented that they would like to have more engagement in Engineering. Some discussed how they would have preferred to be a part of leadership sessions with leaders, in school or industry. Most participants shared that being taught in larger groups was difficult due to group sizes.

4.5 Presentation of RQ2 – What are the perceived advantages and disadvantages of the SLq programme to encourage leadership in pupils?

4.5.1 Introduction to Presentation of Research Question 2 – For Administrators

Firstly, the section relates to the importance of how the advantages and disadvantages of acquiring leadership skills in the SLq programme and overcoming difficulties while leading others. Secondly, the section shares how the administrators perceive pupils engage in STEM in school and how they demonstrate leadership skills and attributes in STEM. Finally, the section discusses the improvements that administrators would make to the SLq programme.

4.5.2 Advantages of promoting leadership in SLq

It was interesting to note that some participants suggested that certain skills were identified to give a wider context of learning. Whether the learning consisted of developing teamwork, communication skills or career development:

“...it’s their own passion that they have to turn up after school, if they are going to be in a club or a project and that motivation aspect is a key aspect within the world of work” (Participant 21).

Many participants spoke of verbal communication skills that allowed pupils to *“...do is much more higher-level skills like problem-solving ability, leadership skills, the ability to work in groups.”* (Participant 23). Indeed, participant 21 remark that pupils develop lifelong skills as:

“They were given briefs about their presentation and then to discuss and deliver that presentation to a range of people, both other pupils and teachers,..., They have to be motivated in their own time, in other words it’s their own passion that they have to

turn up after school, if they are going to be in a club or a project and that motivation aspect is a key aspect within the world of work” (Participant 21).

Participant 24 comment how pupils have shown the SLq programme to give them a sense of belonging:

“...that they may feel that they own this school, they have a right to be here and that they are responsive ... they can influence their environment and they can achieve and that they will be listened to, through small or large projects.” (Participant 24).

Participant 22 also mentioned that importance of projects:

“I certainly think that if you allow a small number of children to work together, especially in STEM, different age groups and abilities they will create a project they really come together on it and they have pride about the project....” (Participant 22).

Indeed participant 22 discusses that projects “develop more practical skills” (Participant 22).

However, some participants remarked that more opportunities could be provided to:

“put them in positions of leaders and that means by and large doing things with their peers because with their peers they have opportunities to be leaders and in a future life they would be leaders in peer groups” (Participant 23).

“If children are learning about teamwork and leadership only through adults you are putting an extra dimension in...” (Participant 24).

4.5.3 Disadvantages with promoting leadership in SLq

Participants had different opinions of the difficulties with gaining leadership attributes.

Participant 21 remarked how that dealing with educational reform has impacted with running vocational qualifications in the school:

“...My concern is that the current comprehensive system is churning out good content driven kids but in terms of initiatives, self-starters and entrepreneurs and leadership skills and we are going back to what was 20 to 25 years ago.” (Participant 21).

Some participants discussed that they perceived pupils not to take the role of a leader:

“...there is quite a difference between managing something and leading something and they certainly wouldn’t have those subtleties ironed out at this stage.” (Participant 22).

“I think some children who don’t have the vocal ability really to come forward or to be the outstanding leaders but do have some of the skills and qualities” (Participant 23).

“...not everyone wants to be a leader and I think it is a big mistake that people presume that everyone wants to be a leader...” (Participant 24).

Nearly all participants shared how pupils use certain skills in activities. Many participants remarked that curriculum subjects are there develop aspects of leadership, prompting participant 24 to state: *“we have far more team players than leaders”*. However, most participants commented that pupils did not understand how leaders took different roles:

“...if everyone who is going to clambering to be the leader, who are going to be the people to collaborate and quietly do the task” (Participant 23).

“The way pupils interpret leadership is that they are quite different perspectives and it depends on their experiences on being lead before...” (Participant 25).

Participant 22 referred to pupils not having the skill of effective communication, suggesting that some are not forthright to share their views. The participant suggests that this is a quality of ‘outstanding leadership’. Similarly, Participant 25 remarked:

“I think some of them can and they can identify what leadership means and others aren’t very confident with being leaders” (Participant 25).

At the same time, participant 24 talks about the emotional support that administrators provide. The participant comments that pupils from deprived or challenged backgrounds are more inclined to find the SLq demanding:

“...I don’t think that when we put children together to work in a group that they necessarily understand how to, for a leader to emerge or what a leader does or what that person needs to be” (Participant 24).

4.5.4 Overcoming Difficulties with Leading Others

Some participants have clear experiences when pupils overcome difficulties. Participant 21 comments that having experiences and personal responsibility for their work and equipment (while on a STEM excursion) pupils were able to demonstrate that they were self-motivated and able to manage themselves. However, this is often a problem of recognition in schools:

“...we offer an enrichment program that we have got and then look at the kids’ ability to go on and then apply for jobs and to be successful in college, but there is no measure for that and there is no taking account of that, apart from very savvy and clued in inspectors, they look at the bottom line which is hard data and the hard data isn’t driven by the softer developmental aspects of the leadership skills that SLq would use.” (Participant 21).

Participant 23 articulates that communication between pupils, is sometimes regarded as being difficult:

“It sounds basic but it’s listening to others, sometimes the child just doesn’t have the language skills but their ideas are fantastic and sometimes they can put their ideas onto paper, being able to communicate effectively, in all methods, is essential” (Participant 23).

Again, this was re-iterated by participant 22, who commented that pupils do not have the language skills to communicate effectively to others. When they are seen to communicate with each other, pupils are able to debate and share their ideas.

Most participants remarked that teamwork is not just about a collective of individuals working together but working together towards a specific goal. Participant 25 said that they

do not explicitly brand this method of collaboration as ‘teamwork’ but pupils develop these skills and qualities without realising:

“...there is quite a lot that is just not about individual learning, pupils have to work in teams or groups to do things. In a lot of lessons, pupils do a lot of leadership skills but we don’t brand them as leadership skills.” (Participant 25).

Participant 23 puts forward that pupils are using social media to share and communicate with each other:

“...is something intrinsic in human nature for the desire to create well-being and work co-operatively and to be happy in schools... I think that young people who network socially have a bit more sophistication so that they have a greater confidence about shared leadership” (Participant 23).

However, participant 25 state that pupils struggle with the concept of roles in groups. The participant remarks that SLq programme helps pupils to question how traditional leadership is viewed and how to deal with issues. Participant 25 states that an ‘old fashioned approach’ of leadership is demonstrated to them every day by teachers and pupils look at staff as role models:

“...live in the real world and they want to use skills with the people around them so we can’t teach old fashioned leadership and I think they look at us and see that we don’t really operate like that anyway. For people to succeed, they have to be shown what success looks like and I think we are teaching the kids of today with what to learn...” (Participant 25).

4.5.5 Demonstrating STEM Skills and Attributes when Leading

When asked how pupils were involved in STEM projects, many participants remarked the importance of good communication to *“reach their potential”* (Participant 22). However,

participant 23 indicated that effective communication should be ranked higher than other skill:

“...verbal communication, it requires a lot of maturity for them to understand the importance of communication...” (Participant 23).

Participant 21 referred to the attitude of pupils and how they could demonstrate the skill of being confident to have clear and meaningful goal for the future:

“It enables them to give a clear view of why they are studying the subjects and then ultimately goal them a goal or at the end of it because if you are choosing a STEM pathway” (Participant 21).

However, participant 23 recognises that SLq provides pupils with *“...better careers advice and by doing that you can raise their aspirations”*. Again, most participants agree with the SLq helps to develop trust and relationships between adults and pupils. Throughout the interviews, it was evident that participant 23 made references to the sporting nature of team building:

“...pupils would associate leadership with teams; they would think in terms of sporting metaphors, hence the teamwork.” (Participant 23).

Most participants stated pupils have successful experiences are built upon pupils’ self-belief and positive attributes:

“...the university experience has been essential for me, they have seen the experts and it is very important that they can ask questions but anything to do with gaining skills but having the ability to know what you are going to witness and the environment so that they are always confident and the background knowledge about what they are doing....” (Participant 24).

“...I think pupils have a high self-esteem but I don’t know if it just around me though, they gain so much personal belief and a lot of respect for others including the peers” (Participant 25).

Participants also were asked about how SLq skills and qualities were shown during 'leadership' activities. Most participants shared that teamwork would give pupils the experience of being led and leading others:

"...trust to allow them to get to familiar with the adults, to work alongside, to progress,..., to raise future aspirations, again getting more involved with pupils" (Participant 22).

"...depending on which activity they were doing, they would need to work in teams and we give them a destination where they need to be and they will plot the route to that direction, estimate the time taken and work collaboratively within that team to get there. At the same time, we will give the simple scientific experiments that they will have to do, they had a defined role, communicate well and get on with their peers and evaluate that went on" (Participant 21).

4.5.6 Improvements to SLq

This question was intended to bring out the drawbacks of any administrative procedure of the SLq. However, participants took this opportunity to discuss administrative needs of the qualification:

"Have another four staff on STEM, dedicated to STEM alone but I am hoping that next year we will be able to get enough people on board and I haven't had enough time to develop it this year. At the moment, the amount of time I have for it is the major barrier." (Participant 25).

"Potentially get more of the managers or the senior leaders involved and have events where people come in to celebrate the STEM areas, we have had events in the past where having the opportunity to meet experienced people in industry for pupils to aspire to and to maybe follow a career path." (Participant 22).

Many participants suggested that pupils may have difficulties with managing themselves, especially managing stress with others:

"...if they are working collaboratively there is a social pressure to perform..." (Participant 21).

“...school has sometimes the barriers and the scaffolding to know where they are and it gives children a place to express themselves and to voice themselves” (Participant 22).

Likewise, participant 21 explains how pupils’ immediate reactions to success and failures strengthen their decision to participate actively or not:

“I think if failure isn’t properly handled by some kind of guiding and mentoring adult, then it could do. I think that kids are more robust than we might imagine as well so I think being rejected by other people and your failure could make you feel that you don’t want to do it again.” (Participant 24).

When probed with the question: ‘Does this discourage pupils from leadership?’ Participant 21 remarked that failure is a learning process:

“...kids are more robust than we might imagine as well so I think being rejected by other people and your failure could make them feel that you don’t want to do it again” (Participant 21).

Similarly, participant 23 describes that the importance of leadership development essentially having experience:

“Well I think it is a combination of social and self-determined pressure to perform. If the teacher is there is talking about leadership, leadership and leadership all of the time, these are the qualities that you need for leadership then a pupil may feel that they don’t have those characteristics, so that I not what is going to make a pupil feel great. But if the teacher is banging on about teamwork and some of us do a great job by enabling other people to do a great job then a pupil may think that ‘this is for me’.” (Participant 23).

Participant 22 highlighted the difficulties with managing stress. This participant suggests that social pressures do not allow pupils to express themselves clearly, *“...I think that sometimes you have children have very difficult social pressures on to or too forceful pressure on themselves...”* However, some participants suggested that the term ‘leader’ is too often used in the SLq:

“...that not all people want to be a leader at an early age and so the risk is that pupils who don’t fit the model of a leader or any characteristics, where does that leave him and what does that do for their self-esteem.” (Participant 23).

Future career opportunities were also discussed as a significant part of the SLq that had to be improved. Most participants propose that the lack of STEM guidance for opportunities when they leave school was sometimes addressed however could have been improved by using STEM Ambassadors and STEM employers to give dedicated talks to pupils.

4.5.7 Summary of Research Question 2 – For Administrators

The findings review that most participants have perceived pupils are leading others on activities with skills and attributes associated with the SLq programme. As shown Figure 4.2 and Figure 4.3, the presentation of RQ2 is summarised in a diagrammatical form where the relevant themes emerge. Most participants related group work by pupils being able to manage themselves and have specific goals. This desire to lead and be led provides a backdrop to how pupils are working together. Similarly, participants remarked that pupils to discover how to self-learn and lead each other to different tasks that they have been set. Throughout the interviews, it was evident that pupils have seen pupils overcoming difficulties. It was evident that communication between pupils, as often with adults, is regarded as sometimes being difficult. Many participants shared that the skill with communication is often overlooked. The role of power is also an important point to consider. Participants commented that sometimes understanding the differences between manager and leader roles causes conflicts.

Finally, participants had the opportunity to discuss their viewpoint with SLq and what improvement could be made. Some discussed how there could be specific leadership sessions with leaders, in school or industry. Most participants commented on the difficulty of being taught in large groups, impacting on their personal leadership growth.

4.5.8 Diagrammatical Presentation of Research Question 2

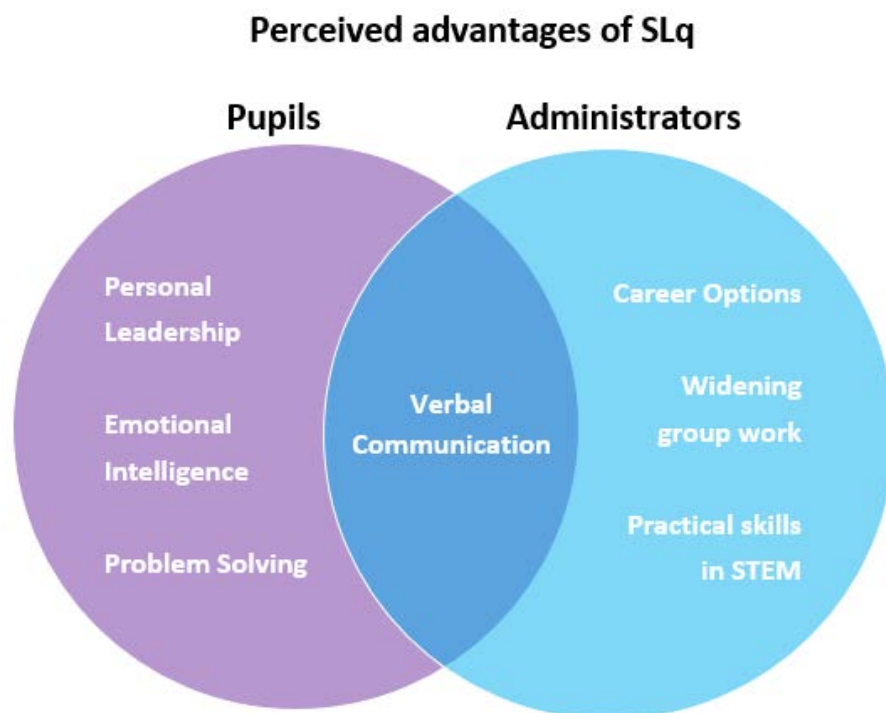


Figure 4.2: Presentation of empirical work for RQ2: Venn diagram of the perceived advantages of the SLq.

