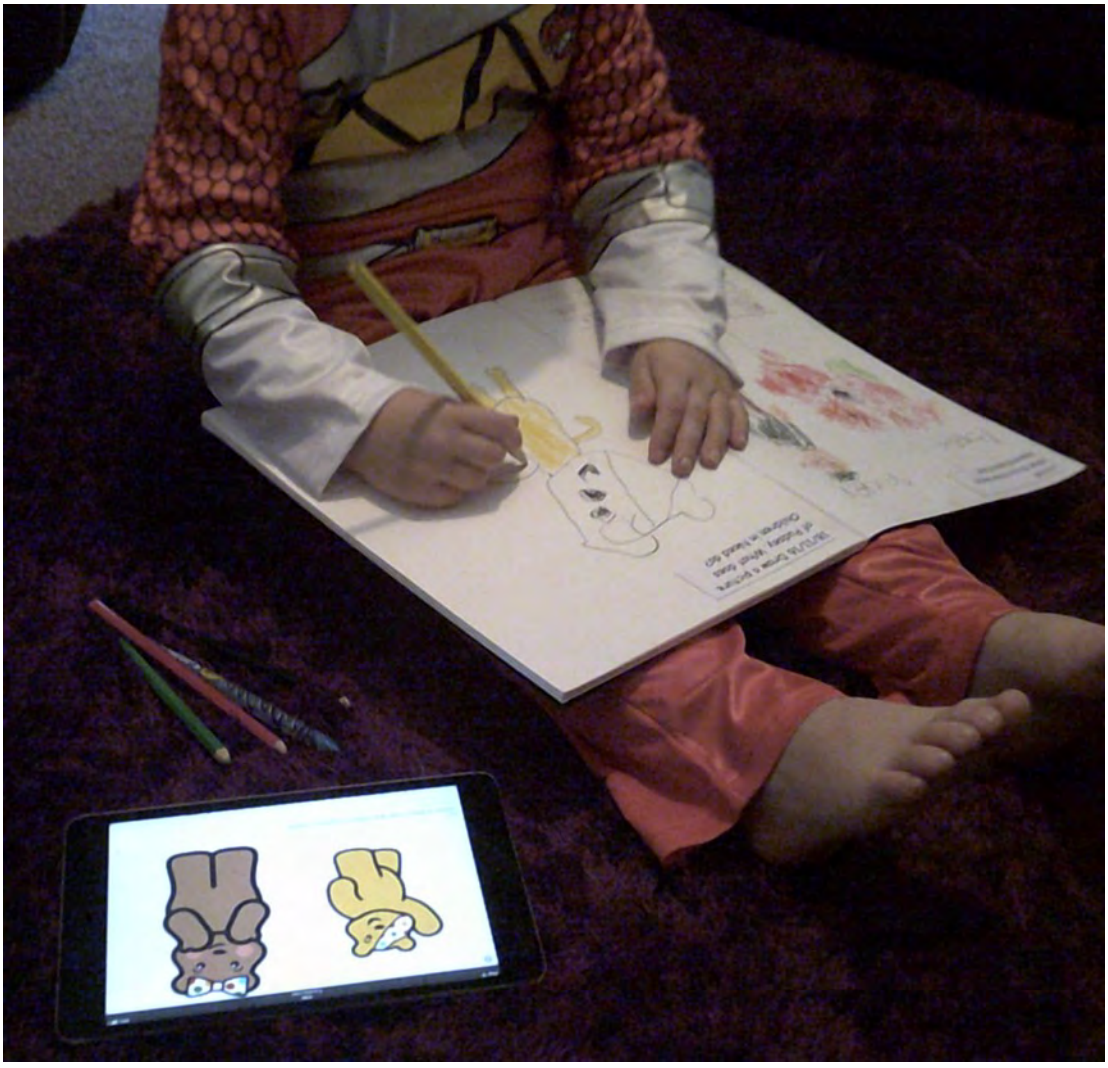
NP3

New Purposes

New Practices

New Pedagogy

Meta-analysis Report



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Additional materials from the project are available from http://www.np3.org.uk which is hosted as part of http://edfutures.net

Executive summary

NP3 (New Purposes – New Practices – New Pedagogy) was funded by the Society for Educational Studies to explore the digital practices that children engage with outside school and the extent to which these are recognised, valued and influencing teachers' pedagogy inside primary schools.