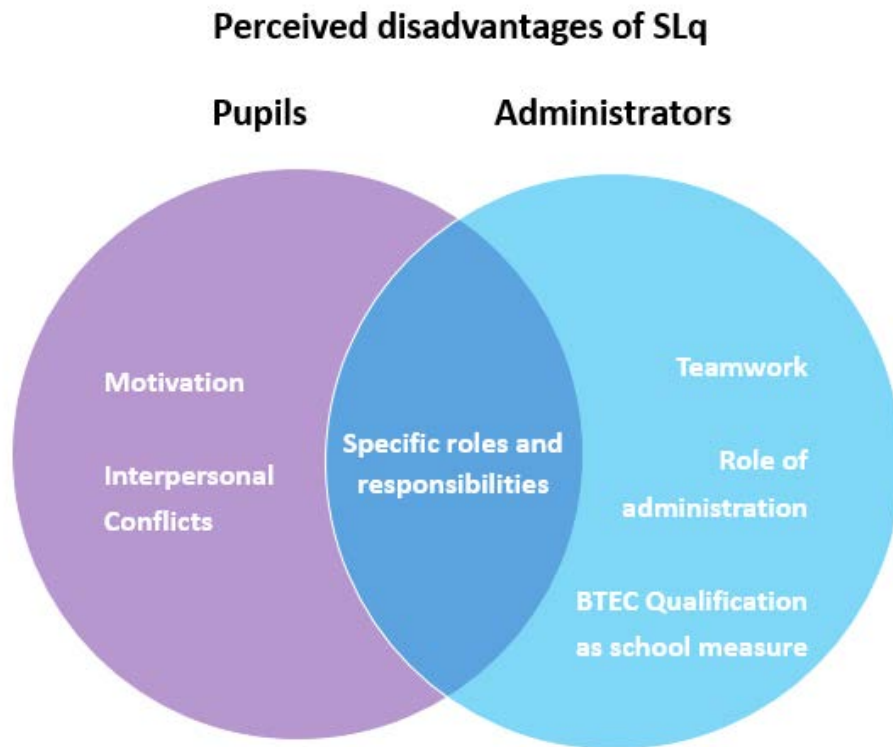


Figure 4.3: Presentation of empirical work for RQ2: Venn diagram of the perceived disadvantages of the SLq.

4.6 Presentation of RQ3 – How does pupil involvement in the SLq programme promote collaboration?

4.6.1 Introduction to Presentation of Research Question 3 – For Pupils

This section details how pupils perceive the components of ‘Networking in Schools’ to promote leadership skills and qualities, namely; the importance of building capacity for communication, developing interpersonal or intrapersonal leadership attributes in networks. This first section details how participants define, understand and identify networks in their school or social context. The subsequent parts reviews how participants use networks to

acquire, develop and demonstrate leadership skills and attributes while on the SLq programme.

4.6.2 Defining Networking

Each of the participants was asked about how they define working with other, as discussed in Chapter Two as *Networking*. Many participants discussed that they understood the term networking to be about communicating and more specifically verbal communication:

“...a structure, like chains of structures... talking to each other, getting in touch and communicating and socialising and getting together” (Participant 2).

Most participants indicated that their involvement with the SLq gave them the skill to communicate, discuss, reason and able to work in a group:

“...where you can communicate with different people, to help them understand and they can also help you to understand about things you don't know” (Participant 20).

Many participants shared how certain teams allowed networking to occur, *“I would think of the internet and connecting with other people, maybe speaking and communicating to them”* (Participant 17).

It was interesting to listen to the participants as they often referred to their interaction with others by their ability to understand the outcomes of leadership:

“...is it when you have to communicate with everyone in your team and if there is a couple of a manager's, then they will have to communicate with each other” (Participant 16).

“...a network of people who will communicate with each other and like at schools where all parents can talk to each other and have meetings with each other about how they are doing or speaking to teachers” (Participant 1).

4.6.3 Building Capacity for Leadership in Networking

Nearly all participants commented how networking with others enabled them to develop an awareness of others:

“...everyone is joined in a big community and then in a way and helps everyone learn different things and such like the parents can learn from the teachers about how their child is doing, the parent can tell the teachers what things the child does well at and what sort of things they are good at doing” (Participant 1).

“...because we are both going to compromise together if we are working on something similar and we have to understand each other. When you’re a leader you just can’t think for yourself, you have to think about the other people as well” (Participant 5).

“...because so that you have a connection to work better and that you can understand other people” (Participant 10).

“... if you are in a very large group, you don’t want to exclude each other and with someone who is not very good and you want to bring them in and want to help that person” (Participant 18).

Interestingly, participant 4 said that having more experience of communication has made them more aware of stressful situations:

“If you don’t have communication then things just get built up and by not saying anything then it keeps building up and it will get worse” (Participant 4).

Developing the need to assess others helped many participants to solve problems.

Participants suggested that communication was essential to understand others:

“...if you could communicate with a large variety of people instead of the same people in the small group so you can get more skills from the people you don’t know or you

may have some skills that they don't have and you can learn from each other." (Participant 3).

Throughout the interviews, it was evident that some participants referred to listening to others to understand how they treated others:

"...if you don't listen to other people someone could have a better idea and if you don't understand if you can't learn from others". (Participant 7).

For some participants, listening to others allowed them to alter their language to their peers, developing their interaction with others:

"...if you are working with someone who is younger than you, you have to adapt your communication with them and vice versa – you have to adapt and by working with different people you can adapt your language easily." (Participant 11).

4.6.4 Using Networks with others for Communicating

Most participants indicated that SLq developed their ability to work in teams and essentially help others. Some participants articulated that group work provided them with the opportunity to reflect with their peers:

"I've done 'how science works' where you have to work with specific pupils to build things but some people have better ways of building than others and communicating you learn what is the best way to do this and if you don't know the answer to the question then someone can tell you, you learn the answer to that question but then it's a part of you that you might know something or you know how to do this better and you need to tell other people and not be afraid to tell them your opinions or ideas" (Participant 2).

"Well it makes me talk more, so communication and it's the only way things can get done and you need communication or there wouldn't be anyone to take control of things and understanding between adults and pupils" (Participant 4).

“When we are giving talks and stuff and like presentations we help out and stuff... and if we don’t understand the work we get to talk to adults about specific tasks” (Participant 12).

“...well we have worked with different age group and with different people, like with the old people in the community so that we just have to be a bit more patient and that and with the young people as well, we work with the primary schools and just with your peer, you talk normally and responsibly as well” (Participant 14).

Some participants used specific scenarios to describe how networking with others helped them personally. Participants put forward how their confidence while being on SLq activities has considerably improved:

“It’s helped me to improve my ability to work in a team and to help others. Also, to put more solutions forward” (Participant 8).

“I think that now I am a bit more confident. Before I used to be a bit like but now I’m more confident and I can work within a team and help other people on that team. But also, follow what I am supposed to do and not go off task.” (Participant 13).

Of note, many participants used this opportunity to describes that they have become more tolerant of others. Participants suggest that activities and groupings aided them to be more empathetic:

“It’s helped me to be more patient with other people because I’m not that patient” (Participant 7).

“it’s helped me to improve to calm situations and to help other people that feel the same way as I do” (Participant 9).

“We had to put our disagreements aside and work together. Sometimes a teacher would come and help us figure out the problem but after we learned to work with other people” (Participant 15).

“...it gave me skills, before SLq I just used to boss people around and now all you have to do is talk to them and now I would talk to other people and ask them about their ideas.” (Participant 17).

This reflective nature was not just about their leadership but about the interpersonal skills whilst working with others. This was particularly the case when participants discussed extra-curricular activities:

“...before I went to SLq, I was not shy but I wouldn’t talk to that many people, but now with experience in STEM, I am not afraid to put my hand up in lessons or say something that might be wrong.” (Participant 18).

“...I have gained more confidence by speaking to adults and people from different backgrounds and being able to listen to other people’s opinions.” (Participant 20).

4.6.5 Using Networks with others to develop Leadership Skills and Attributes

Many participants were positive about their ability to talk to each other about their roles and responsibilities. More specifically, some participants decided to mention a local care home and primary school they visited in the community:

“...we were sitting down and talking to them and it was really good to hear what they were saying and they were teaching us but at the same time they were asking us questions and we were teaching them and sharing ideas” (Participant 3).

“It was to do with our primary school,..., we were given task we had to try to find something out about it. Because we worked in a team and everybody knew what he or she had to do, we had to talk to each other and figure out the specific role for our task.” (Participant 15).

In a few cases, some participants suggested that resolving conflict was an important issue providing opportunities to be concerned with others:

“...depends on the problem, if there were a conflict between two people, I would say ‘guys we have to work together and do the task and we have to put our difference aside and work as a team’ ” (Participant 17).

Participants discussed how their visits helped to build relationships with people outside of their age group. However, while talking their peers, of the same age group, helped participants to:

“...talk about their problems and they would tell us and we could help solve them” (Participant 15).

“...we all sit there and talk about someone else’s problems, we had to come up with solutions and stuff and the teachers came around and talked about our specific solutions so they listened to what we had to say.” (Participant 12).

Of note few participants realised how to ‘understand a situation’, *“...we would also need the think about our ideas in a group and decide which would be the best outcome and solution to the problem”* (Participant 13). Similarly, some participants commented that they were ‘asked’ to do specific tasks rather than investigating possible solutions: *“SLq has taught me that you need to ask someone for help when you need it”* (Participant 16).

However, some participants failed to identify the line of questioning and subsequently had to be prompted with additional questions. Afterward, their answers referred to working towards specific goals and helping those who are in need in their networks and teams:

“...you think about how to put things together and new ideas I think that I listened to people and collaborated with them as well.” (Participant 2).

“...in STEM club, there is situation where you can be put into a group and one person can take over and lead that group and listen to what they are saying” (Participant 3).

Throughout the interviews, it was evident that participants use networking to develop their relationship with others. Understanding group dynamics was a common thread between most participants. Participants mostly referred to the opportunity to learn with others, as this gave them new ideas to cope:

“It has taught me that you need to ask someone for help when you really need it but you could also work by yourself to solve that problem” (Participant 15).

“...we would look at the problem in a group, think of how ideas might work, try the idea – if they fail then go on to the next idea” (Participant 19).

4.6.6 Improvements to Networking in SLq

Nearly all the participants used this opportunity to discuss some administrative issues with the SLq programme such as groupings that were more mixed in the range of abilities. Of note, there are some participants suggested that there should be more opportunities to network with experienced leaders, outside organisations and people in industry so that they can contextualise their learning:

“...maybe like have a wider range and talk to people outside of school and our community and different people in different schools...” (Participant 3).

Some participants mentioned the need to have a structured meeting where they *“know what is going on instead of getting a random email”* (Participant 17). However, some participants suggest that online forms could be used to capture their progress in SLq:

“...where if you needed anything else you could just type it into the website or you could have a little box where you could just put your notes in and the teacher will respond” (Participant 7).

“...I would make more websites available; to help other people to interact better and other pupils can go on it and have conversations with us...” (Participant 20).

4.6.7 Summary of Research Question 3 – For Pupils

Participants discussed that networks provided them with opportunities to work with others from a range of age groups. Their knowledge and understanding of social skills provided many to be empathetic towards each other and discussed the act of working together achieve a goal.

Communication was often cited as an important skill. They use this skill to successfully collaborate with each other often leading to a sense of reciprocity. Participants frequently shared that they use networks to facilitate how they interacted, allowing them to integrate with each other. Indeed, communication in their networks helped them to be more successful in their roles.

It was evident that most participants used their time with others to cultivate their skills in leadership and participants would remark how group discussions allowed them to share ideas and to solve the problem. It was proposed that being in different groups was desirable but not always possible. This aspect may have provided a greater depth of experience for those participants who wanted to develop personal leadership.

Finally, participants suggested improvements to networking while on SLq. Most participants remarked how their groups could be adapted to involve others. Some participants suggested that outside speakers, from industry, should be used to help them understand

other leadership perspectives. Similarly, in a few cases, participants commented that other schools could be involved with the programme, developing new interactions between pupils.

4.7 Presentation of RQ3 – How does pupil involvement in the SLq programme promote collaboration?

4.7.1 Introduction to Presentation of Research Question 3 – For Administrators

This section details how the administrators view how pupils respond to components of ‘Networking in Schools’ to promote leadership skills and qualities. This first section details how participants define, understand and identify networks in their school or social context. The subsequent parts apply to how participants use networks to acquire, develop and demonstrate leadership skills and attributes while on the SLq programme.

4.7.2 Defining Networking

To gauge how adult participants understood the nature of involvement with pupils, the preliminary question was to understand what they thought the term networking meant. Many participants discussed that they understood the term ‘Networking’ with pupils to be about how pupils were interacting:

“...you are utilising staff from those STEM subject areas like the maths department, the children see those where they can be working with a teaching in technology and the working with a teacher in science and they see that relevance and the coherence...” (Participant 21).

“...And because the school is so big, we need more networks, we need more opportunities for groups of pupils to identify we each other and achieve things” (Participant 24).

Many participants discussed how these relationships happened through activities, not just in the SLq but other curricular activities:

“...any activity that is carried out by a peer group has the potential for developing leadership qualities. Sport is an obvious one. In STEM you have science clubs, project work, practical work if you mean in STEM you mean in the classroom subjects I would start to think about outside of the regular curriculum like science clubs” (Participant 23).

“...the different clubs that we offer in schools, the interactive things in websites, various groups the STEM ambassadors in those areas so networking for me is being able to expand their horizons” (Participant 22).

Some participants often mentioned that pupil’s interactions helped them to develop partnership not only in school learning environments but also on residential trips:

“...they form really strong networks as they tend to form networks within their individual groups or teams...” (Participant 25).

Participant 24 comments the importance of building networks in school for *“...more opportunities for groups of pupils to identify we each other and achieve things”*. It was evident that some participants suggest that there is a need for pupil communities where pupils ‘belong’ to a group. Indeed, participant 25 remarked that school communities, including the SLq, allow pupils to form strong bonds between peers and individual teams.

4.7.3 Building Capacity for Networking

Participants were asked about how they observed pupils developed their ability for networking in SLq. Many participants commented how networking was developed by having SLq experiences with others:

“...teach people how to work with other people, which some people find it natural and some find it unnatural to them” (Participant 23).

“...the ability to get along with other people, capacity to accept other people’s strengths and weaknesses” (Participant 25).

As Participant 24 suggests, developing the need to assess and understand others helping many to be more confident. Participant 24 also propose that having opportunities to create networks encourages pupils to show that they can achieve to certain tasks.

4.7.4 Using Networks with Others for Communicating

Many participants indicated that the use of the SLq developed the ability to work in teams.

Throughout the interview participant 22 was keen to mention the importance of STEM:

“It’s the only way to resolve problems I think, it’s about having dialogue and the only way that this country has had its success in the past is because we have the capacity to have brilliant minds but having the courage to go with it and to communicate effectively...” (Participant 22).

Some participants mentioned that pupils have the opportunity to contribute to groups:

“...the boys might think great we won; the teacher might think that they did well but the girls might be thinking well what that was about? We gave pupils an opportunity to contribute and talk about it.” (Participant 21).

“...we moved away from the teacher led lesson to completely pupil learning experience and the child can have their voice and have the interaction.” (Participant 22).

Again participant 22 discussed that allowing pupils to be in teams helps pupils to generate ideas and to work more confidently in teams:

“...but seeing a good pupil helps others to bring ideas to the table” (Participant 22).

“Giving people opportunities for them to work together gives them the ability for learning experiences but it needs to be managed together...” (Participant 23).

Participants mostly remarked that the idea of pupils working together in networks could help them develop collaboration:

“Collaboration can teach people how to work with other people, which some people find it natural and some find it unnatural to them. Giving people opportunities for them to work together gives them the ability for learning experiences” (Participant 24).

4.7.5 Using Networks with Others to Develop Skills and Attributes

Adult participants have a unique viewpoint of seeing how pupils develop a range of skills and attributes not just in SLq but also in lessons and extra-curricular activities:

“...I think to sustain a better program between departments especially towards STEM, it the ethos of STEM and getting the kids to see the inter-relationships between the subjects and the fact that in industry you won't be biologist in industry but will work for a company that will utilise aspects of mathematics and technology and physical processes and chemistry and all of those will be under one roof” (Participant 21).

All participants discussed how teams of pupils give pupils more confidence to develop and exhibit these skills and qualities. Indeed participant 23 states:

“...kids sometimes learn best by being with their friends” (Participant 23).

Participants discussed the role of group activities remarking that pupils use key skills while on activities:

“...Valuing others is also an essential skill that they pick up and the debates that we have in school has been very good for the children. I’ve seen some of the debates and it shows that the pupils do appreciate the time that people have for them” (Participant 22).

“...Giving people opportunities for them to work together gives them the ability for learning experiences but it needs to be managed together...” (Participant 23).

Participants had seen pupils appreciate their peer's expertise. However, for this to happen, groupings were implied to be considered:

“...why not pilot a few things out of composing groups so that you try different types of groupings, different sorts of networks and ask the pupils which one’s sort of work best and you can vary group sizes and so forth.” (Participant 23).

“...You have to think very carefully how you select the groups so that there are all sorts of issues to do with gender, personality types, ethnic mix and social economic mix – it’s not simple and just saying that we will mix everything up is not the answer.” (Participant 24).

“I think there is quite a lot that is just not about individual learning, pupils have to work in teams or groups to do things. In a lot of lessons pupils do a lot of leadership skills but we don’t brand them as leadership skills.” (Participant 25).

Of note, many participants have first-hand experience how ideas can be generated and transferred to others, creating a link between facilitators and the pupils:

“...the ability to find connections and see where things take you. I certainly find now, I experience the link with something else and it is exciting to see a link and make you feel like you had an original thought and maybe we have to develop that” (Participant 24).

4.7.6 Improvements to Networking in SLq

Administrators used this opportunity to express their opinions with how the SLq was taught. Nearly all participants commented that the size of the school was an issue as this led some pupils regularly missing meetings. Participant 21 suggested that the current school timetabling causes issues to arrange a meeting with pupils *“...that really reflects what the academies do and certainly what the grammar schools do as the attribute is placed on how important it is to develop teams or project or enrichment”* (Participant 21). Participant 24 suggests that missing meetings leads to staff are aware of how pupils are progressing. Participant 25 infers the specific improvements to SLq could be made improving how meetings occur:

“...it’s very hard to have all the pupils in at once and I can’t do that with the number of staff I have and with the time I have. Pupils’ need that personalised structure; some pupils have literacy issues and writing it up will be a push for some of them” (Participant 25).

However, the participant also adds that the problem of consuming too much time is inevitable with this process. Subsequently allowing pupils to be more involved in groups could provide more time to have critical conversations about developing leadership skills and attributes.

Participant 23 suggests that pupils could:

“...design their own personal leadership qualities then sitting down with them on a one to one and talk to them about where in their life to they have an opportunity to exercise their leadership, how much do they want to be a leader and what are the qualities they need to be leader” (Participant 23).

4.7.7 Summary of Research Question 3 – For Administrators

Administrators were asked questions about how pupils had demonstrated leadership skills and attributes while being in specific groups or networks. As shown Figure 4.4, the presentation of RQ3 is summarised in a diagrammatical form where the relevant themes emerge. Many participants responded that pupils were demonstrating these traits in school or taking part in activities designed for the SLq. Their experiences of 'Networking' was facilitated by communication in teams, this was mentioned as a strength of the SLq programme.

Communication was viewed as a vital skill for collaboration. When activities occurred, pupils communicated and shared, develop and strategised in their network. However, administrators did note that more structured programme was needed to allow this aspect to be regularly shown. Many participants talked about a range of skills and qualities occurring in lessons and extra-curricular activities. Participants viewed pupils appreciating their peers and facilitator's expertise and feedback. Similarly, some participants proposed that opportunities for discussion could facilitate when pupil learn the context of leadership in a formal setting.

Finally, participants suggested improvements to networking while on SLq. Some responses discussed that personalised leadership sessions should be a part of the programme. One main constraint was evident – the size of the institution. This hindered the collaborative approach to the SLq programme and pupils often dropped in and out of sessions.

4.7.8 Diagrammatical Presentation of Research Question 3

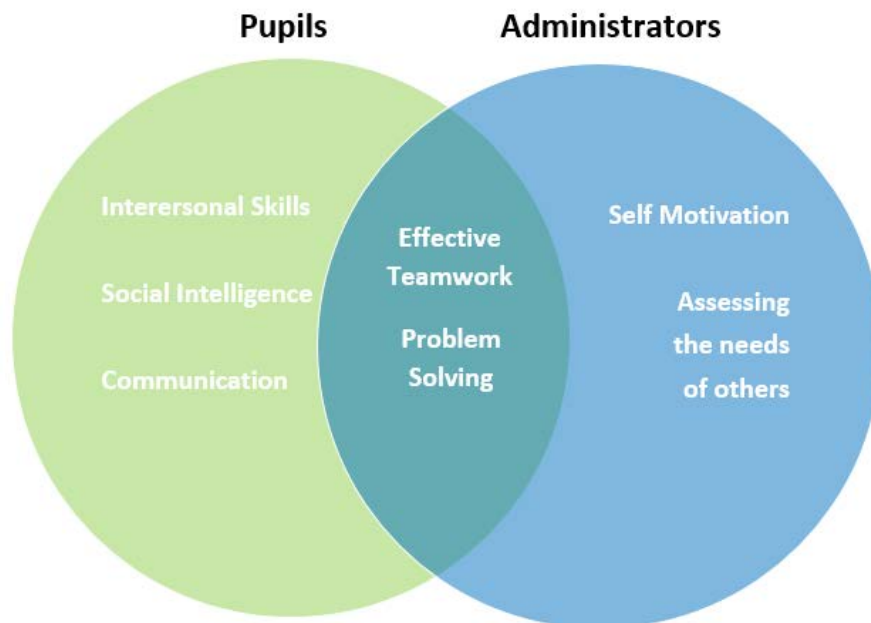


Figure 4.4: Presentation of empirical work for RQ3: similarities and differences between pupils and administrators for SLq collaboration.

4.8 Summary of Chapter Four

This chapter has outlined the findings emerging from the twenty semi-structured interviews conducted with pupils and five semi-structured interviews with administrators, four of which were also based at the school and the other administrator is a national leader for STEM education for the UK. This chapter has related to each research question by structuring this chapter in two parts; for pupils and administrators. This chapter has these parts referring to each research question and relating this to the interview data. Subsequently, this is represented diagrammatically by Figure 4.1, 4.2, 4.3 and 4.4 indicating the presentation of empirical work for RQ1, RQ2 and RQ3.

Chapter Five - Discussion of Findings

5.1 Introduction to Chapter Five

The intention of this chapter is to address the theoretical landscape explored in Chapter Two with the methodology and research design explored in Chapter Three - combined with a critical discussion and analysis of the findings from Chapter Four.

In this case, the Research Questions for the study are re-introduced:

RQ1: How does the SLq programme promote the development of leadership skills in pupils?

RQ2: What are the perceived advantages and disadvantages of the SLq programme to encourage leadership in pupils?

RQ3: How does pupil involvement in the SLq programme promote collaboration?

Chapter Five is divided into three sections, addressing each research question. The subsequent parts of this chapter explore the categories of the emergent themes from the interviews. This chapter compares interview findings from pupils and administrators and compares them against each other.

5.2 Contextual factors

As mentioned previously in Chapter Three, the contextual factors play a significant part in giving the study depth about the perceptions of developing leaders in STEM. Four out of the five administrative participants were based at the same school which allowed these participants to experience the development of the pupils in their environment whilst the fifth administrator was able to give a rounded view of pupil leadership. All twenty pupil participants were in the same academic year group and purposely selected to meet the requirements of collecting data for the research topic. Pupils were chosen due to their participation in the SLq programme and did not necessarily represent the general population of pupils in all UK secondary schools.

5.3 Research Question 1:

RQ1: How does the SLq programme promote the development of leadership skills in pupils?

What is the nature of promoting leadership attributes and skills in the SLq programme and how is the underpinning SLq framework of Bianchi's 'Personal Capabilities' related to the development of leadership for pupils? As previously mentioned in Chapter Two, Bianchi's (2002) PCs represent a framework to span across ten capabilities. The literature review of leadership skills and attributes varied depending on context and circumstances of leaders. The PC's give an indication of leadership skills and attributes that are considered to be influential to pupils in schools. These skills and attributes refer to an individuals' capacity to

demonstrate the behaviours associated with the skills and characteristics as mentioned in the author's framework (Table 2.1). As shown Figure 4.1, the presentations of RQ1 is summarised in a diagrammatical form where the relevant themes emerge from Chapter Four. These themes will now be discussed in relation to the literature review and RQ1.

5.3.1 *Understanding Leadership and Leading Others: for pupils*

Participants recognised the significance of effective teamwork as echoed by Thorndike (1920) as the ability to understand and manage people, notwithstanding the skills of communication and solving problems. Indeed, participants were able to use these acquired skills to develop their own style of verbal communication towards others. Most participants describe their interaction with others to being kind and ensuring that they developed trust. Being able to understand others and acting ethically was often a high priority for participants, as iterated by Hopkins and Jackson (2002). Participants outlined how the relationship of power and working with others causes conflict (Busher and Hodgkinson, 1996; Goleman, 2002). Indeed, participants discussed that the effectiveness of a leader is partly due to their communication with others (Bush, 2008). Participants mentioned that being able to control their stress was beneficial to avoid conflict, especially being of a certain age where disagreement between their peers can hinder their leadership progression (Van Linden and Fertman, 1998).

Of those participants who gave clear examples of role models, US President Barack Obama was often mentioned. Participants were visibly excited to discuss his leadership style as a

role model. Participants spoke passionately about the manner in which he communicated with others. Other participants shared how they looked up to their peers as role models and being able to talk to others about their problems. This provided a platform for communication and essentially sharing knowledge and understanding with fellow participants (Taori, 2001).

5.3.2 *Understanding Leadership and Leading Others: for administrators*

Most participants discussed how leadership was about 'leading from the front', participants appeared to enjoy their style of leadership, being in a position of power and making decisions. This is articulated by the findings of West-Burnham (2009b). However, participants are mindful that the role of a person in power is not authoritarian, as discussed by Etzioni (1961), as participants seek to have a normative power base. This is significant as they explained the manner in which they are perceived as leaders (Ianni, 1989) and the importance of how their 'messages' are communicated (Bell, 1993).

The participants expressed how *good leaders* should collaborate, provide support and capacity to others (West-Burnham, 2010). Some participants commented that not all pupils wanted to lead and that leadership expectation can become too great for some (Leithwood et al., 1999). Just like their pupil counterparts, some described leadership in the context of sporting figures. These role models provide a platform to consider effective teamwork and leadership in an organisation and how the contribution of others leads to achieving a common goal (Lawson, 2003). However, the researcher believes that the participants life

experiences have a considerable impact on their leadership development and ultimately their perceptions of their leadership.

Participants discussed the importance of teamwork when leading others as an essential leadership skill. They also suggest that teamwork helped to establish the role of self-leadership and to be more emotionally aware of others (Goleman, 1998). Participants freely articulate a range of activities where pupils demonstrate leadership whilst on a residential trip or in school STEM projects. Analytical and problem-solving skills are often mentioned as vital skills developed when pupils are on activities, showing that they are able to communicate with each other (Lewis and Burman, 2008; Mitra, 2008).

Participants mention that working towards goals, the idea of being resilient is a skill that needed development. Pupils were perceived to have a lack of foresight of an activity, something that is re-iterated by Claxton (2006). Teaching resilience to pupils is somewhat a difficult task, as participants experienced. However, this essential skill is often developed over time as identified by Black et al. (2006).

5.3.3 Leadership Skills and Attributes in SLq: for pupils

Participants discovered how to share their responsibility by developing peer relationships and therefore had to communicate, co-operate and co-ordinate. This is similarly discussed by Gardner (1999) and Lawson et al. (1999). By forging new relationships, participants

developed their leadership skills in tasks. The researcher did note that participants use their experience in their day-to-day school life to enhance their leadership capacity.

From the responses, participants were enthusiastic about working together on tasks and activities. Most participants talked about their ability to solve problems and communicating with their respective teams. They were sensitive towards each other, creating equal opportunities for their peers to all be involved (Goleman, 1996). Most indicated that they were willing to share their responsibility for power. Some participants understood the role of power (West-Burnham, 2009b). Their reflections did not appear to be arrogant but genuinely expressed themselves to be humble. Most suggested that they had the ability to lead and complete tasks or activities by adapting their behaviour to help others. As West-Burnham (2009b) stipulates, this skill is honed with experience when in a role.

Table 4.3 from Chapter Four indicated 'Developing Personal Skills for Leadership' was ranked higher than others. The learning attribute of 'Practicing Leadership Skills with Others' and 'Learning with Colleagues and Others Pupils' is ranked lower than other attributes. Participants shared how they viewed leadership as being a 'lead figure' rather than a skill that is developed with others. This is endorsed by West-Burnham (2009b) as a 'dominant figure'. In fact, West-Burnham's (2009b) contribution indicates that there is a need to develop and build leadership capacity by enhancing key skills, iterated by Stogdill (1948). Indeed, participants ranked first 'Developing Personal Skills for Leadership' demonstrating that participants sometimes thought of themselves when discussing one to one (Gronn, 2000); Spillaine et al., 2001, Glickman et al., 2001, Silins and Mulford, 2002).

5.3.4 Leadership Skills and Attributes in SLq: for administrators

Using their experience, either as a leader or being a part of the teaching of SLq, participants agree how effective of role models are to leadership. Participants felt that pupils understood a variety of leadership skills by adopting traits from role models (Van Linden and Fertman, 1998). This is similarly discussed by some participants as to how those skills can serve pupils in the future.

Most participants realised that pupils were working in teams collaboratively. By assessing the needs of others and being able to work together, pupils were seen to utilise leadership skills in practice (Bianchi, 2002). They identified that pupils created opportunities to develop other skills, such as problem-solving, resilience and decision-making. Their behavioural patterns changed as they build their relationships with their peers by understanding different viewpoints and opinions – becoming an emotionally intelligent leader (Goleman, 1996; Rutherford, 2006).

From Table 4.5, the participants also ranked ‘Practicing Leadership with Others’ last. Again, participants stated that leadership skills and attributes are qualities that cannot be developed through others as their experience was highly personalised. Participants explained that ‘Learning from More Experienced People’ gave them a unique view to interact with others who have more expertise in the field. Some participants believed that having the opportunity to acquire charisma was a valuable commodity (Lawson, 2003; Torres and Margolin, 2003).

5.3.5 Difficulties with gaining Leadership Attributes: for pupils

Participants noticed that leadership was often viewed as an alien concept in the process of developing their leadership capacity. Bassey (1999) suggests observers are dependent on their perception of reality. In this case, participants explore the experiences of leaders and how participants perceive reality towards their own life. Participants suggested comparing their leadership skills to the leaders that surround them. Experiential learning is, therefore, an excellent method to absorb certain skills of leadership. Just as a plasterer would develop the art of having a perfectly smooth, flat surface on a wall when working on a construction site for many years, participants suggested that their learning of leadership would grow whilst working alongside others.

Some participants recognised how pupils use certain skills to develop their use of communication. However, some talked about this only happening in a network. Van Linden and Fertman (1998) remark that as pupils often spend their time with peers, they assimilate the same attributes as others in their group.

Many participants discussed the difficulties with developing team working skills, especially understanding others. Lawson (2003) comments that individuals in a group setting may become independent due to flourishing relationships. This is because lasting relationships safeguard how focus, trust, mutual commitment and a strong sense of joint ownership develop spreads within teams. Participants are unconformable with undertaking

manufactured learning, however, as Rubin (2002) proposes developing new learning experiences are cultivated by people experiencing robust and meaningful partnerships.