The project was underpinned by a sociocultural theoretical position, which informed it approach and was reflected in its five key research questions (RQs):

RQ1 What are the digital practices that pupils bring to their learning in school? (See Section 6 of the report)

RQ2 Across subject domains what do teachers' intended and enacted pedagogic practices indicate about their awareness of and the value accorded to pupils' digital competencies, and how do pupils' experience these pedagogic practices? (See Sections 7 and 8 of the report)

RQ3 What institutional circumstances and practices enable or undermine how pupils' digital competencies and practices are recognised (RQ1) and integrated into teachers' practice (RQ2)? (See Section 9 of the report)

RQ4 What are the consequences of the answers to RQs 1-3 for learning in terms of social justice, and across and within subject domains? (See Section 10 of the report)

RQ5 How does the research inform how to represent and model a participative pedagogy of mutuality (Bruner, 1996; Wenger, 1998; Alexander, 2000; Murphy & Wolfenden, 2013) and engage teachers with that pedagogy? This was be addressed through the meta-analysis of data across studies. (See Section 11 of the report)

Data collection and analysis

See Sections 3 and 4 of the report for full details of the methodology and analysis.

Over a two year period over 100 children and more than 60 teachers in 13 schools took part in the study. 43 'log children' used digital cameras to capture evidence of the ways in which they used ICT 'at home' (which included any use outside school/school clubs) and were each interviewed individually at least once. More than 20 carers of these 'log children', mostly mothers, were interviewed individually about their child's home context and use of ICT. 31 teachers were observed teaching between one to three times and were each interviewed at least twice (generally before and after each observation). Approximately six children from each of the observed lessons took part in a group interview following the lesson, and in addition at least one group of children from the older year group in the school was interviewed about ICT use in the school more generally.

The data collection and analysis were informed by a sociocultural framework (see Figure 3.3.1), which focussed attention on:

- The constitutive order – the broad context within which homes and schools exist, which for example includes: national policies; social representations of learning, childhood, and ICT.
- The arena of the school/home – the enduring features of the school/home that reflect how the constitutive order has been taken up in terms of beliefs and values. This would, for example, include: norms, routines, rules, facilities, and expectations. The arena frames the opportunities that are available.
- The setting (people in action) – the people within the arena who interact with each other and with the child. Through their actions people within the arena create and/or constrain what the child can do. The setting (People in action) frames the possibilities that are available.
- What is taken up, what individuals do within the setting (people in action), which is a reflection of their identities - what they see as being possible for them to do within the wider possibilities offered by the setting (people in action).

Contributions and findings related to RQ1

All of the 'log children' lived in homes where ICT was readily available, including access to mobile devices and WiFI connected to the Internet. It needs to be noted that the children and carers who took part in the study may be atypical for a variety of reasons. See Section 6 of the report.

Key contribution 1: This study provides rich descriptions of children's use of ICT outside school and insights into their digital practices.

Children engaged in a wide variety of uses of ICT outside school, including, but not limited to:

- Playing games ranging from simple 'arcade' style games such as Snake or Angry Birds through to sophisticated use of virtual worlds such as Minecraft.
- Finding information, either using a web search engine such as Google or, very often, searching within YouTube
- Creating, editing and sharing images, videos and music, ranging from using painting apps, through to taking still photographs or videos with their mobile device, to sophisticated editing of video and audio and uploading to the web (e.g. to their own YouTube channel)
- Communicating with family and friends, and much less often with people they didn't know in the physical world. This included 'in game' communication (e.g. using built-in chat tools or other channels such as Skype)
- For some children sustaining relationships was the main purpose and specific communication tools such as WhatsApp, Facebook and/or Facetime were used
- Programming/coding whilst less common, was mentioned, usually as a minor interest compared with the other out of school uses of ICT
- Other 'fun' uses of ICT, including downloading and/or listening to music, watching videos/TV (often using a service such as Netflix or catch-up TV), reading e-books.