5.3.6 *Difficulties with gaining Leadership Attributes: for administrators*

Being able to view how pupils demonstrated their leadership gave participants a unique opportunity to reflect on their leadership development. Most participants discussed how framing 'leadership' caused some confusion whereby pupils could not distinguish between management and leadership. This was certainly evident when participants perceived their peers being 'bossy' and ordering others around rather than leading. Some participants stated that this was due to a general lack of experience in leadership. While others concluded that working in teams more effectively would help to develop interpersonal skills and provide opportunities to develop further understanding. As West-Burnham (2009a) suggests, effective teams make time for individuals to share their reflections.

Participants admit that pupils can develop new learning experiences but are not able to reflect on their experiences. Busher and Hodgkinson (1996); Rhodes and Brundrett (2009) discusses how personal relationships can significantly impact on pupil learning. Some participants alluded that pupils from more challenging backgrounds feel less emotionally secure, therefore, find it difficult to work in teams. Belbin (1981) infer that great synergy is generated when working in a team. Pupils that are less emotionally secure could be detrimental to the group dynamic and group learning in the SLq programme.

5.3.7 Summary of RQ1: How does the SLq programme promote the development of leadership skills in pupils?



Figure 5.1: Presentation of empirical work for RQ1.

The researcher has displayed the findings of RQ1 for pupils and administrators using a hierarchical pyramid diagram demonstrating if a pupil progresses in regard to developing leadership moving upwards (Figure 5.1). The researcher would like to draw attention to the idea that if a pupil is placed at the bottom of the pyramid, the main obstacles that prevent them from developing leadership skills would be the skills and attributes in the blue section of Figure 5.1. After which, the next section upwards is the attaining skills and attributes that pupils have to develop in the SLq gain a greater perceived leadership (green section of Figure

5.1). Finally, the yellow section of Figure 5.1 displays factors thought to be of most importance in the SLq acquire perceived leadership development.

5.4 Research Question 2:

RQ2: What are the perceived advantages and disadvantages of the SLq programme to encourage leadership in pupils?

When pupils are participating in activities and tasks, what are the perceived key indicators of leadership that pupils develop and that administrators have observed in pupils? Although administrators have observed the development of leadership capacity in pupils, combined with their experience in leadership, they will tend to be biased toward their ontological viewpoint. This is explored further in this section. However, by understanding the advantages and disadvantages of SLq, we further comprehend the importance of SLq and how it is used to develop leadership skills and attributes.

Pupils face many difficulties in their lives and in a school environment these difficulties are easily shown. By looking into the challenges that pupils may face in the SLq programme, we broaden our understanding into how pupils overcome certain problems and how the administrators witness this to happen. Finally, suggestions are made about how SLq could be improved. The openness of this question to participants gave a rare opportunity for all participants to *get it off their chest*. As shown in Figure 4.2 and Figure 4.3, the presentations of RQ2 is summarised in a diagrammatical form where the relevant themes emerge. These

themes will now be discussed relating back to the literature review and then the research will formulate emergent about for RQ2 regarding promoting leadership for pupils.

5.4.1 *Advantages of Promoting Leadership in SLq: for pupils*

Participants were able to give their opinions on the advantages of developing leadership in the SLq programme. Most participants discussed that their leadership was enhanced to stimulate collaboration and discussion by giving each other words of encouragement. Goleman (2002) articulates how people can establish their roles in organised groups to decide which roles they take however, it is important for a leader to relinquish power and distribute their leadership amongst others. Participants talked through the issues relating to power and authority as well as assessing the needs of others. Fullan (2000) suggests that for improvement, relationships are developed to provide capacity and co-ordinate with each other. This seemed to be the case, participants alluded that they had positive relationships with one another in the SLq programme and were aware of their influence on each other.

Participants understood that problems could occur whilst working with their peers as being able to cope with others was often tipped as being important for their development. Van Linden and Fertman (1998) put forward that there are group expectations and rules such as accepting others' feelings and thoughts, speaking for yourself, avoiding 'put-downs', taking responsibility, respecting confidentiality and being open to participation. Participants showcased most of these traits and they were able to identify most issues. This is probably due becoming more aware of their interactions. Bianchi (2002) projects that this style of

interaction allows a positive self-image of individuals to enhance their leadership attitude and awareness and this was seen.

5.4.2 *Advantages of Promoting Leadership in SLq: for administrators*

Participants acknowledged that pupils explored career opportunities more intensively whilst on the SLq programme. Being able to develop lifelong skills and a passion for STEM learning provided the backdrop for pupils to engage with the qualification. The Science and Innovation Investment Framework (2004) had extensively noted that this aspect helps to promote and raise aspirations among young people to entice them to study STEM-related subjects. Participants discussed that pupils committed to their learning; it stimulated their motivation to acquire self-leadership. This is similar to the proposal made by Allport (1937) and Ryckman (1985) signifying that an individual's leadership personality and behaviour gives them the ability to have the disposition of leadership. Participants viewed how pupils evolved in their leadership to help others. Again, the ability to help others in teams is evident as collaboration matures, a consequence of which how they communicate with each other. Certainly, the opportunity to work together is intrinsic to the SLq programme and participants admired how pupils can work together and forge effective teamwork, in small or large groups. This certainly agrees with Busher and Hodgkinson (1996) and Rhodes and Brundrett (2009) as the impact on learning is dramatically increased by working together.

Participants also noted that the pupils use of verbal communication helped them to explore how they can communicate with each other more effectively. Participants saw pupils

processing their thoughts and being more assertive or help others work towards goals. This reinforces Bianchi's (2002) perspective of tenacity where pupils relate to the motivational perspective and character of their peers – where they have the ability to cope, understand and face challenges. The NCSL (2010) and Gornall et al. (2005) agrees that this is certainly an attribute of leadership. Mollison (2010) also suggests that this resilience is linked to leadership and learning. It is apparent that the SLq programme allows pupils gain more experience and to empower them to succeed. In this case, it enhanced their leadership and their ability to influence their environment.

5.4.3 *Disadvantages with Promoting Leadership in SLq: for pupils*

It was interesting to hear that participants answers were directed towards leadership rather than being critical about SLq. The use of probing and open-ended questioning provided a depth of answers rather than surface level comments (Kvale, 1996). Participants stated that the lack of team roles in their activities and tasks led to dissatisfaction. This resonates with Belbin (1981) where individuals have their own dynamic that inhibits certain characteristics. As Bell (1993) suggests a lack of input into selecting team members and not empowering team members may mean shared goals are not established thus hindering the functionality of the team. Participants agreed that the use of verbal communication is used to convey some of their messages but failed to make an impact in directing their peers towards successful pupil partnerships (Van Linden and Fertman, 1998).

Participants had expressed their views on directed roles and how this led to interpersonal conflicts. The ability to resolve these issues became a topic of interest as they knew how to solve this particular issue by using a pupil forum. Certainly, there is also the consideration of leadership behaviours. Judge (2004) remark that both consideration and initiating structure had moderately strong relations with leadership outcomes. In this case, participants were able to demonstrate how their capacity in the SLq programme provided them with the ability to organise themselves.

5.4.4 Disadvantages with Promoting Leadership in SLq: for administrators

Participants were able to give a holistic answer to this question ranging from the role of BTEC qualifications in schools. Participants observe that pupils often found it difficult to communicate to each other effectively. However, Taori (2001) says that it is not the frequency of the communication but the *method of communication* for certain encounters. Some believed that pupils did not 'put their voice across'. This is certainly recognised by Bass and Stodgill (1990) as verbal fluency is a trait of leadership. However, Bianchi (2002) implies that verbal communication helps to encourage personal and interpersonal relationships, albeit to express thoughts, opinions, feelings or to share common meanings.

Most participants claimed that the way individuals worked together caused a problem and they could have worked more collaboratively. This is certainly similarly discussed by West-Burnham (2009a) who states a greater emphasis is needed on team-based relationships. Rubin (2002) also suggests that collaborative leadership can be to resolve conflicts and

facilitates lasting relationships. However, the author suggests that this is a form of distributed leadership and in this case, pupils would have to understand their specific roles in teams. This was certainly picked out as a lack of understanding of each pupil's task or role in their respective teams.

Some participants said that a lack of general administration made the job of building strong relationships difficult to manage. The emotional role of leadership, as discussed by Van Linden and Fertman (1998), states that by accepting pupils' ideas and opinions, they can manage their emotional well-being. However they found that some pupils approach to working with others difficult and needed to give appropriate guidance.

5.4.5 *Demonstrating STEM Skills and overcoming difficulties when Leading: for pupils*

Extra-curricular activities, experiences and work gave most participants opportunities that they would not experience if they were not on the SLq programme. However, a small number of participants did not report how the programme enhanced their opportunities to develop specific STEM skills. Of the participants that did, their added learning heightened their experiences in the classroom.

Participants often discussed how the experience of being able to problem solve helped them develop a broad range of STEM skills. As activities on the SLq programme were based on the STEM agenda (NCSL, 2010), these skills were applied to their curricular subjects. This, in turn, helped those pupils to develop further roles in class and in their leadership context

outside of the SLq programme. This model is certainly discussed by Leithwood et al. (2006) who inform us that the role of teachers is to inspire, enabling pupils to showcase best practice and be leaders themselves. Their development of STEM skills correspondingly enhanced how they communicated with each other. Participants also remarked how their confidence increased shown through their ability to talk to adults and peers. Beckhard (1969) similarly suggests that supporting participation is a sign of developing open communication.

Some participants discussed how they were more socially aware especially when working with others. This was sometimes mentioned as 'being taught to listen'. This is re-iterated by Mitra and Frick (2004) who believe that experiences are enhanced by listening to others to improve. Teamwork is certainly promoted by SLq activities, where they begin to understand the role of their peers. This is confirmed by Lewis and Burman (2008), that environment aids the culture of learning transferable skills such as questioning, problem-solving, critical thinking, observation skills and interpersonal skills. In turn, participants demonstrate how they developed their rapport with others by methods of understanding the broad context of learning, showing elements of their leadership capacity in those subjects.

5.4.6 *Demonstrating STEM Skills and overcoming difficulties when Leading: for administrators*

Most participants discussed how the range of activities gave pupils the opportunities to practice their leadership and they would not have been able to do so in the classroom

environment. Being able to demonstrate communication, teamwork, time management and leadership on the SLq helps to support pupils to develop their skills across all STEM fields. Analogies were used to describe their abilities to work together – from sporting references for team building to debating significant issues in science e.g. global warming. Participants observed pupils effectively demonstrating transferable skills from the SLq environment to the classroom, particularly with regard to leadership. However, the researcher must acknowledge that the ‘observer effect’ may take place when these observations are made. As Denscombe (2007) states, these perceptions are subjective towards the observers and construct their reality towards that on the look on reality. However, they also suggest that working alongside STEM professionals helped to further their career advice into STEM related professions. This provided timely support to those considering STEM careers for the future and as one participant remarked it contributed to build trust between the school and pupils. As Frost et al. (2009) acknowledge, pupils possess a variety of knowledge and understanding about leadership that can determine how actively involved they are in their learning. This is certainly the case where pupils build their own knowledge and understanding of how SLq is used outside of school, to develop their broad context of learning.

5.4.7 Improvements to SLq: for pupils

Most participants feel that the provision in Mathematics could be improved. This has also been highlighted in the Score-Education Report (2010) compared to other STEM subjects. It includes professional development given to teachers and more importantly enriching the

teaching of Mathematics. Participants thought that group sizes contribute to the effectiveness of learning in the SLq programme as well as external visitors imparting guidance with STEM and leadership.

5.4.8 *Improvements to SLq: for administrators*

Most participants conceded that pupils might have difficulties with managing themselves, especially when they have to make some decisions when working with others. This often causes them to become stressed. However, Goleman (1996) proposes that without the capability to be self-assertive and confident in their ability, pupils lack the understanding of how to manage their expectations and personal responsibility. Participants noted that pupils are required to understand the deeper meaning of leadership. However, West-Burnham (2009b) suggests that understanding leadership traits is a timely process which is gathered from learning experiences. However, the SLq starts the process of understanding these aspects via experiential learning.

5.4.9 Summary of RQ2: What are the perceived advantages and disadvantages of the SLq programme to encourage leadership in pupils?

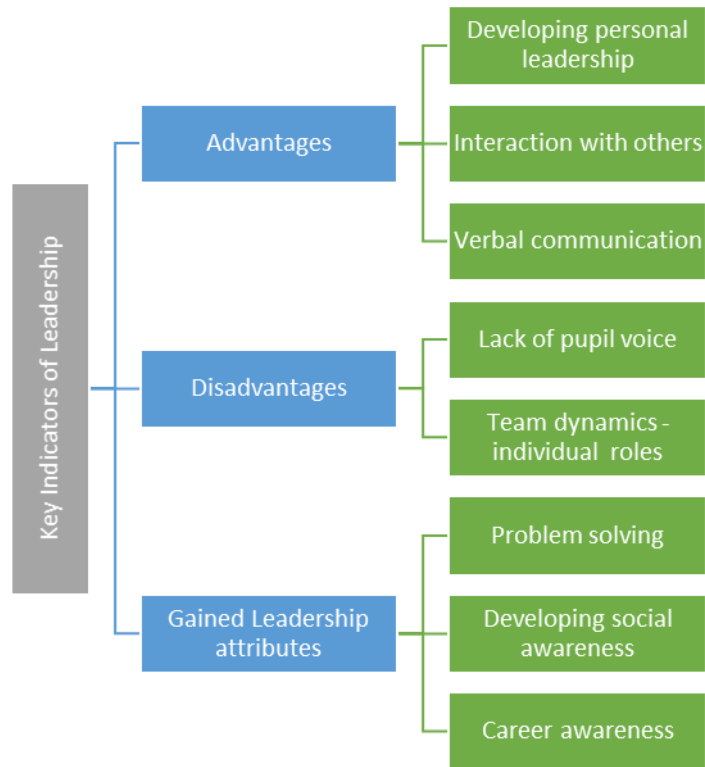


Figure 5.2: Presentation of empirical work for RQ2.

Figure 5.2 displays the key findings for the SLq programme for RQ2 indicating the advantages, disadvantages and perceived gained leadership attributes. The researcher noted that this list is not exhaustive to the attributes, however, that these attributes were most frequently mentioned in the discussion of RQ2 and relevant literature for this study.

5.5 Research Question 3:

RQ3: How does pupil involvement in the SLq programme promote collaboration?

What are the perceived indicators of pupil involvement to develop networking, especially when pupils are on the SLq programme? Many participants provided the viewpoints of how participation helped pupils to develop their understanding of networking and where individuals or groups can be used to ensure teams are developed. Critical skills were also touched upon such as communication, where pupils could enhance their problem-solving abilities while collaborating. Consequently, the lack of networking was evident from an administrative view, where some participants saw the need to co-operate with pupils for the day to day running of their leadership development programme.

5.5.1 *Defining Networking and building capacity for Leadership in networks: for pupils*

Participants described their definition of a network. Their opinions varied from using collaboration to interact with each to being able to communicate in different forms. Social media was commonly used as a means to extend networks between people. Macaulay (2008) describes that this could help enhance networks to support people. This interaction is defined by Hopkins (2003) as a form of collaboration, linking and forging partnerships. In this respect, participants understood the importance of networking between all communities to make connections.

Participants also remark how they can build the capacity for leadership. Rhodes and Brundrett (2009) suggest that collaboration between people will enhance how people develop leadership. This is certainly the case as they learn to provide information to work alongside different groups. As Busher and Hodgkinson (1996) alluded that people having a greater awareness of their interactions will become more proficient with collaboration. Participants exhibited this as most actively listened to each other. Participants felt that they could 'get along' with each other without external constraints (from teachers). This is recognised by Busher and Hodgkinson (1996) as an autonomy feature of networks, where there is a growth in leadership capacity when more people are given the opportunity to lead.