Key contribution 2: In order to make sense of the vast array of uses of ICT, and equally importantly the ways in which children used it outside school, the Digital Practice Framework (DPF) was developed. The Digital Practice Framework encapsulated key aspects of children's digital practices and related to why they were using ICT (Purpose), and the level of sophistication of that use combined with the way in which they positioned themselves in relation to other users of ICT (Participation). The Digital Practice Framework has the potential to be used more widely by those interested in ICT use.

Key finding 1: There was a wide variation in levels of engagement and sophistication of ICT use. This was often due to constraints placed on the child's use of ICT within their home arena or due to lack of support due to parents' own levels of ICT competence and/or concerns about children using ICT. This challenges commonly held assumptions about the majority of children being highly competent users of ICT. Gender did appear to influence children's digital practices.

Key finding 2: Whilst the majority of children use ICT primarily for entertainment, others purposively use it to extend physical world interests. Children were agentic, they pro-actively and independently searched for information about things that they were interested in.

Contributions and findings related to RQ2

To establish the extent to which pedagogy (linked to ICT use) in primary schools aligned with children's digital practices outside school, uses of ICT inside school were analysed against the Digital Practice Framework (DPF). See Section 7 of the report.

Contribution 3: The report provides a wide range of examples of ICT use that illustrate both the ways in which ICT is being used in primary schools, and highlights where these are impacting on practice or ways in which they might do so if implemented differently.

Contribution 4: In order to analyse the impact of ICT use in schools the ICT Innovation Framework (ICTIF) was introduced (see Section 4.5.1). This is an updated version of the

Computer Practice Framework (Twining 2002a, 2002b, 2004, 2008). It has the potential to be used more widely by those interested in ICT use in schools.

Key finding 3: There were a small number of examples of pedagogic practices that did, or had the potential to, align with children's digital practices outside school. These related to:

- the use of school radio stations, where children became radio presenters
- digital leaders programmes, where they went beyond carrying out routine tasks such as managing equipment
- some uses of social media (such as class blogs), where teachers relinquished control;
- programming, for a small minority of children
- and giving children control to decide, without having to ask permission, when and how to use mobile devices.

Key finding 4: In almost all instances within the study schools, ICT use did not align with children's digital practice outside school. Children didn't feel that their out of school digital practices were relevant in school (except in relation to homework, where they often had a greater degree of agency).

Key finding 5: The lack of alignment between teachers' pedagogical practices and children's digital practices outside schools seems at least in part to be related to constraints that teachers have to work within. As a result, the purposes underpinning ICT use in school were almost always the school's or teacher's purposes rather than the children's.

Key finding 6: Schools seldom replicated how children's digital practices develop outside school, especially with regard to providing opportunities for sustained and increasing participation with others who shared similar interests. Instead, children's ICT use in schools tended to be short term and discrete.

Key finding 7: There were many examples of effective use of ICT in the study schools, despite the lack of alignment between teachers' pedagogic practices with ICT and children's digital practices outside school. See Section 8 of the Report.

Key finding 8: A further analysis using the ICT Innovation Framework (see Section 4.5.1) of the 159 observed or reported uses of ICT by children in schools revealed:

- there were large differences in the proportion of time that pupils spent using ICT both within and across the study schools (see Section 8.1 of the meta-analysis report)
- there appeared to be a threshold level of ICT provision that was necessary in order for ICT to be used in ways that changed, or had the potential to change, what and/or how children were taught
- of the 91 instances of observed or reported use of ICT in classes where ICT was estimated to be used by children more than 10% of the time:
    - 11 (13%) changed what and/or how the children were taught in ways that could not realistically have been achieved without ICT
    - a further 36 (40%) had the potential to change what and/or how children were taught in ways that could not realistically have been achieved without ICT, but either there were insufficient data to determine whether this had happened, or they were implemented in a way that undermined this transformative potential
- of the total of 139 instances of ICT use that were categorised as pedagogic use of ICT across the curriculum (PICT on the Focus dimension of the ICTIF), which included instances where the quantity of use could not be estimated with any confidence:
    - just over 60% had the potential to change what and/or how children were taught in ways that could not realistically have been achieved without ICT
    - fewer than 20% did change what and/or how children were taught in ways that could not realistically have been achieved without ICT

Contributions and findings related to RQ3

This research question was expanded to include consideration of factors that impacted on all use of ICT in schools, rather than the narrower original focus on the factors that impacted on the degree of alignment between teachers pedagogic practices related to ICT use and children's digital practices outside school. See Section 9 of the report.