5.5.2 Defining Networking and building capacity for Leadership in networks: for administrators

Participants discussed how the use of networks enhances the interaction between stakeholders. DuFour (2004) agrees with this aspect of networking, developing the collaborative nature of individuals in an organisation. Participants referred to the nature of developing relationships. Belbin (1981) concludes that this should be dependent on the character of individuals in the groups. However, Busher and Hodgkinson (1996) say these interactions can be proficient in developing relationships more effectively and that these groups should remain the same. This was not the case as some participants described how different teams were constantly formed for various tasks and activities.

Hopkins and Jackson (2002) state that building learning networks help to establish learning communities. This is true in this case as some participants talk of the formation of teams in non-STEM subjects i.e. Physical Education. Introducing the right circumstances for pupils to enhance their leadership capacity is also considered by MacBeath and Dempster (2009), who note that creating the conditions for collaborative learning heightens the likelihood for pupils to identify successful relationships with others.

Participants conversed about how the capacity for building networks is embedded and allows opportunities for people to work together. This correlates with Rhodes and Brundrett (2009) who state that when people are working in this fashion, they create a collaborative learning environment. Assessing the needs of others was a topic of discussion as participants observed pupils to be accepting other people's strengths and admitting their own weaknesses. Participants could witness how pupils distributed tasks and roles to others. Indeed, Goleman (2002) asserts that this is undertaken by all stakeholders and participants saw how pupils formalised tasks, allowing collaboration to take place. However, Damon (1977) considers this to be a part of holding power and positions. Participants agree that pupils were working together and accepting the legitimacy of adult authorities. However, for leadership to be distributed, pupils must be able to take on roles and responsibility without the need for intervention (Goleman, 2002).

5.5.3 Using communication skills to Network: for pupils

The participants were asked how collaboration provided the platform to build communication between their peers and adults. The literature review reveals that communication is a clear tenant of leadership. Participants discussed that by exploring how to communicate with others, they established new ways of verbal communication (Taori, 2001). Knowledge and understanding is shared among participants and as Taori (2001) explains, the nature of verbal communication is multi-directional. Bell (1993) notes that communication is also formalised in most situations, having a chair and attendees. However, participants did not display this. Subsequently, some participants did rely on specific commands for tasks. These were often given by staff to pupils and demonstrated that some pupils were not managing themselves effectively.

Taori (2001) also suggests that networks are reliant on the method of communication in *chains*. This again is true in this case; participants passed comment on how they were able to communicate with their peers and adults in an open manner during the SLq and even exclaimed that they were *“not afraid”* (Participant 5).

Verbal communication helps pupils to build their confidence while on the SLq programme and other activities around school or in curricular subjects. Blanchard (1992) suggests that this is a measure of the effectiveness of teams and high of performing people. Only some participants often described the method of interaction being more than just relaying or directing information but more so of being socially aware of each other. However, Bianchi

(2002) explains that the use of verbal communication is built on reinforcing personal and interpersonal relationships often developed at an early age. This is highlighted in official reports (DfEE, 1999) as an influential part of pupil development.

5.5.4 *Using communication skills to Network: for administrators*

Participants had seen how pupils used the ability to work in teams to strengthen how they interacted with each other. Taori (2001) believes that interactions allow individuals to develop how individuals work together. This key feature was picked out by the participants that working in teams, they acquire the ability to resolve problems to collaborate and share ideas.

Jackson (2004) wrote that collaborative learning allows people to share and engage with each other. Participants saw that pupil experiences helped with providing such moments to develop harness key skills like pupil led learning. This is also similarly discussed by Rhodes and Brundrett (2009), giving prominence to learning, teaching and facilitating how learning communities take place for pupils. Partnerships are formed and pupils work alongside each other discussing the role of STEM to their specific task or activities.

Participants believed that STEM was a clear platform to help pupils to start talking to each other. This is reinforced by Noyes (2005) that knowledge is mobilised and pupils become 'producers of knowledge'. However, Brighthouse and Woods (1999) say this culture will develop pupils as learning consultants. Consequently participants suggest that pupils do not

have the ability to take this learning forward out of the SLq programme. Pupils are able clearly to discuss issues in groups, demonstrating that they can communicate and especially teach others by sharing skills. It is important to note that Mitra and Frick (2004) indicated that offering pupils the chance to build relationships while in collaborative networks builds foundations of change, leading to improvement to help schools to improve to facilitate learning.

*5.5.5 Using Networks with others to develop Leadership Skills and Attributes (Bianchi's PCs):
for pupils*

This was an opportunity to connect the participant's views of collaboration to the contextual framework for PCs (Bianchi, 2002). Asking the participants probing questions about leadership skills and attributes in collaboration gave a clear indication of how the framework matched. Participants shared that their ability to problem solve on tasks and activities provided them with opportunities to resolve conflicts with others. As agreed by Blanchard (1992), being able to work together to problem solve makes people more self-aware of their actions and understand team dynamics.

Participants were keen to describe how using their peer groups helped with them to understand others. Of the many skills and attributes taken from Bianchi (2002), being able to reinforce personal and interpersonal relations in teams effectively was believed to have a significant effect on their leadership. Bianchi (2002) deduces that communication is influenced by social environments, cultures, context and that being able to form teams could

aid participants to communicate with each other. Bianchi (2002) also states that specific goals are needed for teams to work. However, participants demonstrate that they could see different possibilities when making decisions, from using STEM subjects in specific tasks to working on activities out of the school context with an open focus, where participants worked in a retirement centre.

Participants said that these situations helped them to avoid conflict with others. The link between skill and attributes, as discussed by Heider (1985), is a form of experiential learning and helps pupils to develop a deeper understanding of social perspectives. Participants corroborated with this as they honed their ability to be aware and act sensitivity around others thus helping them to deal with difficult situations.

5.5.6 *Using Networks with others to develop Leadership Skills and Attributes (Bianchi's PCs): for administrators*

This was an opportunity to understand how participants gauged the potential of pupils to progress their networking skills and attributes to the contextual framework for PCs (Bianchi, 2002). Participants had seen that teamwork was the determining factor for networks of pupils and subsequent learning. Bianchi (2002) considers that collaboration between individuals reflects the nature of how a group or team work enables participation. West-Burnham (2009b) affirms that organisations that are focused on learning have structures to reflect learning relationships. This seems to be the case here as participants viewed pupils forging inter relationships amongst their peers and staff. These relationships can be seen as

Network Learning Communities (Jackson, 2004) and as Rhodes and Brundrett (2009) mention, facilitators create environments for people to work together.

The SLq is seen as an effective mechanism to demonstrate leadership. However, Lieberman and McLaughlin (1992) recount that creating new networks could lead to some hierarchical structures emerging and this was picked up on the participants that recommended groupings needed to be considered. Some participants asserted that pupils could accept others while in groups and value other people's opinions including trusting their peers and adults. This is also reinforced by Lieberman and McLaughlin (1992) describing that individuals in networking groups become socially aware of each other and can have confidence in others to allow collaboration and networking to happen.

Participants could see that pupils' ability to problem solve in groups helped them to realise and value others. However, as Sliwka (2003) states this can also be the frustrating part of networking as individuals experience both enriching and frustrating events from collaboration to stagnation. This was evident as participants indicated that pupils were sometimes confused about the nature of group formations and defining leaders in groups. Hopkins (2003) remarks that to counter this, individuals should be empowered to participate as one. One participant shared that pupils did not have the knowledge and understanding to do this. Jackson (2004) proposes that collaborative planning and creating understanding for others can promote an environment for networks.

5.5.7 *Improvements to Networking in SLq: for pupils*

Participants discussed that opportunities to work in groups could be improved. Groups were fairly distributed yet the capacity for participants to work together co-operatively failed to make a significant impact. Indeed, Busher and Hodgkinson (1996) think that co-operation in networks requires a higher level of commitment and level of trust between people. Participants considered the importance of feedback and pupil voice. As Devine (1998) and Roche (1999) advocate the voice of children can make an impact when making key decisions; this includes increasing school improvement. Participants agree that this aspect is needed so that views and opinions are heard and feedback for improvement given.

5.5.8 *Improvements to Networking in SLq: for administrators*

Participants suggested that although the SLq brought many positives to developing pupil leadership, the capacity of the school could be improved to make sure that pupils are working together. Participants knew that the SLq was not officially a part of the curriculum programme and made accepted that it is less tangible for normal staff in the school to grasp.

Participants also admitted that personalised leadership training would be beneficial. This is similarly brought up by Rhodes and Brundrett (2009). This creates personalised models for leadership, therefore, allowing teachers to make decisions to influence individual pupil outcomes. Subsequently, Day et al. (2007) and Davies et al. (2006), demonstrate that leadership can be nurtured to allow pupil learning and to experience different perspectives

on their personal development. Participants reflect that the opportunity to personalise pupils' leadership growth was greatly missed and this additional element would deliver a better outcome for the SLq programme and teaching pupils about leadership.

5.5.9 Summary of RQ3: How does pupil involvement in the SLq programme promote collaboration?

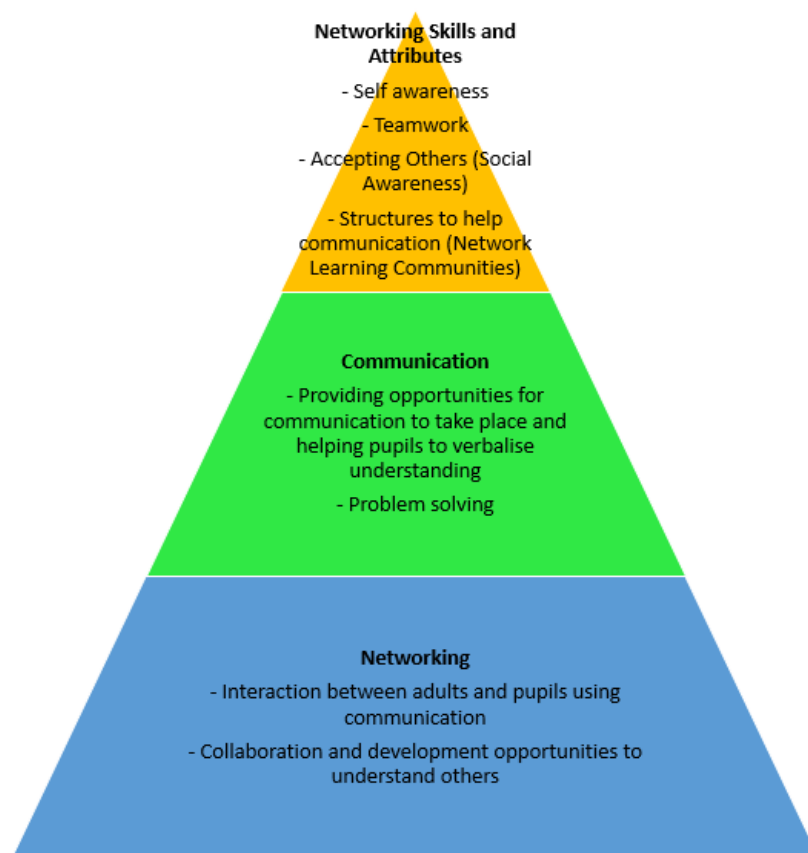


Figure 5.3: Presentation of empirical work for RQ3.

The researcher has attempted to display the findings for RQ3 for pupils and administrators by using a hierarchical pyramid diagram demonstrating if a pupil progresses in regard to involvement to promote collaboration moving upwards (Figure 5.3). The researcher would

like to draw attention to the idea that if a pupil is placed at the bottom of the pyramid, the main obstacles that prevent them from developing collaboration in the SLq would be in the blue section of Figure 5.3. Communication plays an important role for networking to occur and is recognised in the next section upwards (green section of Figure 5.3). Finally, the yellow section (Figure 5.3) displays corresponding factors thought to be of most importance gaining greater collaboration.

5.6 Summary of Chapter Five

The diagrammatical representation in Figure 5.4 further reveals the findings of the underpinned theoretical framework with this study. The research has taken into account the themes explored from Chapter Two, in particular, the framework suggested by Bianchi (2002) and the important literature from Table 2.3. Figure 5.4 suggests the key features that pupils had demonstrated by the nature of interviews, to develop leadership skills and attributes in the SLq programme and features linked to Bianchi's (2002) work. In various activities, pupils demonstrate certain skills like team work, verbal communication and emotional intelligence. Through their development of leadership skills, they often look to others to gain experiential leadership and communication skills. Their ability to acquire leadership attributes has also been noted, where the process of understanding others is a common theme to be discussed in Chapter Six.

While this model (Figure 5.4) is not a panacea for pupil leadership development in STEM, it is useful in exploring the skills and attributes that are commonly exhibited. Therefore attention

must be paid to the skills and attributes that were not revealed. In this case, the model can be used as a basis for improving the provision of SLq in secondary schools. This intends to promote leadership development and improving the competence of a future generation of STEM leaders.

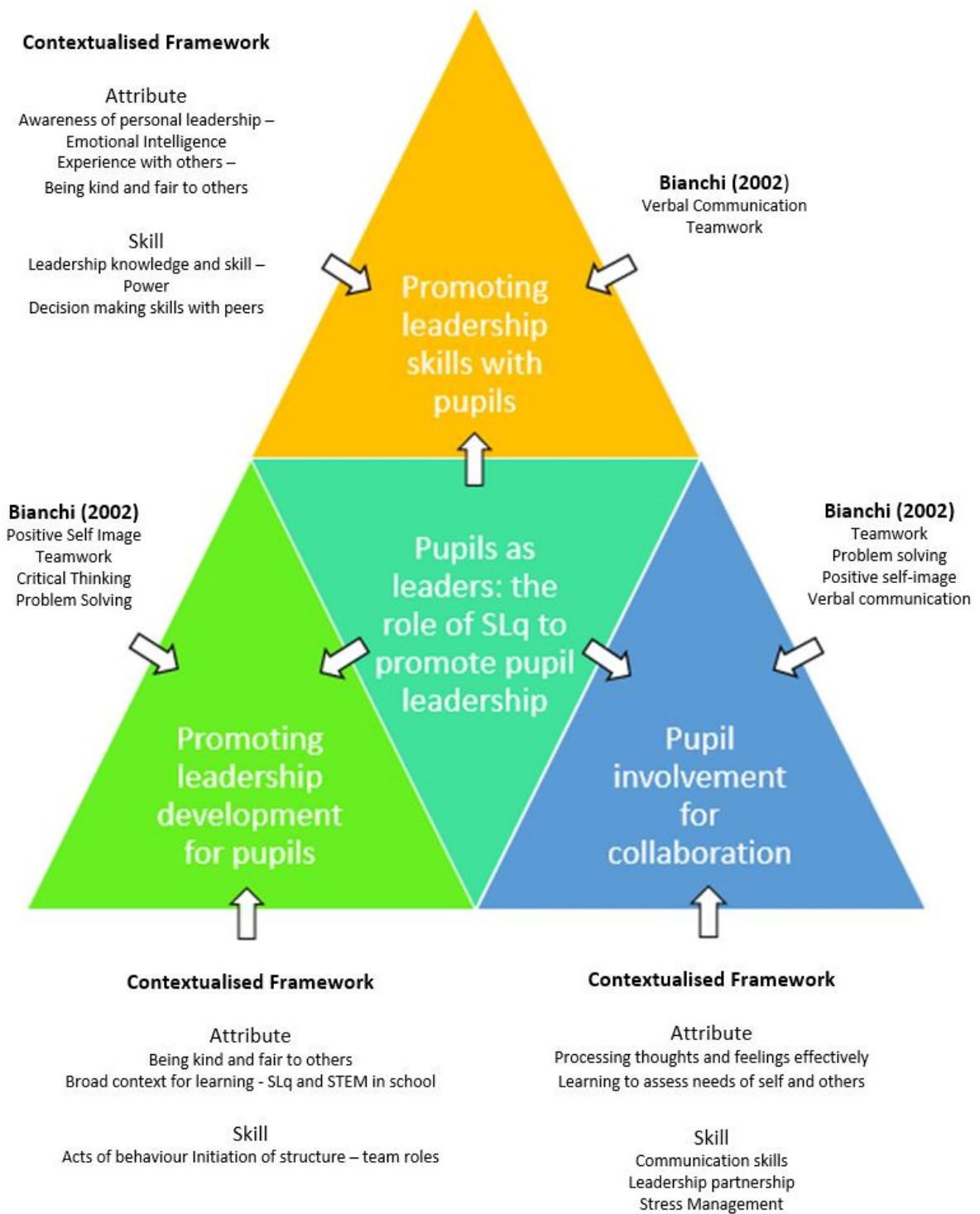


Figure 5.4: Summary of SLq for leadership development.

Chapter Six - Conclusions and Recommendations

6.1 Introduction to Chapter Six

This research study intended to identify overall themes of how pupils acquire leadership skills and attributes while undertaking the SLq programme. This is done by exploring the course programme, relationships, experiences and learning activities of twenty secondary school pupils and five administrators. This thesis argues that not all of the Bianchi's (2002) PCs framework is intrinsically met to develop pupils' leadership capabilities. However, this research reveals that pupils acquire some of Bianchi's (2002) leadership skills and attributes (Figure 5.4) and subsequently, pupils develop skills and attributes within a focused range instead of covering a broad-spectrum of leadership discussed in the Literature Review.

6.2 Research Questions

The research questions that underpinned this thesis were:

RQ1: How does the SLq programme promote the development of leadership skills in pupils?

RQ2: What are the perceived advantages and disadvantages of the SLq programme to encourage leadership in pupils?

RQ3: How does pupil involvement in the SLq programme promote collaboration?

6.3 Research Design

The use of the contextual framework matrix for coding PCs and leadership traits (Table 3.2), constructed from literature by Van Linden and Fertman (1998), Stogdill (1974) and DesMarais et al. (2000) helped me to create an effective research strategy to analyse the data. In addition to the matrix, the analytical method described by Miles and Huberman (1994) enabled me to carefully evaluate my research method so that the outcomes from my field work would further my understanding of the issues for this study. Through my review of Robson's (1993) work, I gained a clear understanding of the complexities and ethical issues that could arise when pupils are interviewed and modified my approach accordingly. The interviewees selected aided me to gain the views of pupils undertaking the qualification and adult leaders who view pupils participating in STEM activities relating to the SLq. The research design I believe was fit for purpose.

6.4 Empirical Claims

In this final chapter, I will re-address the three research questions presented in Chapter One. The research will address the research questions by making seven *empirical claims of the study*. This will aid to navigate through the recommendations and provide a new framework (Figure 5.4) to contribute to the present literature base. I intend to highlight the link between the data collected in this study and the skills and attributes as discussed in Chapter Two and shown in Table 2.3. This forms seven claims to represent the data collected in this small-scale research and present a picture of leadership skills and attributes can be delivered

through a pupil led programme. To conclude, I will highlight recommendations within this study which may benefit with further research.

6.4.1 Claim 1: *The SLq programme gives pupils an introduction to the role of power in leadership*

Etzioni's (1961) work provides a backdrop to understanding the differences in power; pupils identified that power should not be in the form of being *Coercive* but *Normative*. As remarked by administrators, these ideas are associated by how pupils view relationships between teachers and senior staff (Chapter Four 4.5.4 and Chapter Four 4.3.8), however, they appreciate the role of a leader while attempting to understand the behaviours and characteristics of leadership. Charismatic leaders are mentioned to be a major factor for comprehending how pupils view role models, they often mirrored of leadership qualities of notable role models (Chapter Four 4.2.2 and 4.3.4). However, administrators identified that structures within an organisation naturally exhibit levels of authority and pupils were able to form their own ideas of leadership from this concept. Their formative experiences give them a preconception of leadership and that it is not a role suited to everyone (Chapter Four 4.3.2). Their childhood experiences contributed to their perception of leadership (Chapter Four 4.3.4). West-Burnham (2009b) emphasises the importance of decision making (Chapter Two 2.9) and the researcher encountered many occasions when pupils make decisions as a collective (Chapter Four 4.2.4) where pupils are given limited amounts of authority and responsibility within the highly defined level of tasks. Pupils used this opportunity to

develop habits of shared responsibilities and were more likely to be empowered as they participated (Chapter Four 4.3.8).

6.4.2 Claim 2: *Pupils' leadership skills and attributes are developed through experiential learning through the SLq*

Stogdill (1974) share how early theorist attempted to explain leadership by inheritance. However, the study found that leadership skills and attributes are developed from experiential learning through a combination of forging new relationships and enrichment activities (Chapter Four 4.2.2). Pupils were not able to the identify 'how' they led in their activities (Chapter Four 4.2.3), however, using examples they could give a range of skills used in tasks (Chapter Four 4.2.4). Their level of experience grew via positive relationships between peers and adults where pupils adopt leadership skills and can communicate, collaborate, make decisions and are kind to each other (Chapter Four 4.2.5). As pupils collaborated they could resolve conflicts and facilitate lasting relationships (Chapter Four 4.4.4). Activities in STEM help pupils to provide a positive experience while leading (Chapter Four 4.2.4, 4.2.5 and 4.3.3) but administrators also perceive that experiences are also gained from personal experiences (Chapter Four 4.3.4). Ultimately, pupils are viewed to have different behavioural patterns in the SLq programme and the qualification framework (Chapter Two 2.15), which helps them to create relationships with others by appreciating different viewpoints.

6.4.3 Claim 3: *Pupils undertaking SLq partially develop emotional intelligence as an essential leadership skill*

Goleman (1996) believes effective teamwork helps to establish self-leadership by being more emotionally aware. However, this is sometimes not the case and pupils often lack the ability to reflect on their own practice as an iterative process. In an environment where pupils are working together, demonstrating their capacity to share, develop and enhance their leadership skills and attributes, emotional intelligence is not often cultivated (Chapter 4.3.8 and 4.4.2). Gardner's (1983) elaboration of Thorndike's (1920) intelligence theory into two distinct traits, interpersonal and intrapersonal, provides the content domain for emotional intelligence and contributing to the body of knowledge to interpersonal and intrapersonal interactions with other individuals. Pupils harboured certain pressures and anxieties to exhibit a range of emotionality to how to process ideas (Chapter Four 4.3.8 and 4.4.2). As Werner (1990) suggests, teachers are not just facilitators but also positive role models. While the importance of the teacher cannot be overemphasised, this factor often overlooked. Pupils need support, especially if they are from deprived or from challenging backgrounds. As a consequence, they will need additional support in their development of emotional intelligence (Chapter Four 4.5.3).

6.4.4 Claim 4: *The SLq programme does not completely develop leadership skills and attributes through SLq activities*

Leithwood et al. (2006) informs us that the role of teachers to inspire, enabling them to showcase best practice that pupils often lack SLq activities give pupils opportunities that they would not necessarily have during their normal curriculum time. Pupils are observed to value the range of career opportunities available during the SLq programme hence gaining lifelong skills and a passion for STEM (Chapter Four 4.2.4, 4.3.3, 4.4.3 and 4.4.5). Lewis and Burman (2008) suggest that the environment aids the culture of learning. Pupils are able to transfer skills such as questioning, problem-solving, critical thinking, observation skills and interpersonal skills in the SLq program and the qualification framework (Chapter Two 2.15) and curricular/non-curricular subjects as Watt (1991) infers as 'linear thinking'. Hoegl and Gemuenden (2001) say that the focal point is the quality of a team's collaboration rather than the content of its tasks and activities. However, pupils use their experiences in the SLq programme to make sound choices about their future rather about developing leadership in a group (Chapter Four 4.4.2). In this case, participants indicate that STEM ambassadors or employers would help pupils to provide information about the possible choices they could make in the future (Chapter 4.5.6).

6.4.5 Claim 5: *Pupils' decision-making ability is enhanced by having specific team roles*

Belbin (1981) and Bell (1993) write that certain individuals within teams have a dynamic that could inhibit certain characteristics and may not necessarily empower team members to acquire skills and knowledge. In Chapter Four (4.5.3), participant 24 suggests that “*we need far more team players than we need leaders*”, pupils were noted to have a distinct lack of understanding of how different leaders' roles worked but pupils are seen to associate teams with recollections from the sporting world (Chapter Four 4.5.6) building their experiences from their perception of how people interact. The study reveals the importance of developing team roles in their activities and tasks (Chapter Four 4.2.4, 4.3.2 and 4.3.3). Dissatisfaction within the teams and lack of knowledge about team roles was evident when pupils needed to manage their expectations and personal responsibility (Chapter Four 4.2.6). However, individuals showed a deeper understanding of helping others, being socially aware (Chapter Four 4.2.2) and having positive relationships with specific groups (Chapter Four 4.4.4). Team-based relationships were instrumental in helping pupils to grasp how others view social norms of reality, hence building on their successes (Chapter Four 4.3.3 and 4.6.3) and be more self-assured (Chapter Two 2.15, Chapter Four 4.2.2 and 4.6.5). In this case, pupils displayed what Belbin (1981) articulates as *cerebral orientated* team roles, which is when people use intelligence to solve problems and evaluate strategies for progression.

6.4.6 Claim 6: *Pupils' build the capacity to network by collaborating and their interactions*

The essence of networking is collaboration and activities (Hopkins and Jackson, 2002). Pupils with a greater awareness of their social interaction become more proficient with teamwork, co-operation and peer learning experiences and Bianchi (2002) deduces as 'inclusion' (Chapter Two 2.15 and Chapter Four 4.2.4). In teams, pupils are happy to interact and enjoy learning (Chapter Four 4.3.2) while being able to be more socially in tune with their peers (Chapter Four 4.3.2). Networking gives the opportunity for pupils to discuss their problems in confidence (Chapter Four 4.4.2) and learn together as a group. Whitty and Wisby (2007) acknowledge the importance of encouraging pupil voice, the authors also believe that pupil engagement and pupil representation are "*features of effective learning*" (Whitty and Wisby, 2007, p.9). However, the success is limited to how network learning communities manage themselves. Pupils have difficulties in identifying leaders in the group (Chapter Four 4.5.3). This is when pupils attain leadership skills without realising what they have done. Therefore their context of reality is altered from their perceptions of personal development to group expectations (Chapter Four 4.5.4). Nevertheless, pupils are believed to be hindered by large group networks. Participants suggested that the overall size of the institution can make some interactions problematic (Chapter Four 4.7.7). However, when pupils are in groups, collaboration was seen to help 'how' pupils worked together in natural or unnatural settings giving gave pupils the capacity to demonstrate confidence (Chapter Two 2.15 and Chapter Four 4.5.4).

6.4.7 Claim 7: *Communication is an indispensable leadership skill to develop the capacity to lead*

Enhancing the method of how pupils communicate with each other allows knowledge and understanding to be mobilised (Noyes, 2005). Pupils communicate ideas to spread, digest and analyse the best way forward (Chapter Four 4.4.3). Pupils develop excellent communication skills by working in teams and being able to self-assess their own needs (Chapter Two 2.15 and Chapter Four 4.2.5). The capacity to learn recognise different perspectives is an important facet of personal leadership and communication gave pupils the confidence to discuss their ideas and to reflect (Chapter Four 4.2.6). Some pupils remarked that their progress in curricular STEM subjects increased (Chapter 4.4.5) and that this enhanced their passion in activities (Chapter Four 4.5.2). Van Linden and Fertman (1998) suggest that communication between pupils is highly problematic. However, some pupils develop this skill to work to a higher ability and solve problems (Chapter Four 4.5.2). On some occasions, pupils recognise the difficulties with verbal communicating, from altering their language (Chapter Two 2.15 and Chapter Four 4.6.3) to the frequency of sharing improvement to their peers or administrators. Non-verbal communication was regarded as a less effective method of communication compared to verbal form. However, communication was articulated as being multi-directional Taori (2001) and a vital skill needed for collaboration. Pupils were seen to share, develop and plan their problems in networks however institutions may wish to provide opportunities to voice their concerns and give feedback on the SLq programme (Chapter Four 4.7.6). Adults must recognise that their communication may cause pupils to feel patronised, defensive, belittled or

embarrassed. Accepting pupils' ideas and opinions aid them to manage their emotional well-being which in turn fosters patience and allows them to communicate effectively (Van Linden and Fertman, 1998).

6.5 Summary of Seven Empirical Claims

To conclude, the seven empirical claims, linked to the empirical data indicates the skills and attributes that have been derived from this study. As Figure 5.4 highlights, not all of Bianchi PCs (2002) and the qualification framework (Chapter Two 2.15) are extrapolated from the findings of this study. The seven claims represent data collected in this small-scale research to present a picture that leadership skills and attributes can be delivered through a pupil led programme. With the correct stimulus, facilitation and time, pupils will acquire the vital skills and attributes for their future.

6.6 Recommendations for Further Research

This small-scale research project has explored the perceptions of developing leadership skills and attributes in the SLq qualification by interviewing twenty participating SLq pupils and five administrators of STEM enrichment. The concluding *seven empirical claims* take the key discoveries of the study to further aid facilitators of other STEM leadership programmes.

The researcher acknowledges that due to the relatively small sample size of the study, this does not allow for generalisability across the SLq programme or STEM leadership

development for pupils. However, due to the ebb and flow of BTEC qualifications in schools, we will see a decrease in these vocational programmes being compulsory subjects or being taught in enrichment programmes. This is a potential problem for transferability across one school to another and is potentially an area for further research. Headteachers and principals must be committed to developing soft skills needed in the modern work place and look to build a curriculum that is innovative rather than just because 'it ticks a box'. The SLq programme can deliver those skills and attributes to develop leaders for the future.

An area of potential interest for subsequent research would be the comparison of learning communities in the SLq compared to learning communities that exist in schools. Participants remarked that the SLq was not officially a part of the curriculum programme and made the acceptance and outcomes of the SLq less tangible for the staff in the school. Subsequently, an improvement in Mathematics provision was mentioned signalling that further research could reveal solutions to bring together successful curricular and non-curricular activities for a fruitful vision of SLq type programmes.

The issue of personalised leadership training would be beneficial to build leadership learning communities. Hartley (2007) agrees that the dynamic of the groups can be possibly outweighed by ambiguity. Therefore, the responsibility lies with administrators to ensure that pupils have the capability to be confident in their ability to deliver this programme. In this case, pupil leadership can be nurtured to allow pupils to experience different perspectives on their personalised leadership styles and focus on a core aspect of Bianchi's PCs (2002). Participants felt that this was missed. Therefore the importance of a

personalised approach to pupil leadership in the SLq programme is much needed. This is where pupils can discuss, reflect and evaluate their capabilities while learning. This would deliver a better outcome for the SLq programme and help grow leaders for the future.