Contribution 5: The report provides evidence about key features of the constitutive order and school arena that impact on ICT use in primary schools, and illustrates a range of different ICT strategies.

Key finding 9: The data from the study schools did not support the view that there was a relationship between how remote a school was and the degree to which they had embraced ICT, however this may have been due to the sample of schools in the study.

Key finding 10: Significant elements from the constitutive order, namely curriculum, assessment and accountability requirements, appeared to be major factors preventing teachers' pedagogic practices from aligning with children's digital practices outside school. This was less strongly evident in the independent schools, where accountability to parents seeming to be more important than accountability to formal inspection. The curriculum, assessment and accountability regimes in Scotland were less important constraints on practice then those in England.

Key finding 11: A range of different ICT strategies were evident across the study schools, often reflecting their overall educational vision and priorities (though these were often in conflict). Different schools met the same priorities in different ways, for example meeting requirements to teach computing by using a timetabled set of laptops rather than an ICT suite.

Key finding 12: There was a general move towards greater use of mobile devices.

Key finding 13: Older children were often provided with more access to ICT (at least in terms of resources allocated) than younger children.

Key finding 14: There appeared to be a minimum threshold of provision below which the level of ICT use was minimal. However, once this threshold had been exceeded, there was no clear relationship between the model of ICT resourcing and the extent to which or ways in which ICT was used. This seemed to be more down to the agency of individual teachers.

Contributions and findings related to RQ4

RQ4 was concerned with consequences of the answers to the previous research questions for learning in terms of social justice, and across subject domains. This analysis focussed primarily on differences in ICT use: across subjects; with children labelled as having different 'abilities'; and in relation to gender. See Section 10 of the report.

Contribution 6: The report provides evidence about differences in the ways in which ICT is used across subject domains in primary schools. It illustrates differences in ICT use for children when they are grouped by 'ability', and highlights some of the consequences for learning of differences in ICT use outside school (which were identified in response to RQ1).

Key finding 15: The assumption that SES determines ICT access at home may need to be re-examined as the data did not show there to be a definitive link between socio-economic status and children's access to devices, access to the internet or use of ICT.

Key finding 16: The teachers' perceptions of the nature of the different curriculum subjects and their views of 'knowledge', strongly influenced how ICT was used in practice, although there as clearly scope for ICT to be used effectively across subjects. ICT use had greater impact (or potential to impact) on what and how children were taught where subjects were

perceived to be less 'fact based' and 'procedural', such as in history and music, compared with maths.

Key finding 17: Much of the ICT use in English and Maths provided opportunities for 'drill and practice' types of learning, which supported the development of children's skills for meeting the National Curriculum requirements.

Key finding 18: In English, ICT was used in variety of ways to enhance writing where the writing itself was or could have been changed by use of ICT (e.g. using rich immersive worlds offered powerful opportunities to stimulate and scaffold writing). ICT also provided opportunities to explore new forms of composition and write for real audiences (e.g. using blogs).

Key finding 19: In maths, ICT provided the possibility for children to articulate, share and co-construct understandings of particular mathematical methods (e.g. using Explain Everything). In maths, some teachers tried to increase children's independence through providing access to video clips to explain various aspects of mathematics

Key finding 20: To use ICT effectively, teachers need to be confident in the use of the software and aware of the pedagogical reason for choosing to use ICT in a particular way with a particular group of children.

Key finding 21: In those schools using 'ability' grouping, the data suggests children in 'lower ability' groups often have less opportunity to use ICT than children labelled as 'high ability'. Children in 'lower ability' groups also seemed to spend a higher proportion of their time using ICT doing 'drill and practice' activities. Those labelled 'more able' seemed more likely to be allowed to work more independently and on richer tasks that offered more scope for children to be agentive, collaborative, co-creators of knowledge. This difference in provision was evident in both KS1 and KS2.

Key finding 22: There were some patterns of children's ICT use at home that teachers need to be aware of in order to consider ways in which their pedagogy can be inclusive and does not lead to or perpetuate gender-based inequities in children's use of ICT and development and learning. More knowledge of children's home digital would help teachers to not view girls and boys in binary terms or as homogenous groups, and to recognise how gender is mediated by other factors such as ethnicity or social class.

Contributions and findings related to RQ5

RQ5 was concerned with the extent to which teachers' pedagogic practices aligned with a sociocultural model. See Section 11 of the report.

Contribution 7: The report introduces the Innovative Pedagogy Framework (IPF). This is a powerful tool for analysing teachers' pedagogic practices. The IPF defines five theoretically informed models of pedagogy in terms of their key features.

Contribution 8: Ways in which the Innovative Pedagogy Framework can be used are illustrated, and possible relationships between the pedagogical model adopted and the quantity and impact of ICT use is identified.

Key finding 23: the data suggested a relationship between a school's over-arching pedagogical model (based on the Innovative Pedagogy Framework) and the Quantity and Mode of ICT use (as defined by the ICTIF), specifically, a Traditional pedagogical model having less ICT use with less impact on what and/or how children are taught than a Constructivist or Innovative pedagogical model.

Key finding 24: Whilst the school arena is important, an individual teacher's identities and pedagogical stance may be more important determinants of their practice related to ICT use.

Key finding 25: Irrespective of their pedagogical stance, teachers who position themselves as ICT users and see ICT as being an important part of their identity are more likely to make more use of ICT in their teaching, which may also involve using it in ways that change what and/or how the children are taught.

These findings are tentative and need further investigation.

Recommendations

Recommendation 1: If **parents** want their child to move from being Marginal to Engaged, or Engaged to Core users of ICT (as defined by the Digital Practice Framework) and to learn how to manage their online presence effectively then parents should, from a young age:

- induct their child into using games or other ICT apps that the child is interested in
- progressively support their child in connecting up with trusted others who have a shared interest
- maintain regular open communication with their child about their ICT use

Recommendation 2: **Policy makers** need to be clear about what they see the purpose(s) of school to be, and what outcomes they want children in schools to achieve and should ensure that they align their policies and regulations with those purposes and intended outcomes.

Recommendation 3: More specifically, **policy makers** should implement the recommendations of the Educational Technology Action Group (ETAG), which can be downloaded from http://etag.report.

Recommendation 4: **Schools** need to be clear about their educational priorities and should use the Innovative Pedagogy Framework (IPF) to help them clarify their pedagogical beliefs. They should ensure that their ICT strategy aligns with those priorities and their pedagogical model.

Recommendation 5: **Senior leaders** should carefully plan the roll out of their ICT strategy, taking heed of the plentiful advice that is available, including, for example about the implementation of mobile devices (e.g. see http://edfutures.net/Digital_technology_strategies), and effective professional development (e.g. Twining & Henry, 2014; Twining, Raffaghelli, Albion & Knezek, 2013).

Recommendation 6: **Schools** should embrace the fact that children are accessing the internet outside school, and should work with children to educate them about how to do so in a safe and effective manner.

Recommendation 7: **Schools** should more proactively seek out information about digital practices 'in the home'. However, schools should avoid trying to manage or formalise children's out of school digital practices.

Recommendation 8: **Teachers** should acknowledge that teacher agency is one of the most important determinants of what happens in classrooms.

Recommendation 9: **Teachers** should use the Innovative Practice Framework (IPF) to clarify their pedagogical beliefs. They should share their pedagogical beliefs with colleagues.

Recommendation 10: In schools in which children have access to a high level of ICT resourcing, and in particular 1 to 1 mobile device provision, **teachers** should give children much greater freedom to decide when and how to use ICT in order to achieve desired outcomes.

Recommendation 11: **Teachers** should ensure equity of access, both in terms of time and types of use, for *all* children.

Recommendation 12: **Teachers** should provide opportunities for discussion of the children's out of school digital practices.