6.7 Overarching Conclusion

In setting out this thesis from understanding STEM in the UK to recognising leadership and leadership traits, the emergence of developing skills and attributes at an early age has an important place in schools. Learning key skills is widely acknowledged as a learning method to develop meta-cognitive skills, techniques and self-regulation through a child's development (Sternberg, 1998; Berk, 2008). However, the literature review has indicated acquiring key leadership skills is a necessity for pupils. This helps them to achieve and progress in education and subsequently later in life. I found that the prevalent ideology of the policy makers, at that time of writing, place an importance on the issue of STEM and developing key skills. Successive Governments have influenced the agenda of STEM but the need for a tangible education programme was desperately in need. The SLq programme provided secondary school pupils to participate in STEM focused activities, tasks or project whilst developing leadership skills. As Figure 5.4 suggests, the key features that pupils had demonstrated by the nature of interviews, to develop leadership skills and attributes in the SLq programme and features linked to Bianchi's (2002) work. The findings show that not all 'Personal Capabilities' were achieved. The study concludes with *seven empirical claims* of the findings that are based on; Power, Experiential Learning, Emotional Intelligence, STEM activities, Specific Team Roles, Collaboration and Communication. This confirms with

Zaccaro et al. (2004) outlining that there is no consensus about universal traits that cause leaders to be effective. However, I found that activities and enrichment allowed pupils to contextualise leadership skills and attributes to their everyday school life. My concern is that the nature of BTEC qualification, with respect to school performance measures, may have a detrimental value to the uptake of leadership qualifications like the SLq. In this study, adults recognised the value of the SLq programme however they discussed how BTEC qualifications did not count toward school outcome figures. I believe it is evident from the research that it is essential to help pupils in secondary school education to understand the complexities of leadership in a digestible format. The SLq does provide a method of delivering these complexities but as indicated by this study, schools will need to be aware of specific leadership skills they want to base their programme on.

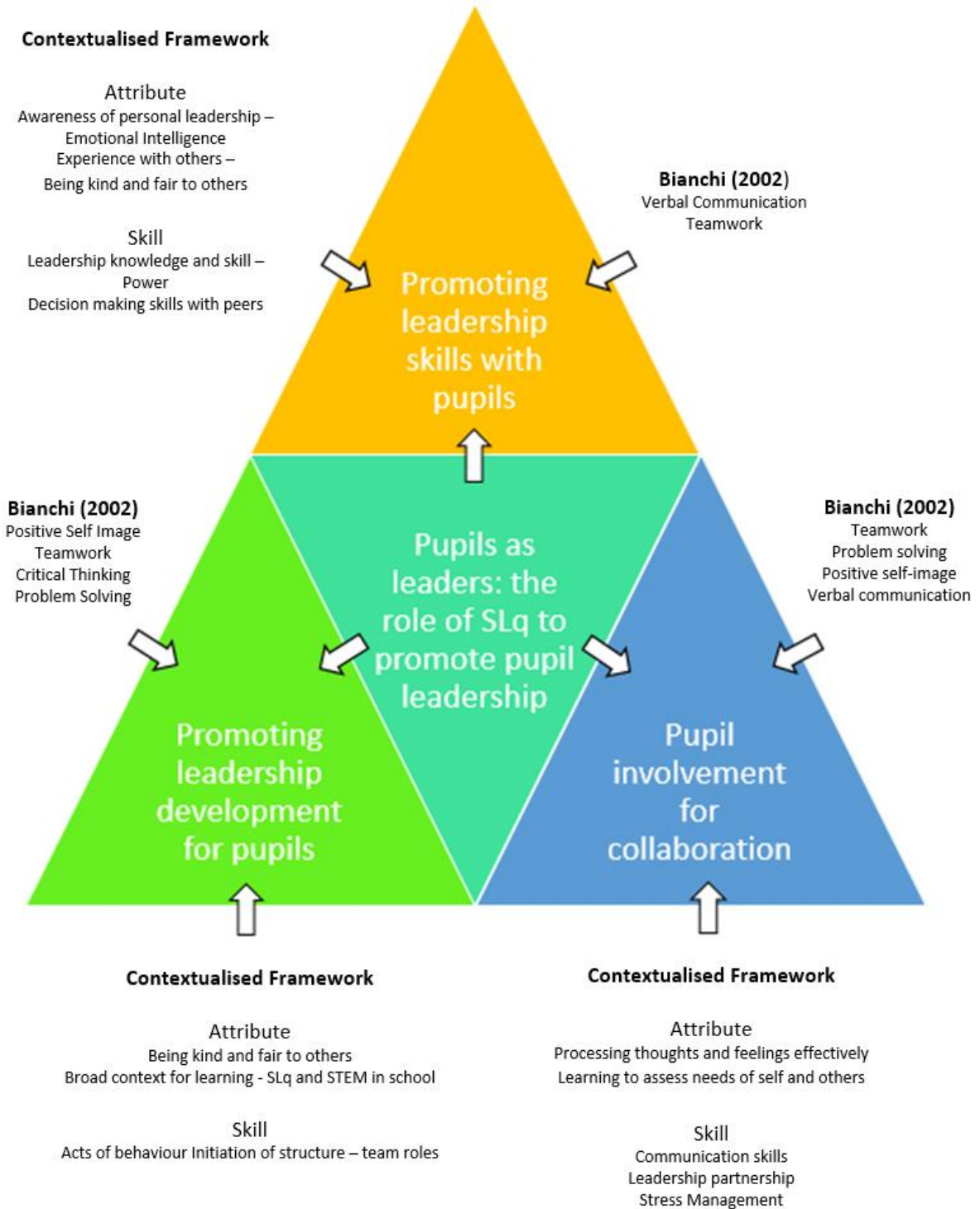


Figure 5.4: Summary of SLq for leadership development.

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Appendices

Appendix A – SLq overview



BTEC Qualifications in STEM Leadership

STEM Leadership Skills qualifications

What is STEM Leadership Skills?

Edexcel has been working with the Centre for Science Education at Sheffield Hallam University to develop a series of STEM leadership units that sit within the WorkSkills suite and can be combined to create STEM Leadership Skills qualifications.

The STEM qualifications

The STEM suite consists of 10 units (five unit titles, each available at Level 1 and Level 2 and worth two credits) that can be combined with other optional units from across the WorkSkills framework to build the following qualifications:

- Edexcel BTEC L1 Certificate in STEM Leadership Skills
- Edexcel BTEC L2 Certificate in STEM Leadership Skills

Background to STEM

STEM Leadership Skills develops personal and leadership capabilities with a focus on science, technology, engineering and mathematics. The aim is to:

- Increase motivation to learn STEM subjects
- Improve the chances of learners applying these skills in the workplace
- Raise the expectations and aspirations of learners
- Give added value to their work in STEM subjects

Support has been received from the STEM community, with ongoing interest and involvement from The Comino Foundation and the SSAT. The Royal Society of Chemistry has offered student sponsorship grants, and the Spacelink Foundation are furthering their interest in the design and publishing of resources to support learners. Other projects such as the Climate Futures project (The Comino Foundation) and the Personal Capability Programme are also providing funding to resource new materials to support the delivery of the qualification.

Other organisations such as the National and Regional Science Learning Centres, Hands on Science and STEMPOINTS are linking their work to the qualification and profiling STEM leadership skills within their programmes.

What is the benefit to centres?

This gives, for example, science departments the opportunity to gain the equivalent of 3 GCSEs if they already offer the GCSE awards in Science and Additional Science or BTEC First Certificate in Applied Science, and 5 GCSEs if they already offer BTEC First Diploma in Applied Science.

How do centres sign up for STEM?

Centres that already deliver WorkSkills will automatically be given qualification approval for the STEM qualifications. They are then free to make registrations in the normal way.

Appendix B – Participation letters (for pupils and administrators)

Dear Parent / Guardian

The demand on skills in education, and for future employment opportunities, has always been an important issue at a Secondary School level. This importance has been noted by successive governments, who have focused on learning of new skills in Science, Mathematics, Technology and Engineering (STEM) subjects. As you may be aware, your child’s school now offers a qualification in leadership based upon STEM, the STEM leadership Qualification (SLq). As a doctoral student, and a secondary school teacher I am seeking to understand how children gain ‘leadership qualities’ with this qualification. Such a study will help to understand how your child learns these qualities.

I would like to invite your child to participate in a study, consisting of one interview – with his/her SLq peers in a group to explore the perceptions of leadership qualities. The interview will take no longer than 30 minutes and will be conducted by myself.

Your child does have the right to withdraw at any time during the study and any data gathered will be kept securely and strict confidentiality will be maintained at all times. If you are willing for your child to participate in this study, do let me know by adding your signature below. Thank you for your time to read this letter.

Kindest regards

Sukhvinder Singh Ubhi.

Please allow my child to take part in this interview Child’s Name: _____

Parent’s Signature: _____ Signature: _____

PLEASE RETURN TO YOUR CHILD’S SLq TEACHER AFTER COMPLETION.

If there are any concerns please feel free to contact me:

Mr Sukhvinder Singh Ubhi

Ed.D Doctoral Student

University of Birmingham

Edgbaston

Birmingham

B15 2TT



Dear Sir / Madam

The demand on skills in education, and for future employment opportunities, has always been an important issue at a Secondary School level. This importance has been noted by successive governments, who have focused on learning of new skills in Science, Mathematics, Technology and Engineering (STEM) subjects. As you may be aware, children at schools are now offered a qualification in leadership based upon STEM, the STEM leadership Qualification (SLq). As a doctoral student, and a secondary school teacher I am seeking to understand how children gain 'leadership qualities' with this qualification. Such a study will help to understand how children learn these qualities.

I would like to invite you to participate in a study, consisting of one interview – to explore the perceptions of leadership qualities. The interview will take no longer than 50 minutes and will be conducted by myself.

You do have the right to withdraw at any time during the study and any data gathered will be kept securely and strict confidentiality will be maintained at all times. If you are willing to participate in this study, do let me know by adding your signature below. Thank you for your time to read this letter.

Kindest regards

Sukhvinder Singh Ubhi.

Name: _____

Signature: _____

If there are any concerns please feel free to contact me:

Mr Sukhvinder Singh Ubhi

Ed.D Doctoral Student

University of Birmingham

Edgbaston

Birmingham

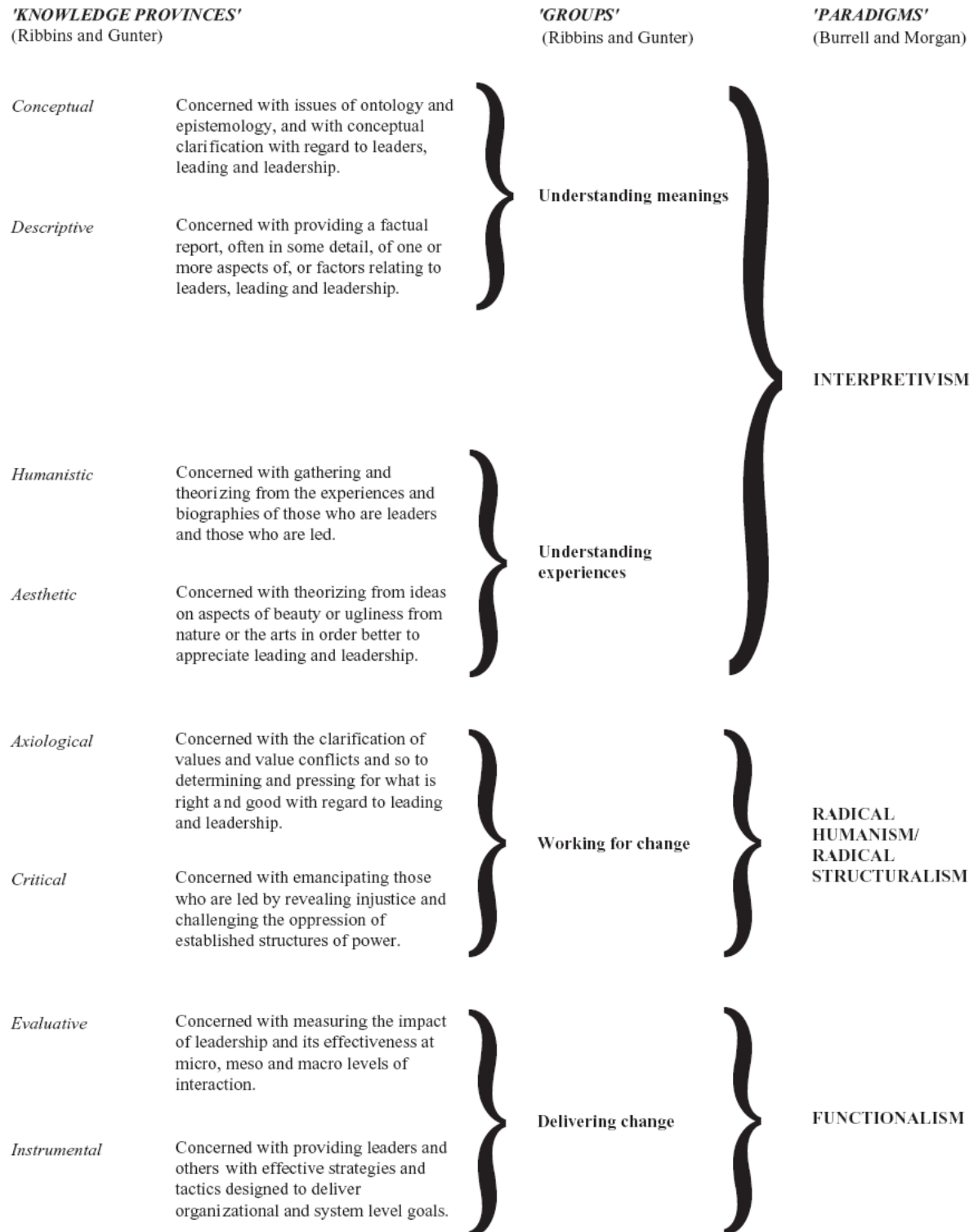
B15 2TT



Appendix C - Five Knowledge Domains (adapted from Ribbins and Gunter, 2002, p.378)

Knowledge Domain	Significance
Conceptual Research	Concerned with the Ontological and Epistemological issues with conceptual clarification
Humanistic Research	To gather and theorise from the experiences and biographies of participants
Critical Research	To reveal and emancipate leaders from social injustice
Evaluative Research	To seek, abstract and measure the impact of leadership effectiveness at all levels of organisational interaction
Instrumental research	To provide leaders and followers with effective strategies to deliver organisational strategies and outcomes

Appendix D - Knowledge provinces, groups and paradigms (adapted from Hartley, 2010, p.272)



Appendix E – Interview Schedule for pupils

INTERVIEW SCHEDULE FOR PUPILS

Thank you for being willing to take part in this interview and can I assure you that you and any information that you give will remain completely anonymous.

Part 1

1. What do you understand by leadership?
 - Probe – could you give me any specific examples of how a leader ‘acts’ around others?
2. Is it difficult to gain these skills you have mentioned?
 - Prompt – if no skills/qualities are mentioned, give pupils the list from Bianchi’s framework.
3. What do you think makes some leaders better than others?
 - Prompt – give pupils the list of units for SLq
 - Let pupil rank order which one pupil give highest regard
 - Probe – pupil are asked **why** they have ranked in that particular order

Unit 1:	Developing Personal Skills for Leadership
Unit 2:	Practising Leadership Skills with Others
Unit 3:	Learning with Colleagues and Other Learners
Unit 4:	Communicating Solutions to Others
Unit 5:	Learning from More Experienced People

4. How difficult is it to learn these skills that we have discussed?
 - Probe – relationship with others
 - a. Difficulties in course
 - b. Problems with the work
 - Prompt – How do you identify what leadership is?
 - a. How do you know that the specific task you are doing is related to leadership qualities and skills?
5. What do you think are the advantages with promoting leadership in STEM?