1 Introduction

NP3 emerged from prior research which suggested that mobile devices[1] are impacting on children's and teachers' practices in primary schools (e.g. Clark, Twining & Chambers, 2014; Jamieson-Proctor, Redmond, Zagami, Albion & Twining, 2014; Twining, 2014a) and are blurring boundaries between formal, non-formal and informal learning[2] (Falloon, 2015; Passey, 2010; Radović & Passey, 2016; Twining, 2014b). Emerging evidence (Maher & Twining, 2017; Twining, 2015) shows pupils are perceiving affordances between their practices in informal learning settings and their learning in schools, demonstrating an evolving adaptive expertise (Rogoff, 2003) and concomitant experience of agency in their learning. However, teachers are slow to incorporate these new digital practices within their pedagogy (Maher & Twining, 2017), perhaps because they do not perceive useful affordances, or know how to manage negative ones (e.g. Using social media, seen as negative due to safety concerns). It is important that teachers do recognise and value pupils' new practices in order to enhance their learning in the 'formal' context of school (Gurung & Rutledge, 2014).

NP3 set out to explore the digital practices that children are developing outside school, and the extent to which these practices are impacting on pedagogy inside school. Specifically, it set out to address five key research questions:

RQ1 What are the digital practices that pupils bring to their learning in school?

RQ2 Across subject domains what do teachers' intended and enacted pedagogic practices indicate about their awareness of and the value accorded to pupils' digital competencies, and how do pupils' experience these pedagogic practices?

RQ3 What institutional circumstances and practices enable or undermine how pupils' digital competencies and practices are recognised (RQ1) and integrated into teachers' practice (RQ2)?

RQ4 What are the consequences of the answers to RQs 1-3 for learning in terms of social justice, and across and within subject domains?

RQ5 How does the research inform how to represent and model a participative pedagogy of mutuality (Bruner, 1996; Wenger, 1998, Alexander, 2000; Murphy and Wolfenden, 2013) and engage teachers with that pedagogy?

1 The term 'mobile devices' is used in this document to refer to Internet-enabled devices such as laptops, Tablet PCs, Chromebooks, Tablets, iPods, smartphones AND their software AND the associated infrastructure (e.g. WiFi, Internet connection). The term 'digital technology' is used when we wish to refer more broadly to any/all digital technologies (including desktop computers for example).

2 CEDEFOP (2008) originally conceived of learning as happening in formal settings (e.g. classrooms), non-formal settings (e.g. clubs), and informal settings (e.g. the home). The NP3 project acknowledges that the use of 'formal' and 'informal' is contentious but it provided a useful initial structure for the research team.

This is a set of questions that has not been addressed in the digital technology in education literature thus far. This partly reflects the fact that much of the research on the use of digital technology in education has been descriptive and under-theorised. This applies to the Vital and Snapshot Studies, where the focus was on developing dimensions to describe rather than to understand practice, and specifically in educational settings. By applying a sociocultural theoretical lens to the research this study will represent a step change in how learning between home and school is conceptualised, increasing the explanatory power of the work. The next section explores key literature relating to children's use of ICT out of school and ICT use in school. The subsequent section details the theoretical perspective informing the research and the implications of this for the research design and data collection. These are then discussed in the methodology discussion. We, like others, use the term digital wisdom instead of digital literacy, to refer to the broad set of knowledge and competences associated with using digital technology, and a critical stance towards digital technology as a meditational tool, which is essential for citizens in a connected world (e.g. Palmer, 2012).

2 Literature review

2.1 Theoretical perspective

At the heart of a sociocultural perspective are the relations between sociocultural structure and social practice and this informs how context is understood. In arguing a sociocultural view of the context of activity Lave distinguishes two analytical levels, the constitutive order, and the 'lived world' which is shaped by and shapes the constitutive order (Lave, 1988). The constitutive order is a theoretical construct described as a semiotic system of signs, symbols and organisational principles that structure the social universe (p.16). That is the broader cultural systems of relations or cultural scripts about ways of being in the world, and social structures that give meaning to, and shape, the activities in which people engage in the lived world. The constitutive order is where belief systems, and the ways in which the material and social world is organised through political, social and economic structures interrelate; analytically one does not have meaning independent of the other. This inter-level of analysis, crucial to a sociocultural perspective, allows understanding of how at particular points in time and within a particular cultural context certain perspectives such as beliefs about learners and learning and what constitutes an educated person and associated policies and practices emerge and influence activity in the lived world in the home and in schools.