Part 2

1. What do you think is meant by the term 'networking'?
 - Prompt – with people/peers
2. Why is networking important?
 - Probe – why is that important for building capabilities for leadership qualities and skills in SLq
3. Can you give me an example, without naming anyone, where you have collaborated with adults in SLq?
 - a. for working with specific pupils (without naming)
 - b. for dealing with others and resolving problems?
4. How is STEM club/activities helped you to communicate with others taking SLq?
 - Probe – explore the issue of trust between adults and pupils
 - a. Developing learners for leadership
 - b. Promoting qualities and skills of leadership
5. What could be improved in SLq to help 'networking'?

Part 3

1. Can you give me any examples of activities that you have led on?
2. How is your current activities in SLq helped you to work with others that you would not have normally worked with?
3. Do you feel more confident in or around school because of SLq and your current SLq activities? Why/why not?
 - Probe – self-esteem/Student outcomes
4. What do you most enjoy about your current SLq activities?
 - Prompt – current activities / past activities
 - a. Key skills and qualities that have been demonstrated
5. What aspects of SLq do you think is not working? (without naming anyone)
 - Probe – what can be improved?
 - Prompt – how could these aspects improve the skills and qualities that we have talked about?
6. How could SLq be improved to help you learn about leadership?
7. Could you finally rank these skills and qualities in order of importance:

1
2
3
4
5
6
7
8
9

Positive Self Image
Self- motivation
Teamwork
Verbal Communication
Tenacity
Problem Solving
Creativity
Critical Thinking
Social Intelligence

Appendix F – Interview Schedule for administrators

INTERVIEW SCHEDULE FOR ADMINISTRATORS

Thank you for being willing to take part in this interview and can I assure you that you and any information that you give will remain completely anonymous.

1. What does leadership mean to you?
 - Probe – how does your practice of leadership differ from others?
 - Probe – can you give an example of how a leader acts around others...?
 - Prompt – if none are given: reflect on their current role and their influence on others
2. Many of the pupils have indicated they prefer to learn about key skills and qualities in STEM (for leadership), as well as partaking in activities. What do you think these key skills and qualities are?
 - Probe – can you give me an example of a subject and the typical skills that can be attained?
3. Out of the following cards, could you suggest which unit did the pupils choose, being of highest importance to their learning? And why?
4. What about the least important? And why?

Unit 1:	Developing Personal Skills for Leadership
Unit 2:	Practising Leadership Skills with Others
Unit 3:	Learning with Colleagues and Other Learners
Unit 4:	Communicating Solutions to Others
Unit 5:	Learning from More Experienced People

5. What are the difficulties with promoting leadership in SL for the children?
 - Probe – how do pupils identify leadership?
 - Probe - what possible problems do pupils encounter with identification with leadership?
 - Probe – what possible problems do pupils encounter in general?
6. Are leadership skills and qualities beneficial to pupils?

Do you think they learn about leadership with:

- Probe – with their peers
- Probe – with adults?

6. Which networks are specific to pupils in the STEM leadership qualification?
7. What are the important aspects for collaboration?
 - Probe – how do pupils resolve problems in SLQ?
 - Probe – do they encourage new learning experiences?
8. How is pupil voice utilised in STEM (SLQ)?
 - Prompt – mention – Citizenship/empowerment/student leadership/inclusion/ECM agenda/participation
 - Probe – how does this improve pupils learning about leadership?
 - Probe - which skill/quality do you think pupils acquire during networking?
9. How would you improve networking in STEM?
 - Prompt – mention – administration/communication with pupils/personalised learning for SLQ
10. How do pupils build the capacity for leadership and develop leadership skills in STEM?
 - Probe – example of an activity...
11. What skills and qualities don't pupils grasp as easily?
 - Probe – what would you do to address the skills and qualities that they don't grasp?
12. How does STEM engage pupils (for) in terms of - pupil participant, raising aspirations and self-esteem
13. What is currently working in SLq? What improvement would you make?
14. Out of the following key skills and qualities, which would you rank in order of importance in terms of developing leadership for learners?

1	Positive Self Image
2	Self- motivation
3	Teamwork
4	Verbal Communication
5	Tenacity
6	Problem Solving
7	Creativity
8	Critical Thinking
9	Social Intelligence

15. How does the development of leadership for learners compare with your own personal development of leadership?
16. Are there any disadvantages with developing leadership at an early age?
 - Probe – does it discourage pupils from leadership?
 - Prompt – discuss social pressure to performance
17. What type of skills and qualities employers specifically need for a modern workforce?
18. How does 'leadership for learners' fit into the school curriculum for developing young learners?
 - Probe – Is it a modern approach to learn about leadership?
19. How do you see SLq in future education policy?

STEM LEADERSHIP QUALIFICATION SLq STUDY

The demand on skills in education and for future employment opportunities, has always been an important issue for members of staff at a Secondary School level. This importance has been noted by successive governments, who have focused on the learning of new skills in Science, Mathematics, Technology and Engineering (STEM) subjects. As you may be aware, your child’s school now offers a qualification in leadership based upon STEM, the STEM leadership Qualification (SLq). As a doctoral student and teacher, I am seeking to understand how children gain ‘leadership qualities’ with this qualification and what are the specific benefits of the course. Such a study will help to understand how your child learns these qualities.

A series of interviews will take place, exploring the perceptions of leadership qualities. The interviews will involve members of the educational community, such as Sir John Holman and pupils of a school in [REDACTED].

Your child does have the right to withdraw at any time during the study and any data gathered will be kept securely and strict confidentiality and anonymity will be maintained at all times.

If you are willing for your child to participate in this study, please await further information from your STEM teacher. Thank you for your time to read this letter.

Kindest regards

Sukhvinder Singh Ubhi.

Appendix H – Participation letters for administrators

STEM LEADERSHIP QUALIFICATION SLq STUDY

The demand on skills in education and for future employment opportunities, has always been an important issue for members of staff at a Secondary School level. This importance has been noted by successive governments, who have focused on the learning of new skills in Science, Mathematics, Technology and Engineering (STEM) subjects. As you may be aware, children at the school are now offered a qualification in leadership based upon STEM, the STEM leadership Qualification (SLq). As a doctoral student and teacher, I am seeking to understand how children gain 'leadership qualities' with this qualification and what are the specific benefits of the course. Such a study will help to understand how children learn these qualities.

A series of interviews will take place, exploring the perceptions of leadership qualities. The interviews will involve members of the educational community, such as Sir John Holman and pupils at the school in [REDACTED].

You do have the right to withdraw at any time during the study and any data gathered will be kept securely and strict confidentiality and anonymity will be maintained at all times.

If you are willing to participate in this study, please await further information. Thank you for your time to read this letter.

Kindest regards

Sukhvinder Singh Ubhi.

Appendix I – Example of interview transcript

Interview conducted with STEM pupil (1)

SU: O.K. we are going to talk about the Science, Technology, Engineering and Mathematics (STEM) Leaders Qualification – called SLq. This interview will help me to gain an insight to how leadership skills and qualities are achieved in a typical secondary school. Are you ready?

Pupil: yep

SU: O.K. we're going to discuss about leadership and what you understand about leadership? So, what do you understand about leadership then?

Pupil: that leaders are people that who provide, like er, kind of like an inspiration for everyone first and people will follow them and look to be like them and er with leaders are the sort of people to who make big decisions and have to like make generally decisions based around everyone else.

SU: so, can you give me an example of a leader and how they act around others?

Pupil: er well, Barack Obama and when there was the BP oil spill, he had to rather than rush into things and think about getting it sorted as quickly as he could, he decided to take his time and look at things from a different view and think how it was going to get sorted and the best logical solution and how you would sort it rather than rushing in straight away and sorting it as soon as you can.

SU: do you think it is difficult to gain these skills and qualities that for example that Barack Obama has?

Pupil: er, some will be harder to develop more than others, cause if you are shy then you need to provide yourself with er this thing where you have to get used to talking to people and discussing with others and looking at their ideas as such but when people say the phrase 'born leader' think that generally means that people that genuinely do go onto become leaders with most of the time will have this general sense of like the skills of about them so they will have like become positive and things like that.

SU: Right, you now have a selection of the different unit titles from the SLq specification. These outline what you will be doing for your qualification. Could you look at them and rank them in importance, from 1 to 5, 1 being the most important and 5 being the least, how you perceive to be the highest regard.

Pupil: O.K... *(Pupil arranges card sort in their particular order)*

- 1: Learning with Colleagues and Other Learners
- 2: Communicating Solutions to Others
- 3: Practising Leadership Skills with Others
- 4: Learning from More Experienced People
- 5: Developing Personal Skills for Leadership

SU: O.K. why did you rank them in this order?

Pupil: er, because I think really if you learn with others and develop with other people around you, then you can understand different people's ideas, think about how different react in different situations then use this to develop yourself more than using this you could react in a way that's better to what your trying to figure out as the leader rather than being alone and developing skills that you think for yourself rather than with others, you generally get their ideas and use them to better you as a leaders and as a person.

SU: er, identifying leadership, for adults and for pupils – but how is the SLq specific to leadership?

Pupil: er, with the one where we went to the space centre, there was kind of different kinds of leaders within their groups and then there was a main leader person who would relay messages and such. Because then there was not a person who could like try to keep control with everything that was happening while you was there, there was also different people within their little groups who had to sort out specific things to others.

SU: O.K, group work, communication – but what others skills and qualities?

Pupil: thinking about things like where you're in a certain situation where something might happen and as a leader you have to think about it and discuss it with the team that you're in and discuss it with other people to get a general idea then making a decision on what you know. So that your trying to think in a way that how it would affect other people and how you will deal with it and trying to make the right decision on what other people think.

SU: What do you think the advantages are with promoting leadership in schools?

Pupil: well it makes people try to think about what person they are, what things they can do and to try to make themselves, in a way better within themselves and trying to become more positive towards other people, speaking with a lot more people in a way that a leader with speak with others as such. Thinking about different people's ideas when you're in group work at school and generally with uniforms in school – where you have an image where your smart and you're ready to work and can learn and people can look at you and say 'WOW, he's ready for this' and like get stuck in and get good levels and grades.

SU: Networking? What do you think networking means?

Pupil: networking can generally mean loads of different things linked together, whether it's like the internet – there's so many pages linked together or a network of people who will communicate with each other and like at schools where all parents can talk to each other and have meetings with each other about how they are doing or speaking to teachers.

SU: why is networking important?

Pupil: it just helps everything link together and er.. and everyone is joined in a big community and then in a way and helps everyone learn different things and such like the parents can learn from the teachers about how their child is doing, the parent can tell the teachers what things the child does well at and what sort of things they are good at doing. Then the teacher can use this to help the pupil so the network just generally helps information to pass along and everyone just stays aware and help people out.

SU: How about networking in Leadership then, why is it important and do you think it's essential to be networking and to be a leader as well?

Pupil: yeah because as a leader and you want to communicate with every and if you have a network as such, then you can pass information along people and learn about what sort of people in the groups you have to have different skills and the things they do well at and then you can use this to help you as the leader to decide on decisions you need to make based around what you doing.

SU: can you give me a specific example of you doing that in SLq?

Pupil: when we created a certain bubble bath product, there was certain leaders of their group who had to use their networks to discuss with other groups the things that people liked and find out what sort of people were good at certain things so if one was designing the packaging they would be good at Art and finding out from other people what they were good at. Also discussing with other people what sort of pricing and keeping what everyone likes in a group.

SU: how did that collaboration help you to deal with others and the problems that might arise?

Pupil: well if you got stuck at certain parts, if you started talking to other people and getting their ideas and thinking about what certain people want because you are talking to those people then you can discuss with them in their groups, like a network, what sort of things they like doing and then moving on with their ideas and what you think is a good choice based around their ideas.

SU: how did your experience help you to communicate with others, with yourself, adults and you peers?

Pupil: because we discussing in groups, you just got used to talking with loads of different people and even if different people came and we talked a lot about the different ideas and you wouldn't just stick to your group we go and ask and adult or we would go to another group and say would you consider this idea.

SU: what other skills and qualities do you have developed during that activity?

Pupil: I think it was er, a lot based around the Maths side as well because when we had to think about what sort of thing was going into the bubble bath as well, we had to do a lot of thought on the numbers and what size it would be and how much you would need of everything and a lot of thinking about how much would go into that product.

SU: so, if you were in charge of SLQ, what would you do to improve networking?

Pupil: rather than have working in a small group, maybe we could mix it up and get other groups talking with others and different people because the bubble bath one, there was a lot of people sticking to their friends and not really talk to anyone else but with some other activities there was a lot of communication between my peers.

SU: have you specifically lead on a project?

Pupil: not at the minute, no.

SU: how did you feel about not leading on a project?

Pupil: I was a bit disappointed because I would have liked to listened to loads of people and took on board all of the thought process of what things need to come and in what order and who is going to be doing what and station people with certain skills and such, but er, I was not too bad about leading on that because in our separate group we had certain leaders but I became a bit of a leaders I suppose.

SU: how did you become a leader?

Pupil: when a certain situation raised, I had to calm everyone down and just remind them not to rush it and take your time and what we need with the task.

SU: how did the SLQ help you to work with people that you would not normally work with?

Pupil: just generally being around other people and normally in school you will have certain friends and who you like just hang around with but in STEM you meet loads of different people and you just generally just get used to thinking around people who think the same way that you think differently about certain things. Meeting up with people who like basically enjoy the same things as you in this kind of area and then discussing it with them.

SU: do you feel more confident in or around school because of STEM and SLQ?

Pupil: yeah

SU: why?

Pupil: because it just helps me to talk with so many different people who normally in school I wouldn't have talked to if I didn't really know them but now because of STEM I now have talked to

different people I'm a lot more used to talking with different people about different things that they like and such.

SU: how about in your classes?

Pupil: yeah as well because it's the same to do with what you're thinking about things, talking to people about different ideas in STEM and talk about different ideas in class and ideas in certain science projects and you ask people for help if you're stuck on certain things and just talking with them and what you think is a good idea or a bad idea.

SU: what do you most enjoy about STEM and SLq activities?

Pupil: I like just being around different people and thinking about not only the way I think about things but also how they think about it and then using it to help me to advance as a person rather than just thinking about how I think about things I look at it as how I would think about a problem and how other people might feel about it as well.

SU: O.K. what about SLq – what's not working?

Pupil: er, some of the things within STEM where we just have rather short activities where there's not that many things going on, like a sense of projects.

SU: so, a sense of projects but what can be improved to help you within those projects to understand about leadership?

Pupil: I suppose it's just doing more group activities where you do projects because there are some where we do just as I said a couple of things but instead we could do a long project where different people are put in different groups and certain people are chosen to be leaders and different people have to adapt to working with different people.

SU: O.K, I have another ranking activity where if you can give in order that you feel to be of most importance, being number one and the least being number nine, words that are associated with leadership in SLq – can you rank these please and what you think leadership is...

Pupil: (doing card sort)

SU: happy, yeah. O.K why in that order then?

1	Positive Self Image
2	Self- motivation
3	Teamwork
4	Critical Thinking
5	Verbal Communication
6	Problem Solving
7	Creativity
8	Social Intelligence
9	Tenacity

Pupil: er... because with a leader if you can't generally take care of yourself and bring a positive image of yourself first then how are you supposed to inspire other people to build themselves up to be bigger and better things really and if you don't have that no one will follow you in a situation where you can easily give up on it.

SU: Well that is it, thank you very much for the into and I hope it helped you to discuss SLq in a wider context in terms of the activities, skill and attributes that you have gained so far, thank you.