Within the 'lived world' Lave distinguishes two further levels of related context, the 'arena' and 'setting'[3]. Lave (1988, p.150) defines the arena as "a physically, economically, politically and socially organized space-in-time" within which activity takes place. Schools as institutions constitute an arena organised by school structures, policies and enduring practices; that is practices which are not directly negotiable by individuals (Ivinson and Murphy, 2007). Examples of enduring institutional practices include: how children are organised in classes such as ability groupings; rules of access to digital technologies and the internet; how communications within a school and between the school and its community are organised; behavioural expectations in different institutional spaces such as assemblies, playgrounds, corridors and classrooms. Arena practices influence how participants come to understand what is possible to do and be within that institution. Just as people 'read' and take up cultural scripts made available in the constitutive order in different ways, ways that are influenced by their experiences and histories, schools take up policy structures and specifications in ways that reflect their economic, political and social organisation and the participants within them. School arenas therefore vary and these variations in practices and the values that underpin them mediate how teachers and children are positioned and the opportunities they have to practice in particular ways and to learn. To understand what opportunities children have to develop digital wisdom and how learning outside of school might mediate, and be mediated by digital learning in school the research extends the concept of arena to the home. Like other institutions families have different physical, social, political and economic organisations and different practices as a consequence. The arena of home and its enduring practices mediate how the child understands themselves as children, as learners, and as digital users. Carers and parents are influenced by beliefs and conventions about what being a child means and how digital access and competence relates to that. To understand what children come to know and do well as part of their evolving digital wisdom in both the arena of home and the arena of school attention has to be paid to what is made available in terms of possibilities for participation in ICT and activities. Even if children's participation is constrained it matters what arena practices represent in terms of digital identities as through association or dissociation children can imagine future possibilities (Wenger, 1998).

Setting as another analytical level in the lived or experienced world is the phenomenological reflection of the arena, it is "personally ordered and edited" (Lave, 1988:151). Settings are understood as the relation between acting persons (People in action), in this research teachers and pupils, and pupils and their families and friends, and the school and home arenas in which

[3] Not to be confused with the use of the term setting in early years to refer to a pre-school/nursery/school Figure 3.3.1 provides a diagrammatic representation of the sociocultural framework being used throughout this report.

they act. Settings are generated as people interact in activity, through people in action. For example, as a teacher engages with her pupils doing maths the setting emerges and is experienced differently by participants because of their diverse histories of participation which shape the sense they make of it. This concepts of arena and setting (people in action) applied to curriculum moves understanding of it beyond the specified (constitutive order) to that which is taken up in school practices and policies (arena) and is further mediated as teachers enact their intended curriculum. As settings emerge mediation continues through pupils' interaction with each other, the teacher and the learning resources. The experienced curriculum is that which is made available and mediated by pupils' different ways of knowing and being. This has consequences for what is made available to learn and by whom because as settings emerge in social interaction so too does the activity of say doing maths. That is, as children participate in school activities and the digital technologies and practices associated with them their different experiences of participation will shape their understanding of both. For Lave all three modes of analysis the constitutive order, arena and setting (People in action) in the lived world are mutually constitutive and dialectically related. To understand one level needs attention to the others.

Rogoff's (1995) planes of analysis, community/institutional, interpersonal and personal, map closely onto Lave's concept of context. Rogoff argues, like Lave, that these planes of analysis are inseparable and mutually constitutive. The interpersonal and the personal planes, align with Lave's analytical level of setting. The interpersonal plane is what emerges between pupils and teachers. The intrapersonal plane is teachers' and pupil's experiences of the setting and what they appropriate from this shared experience. Rogoff's planes allow a way of understanding what emerges as settings are generated between children and their teachers in activity.

Applying a sociocultural perspective that treats the home and the school as arenas turns attention away from divides such as informal and formal learning as no distinction is drawn between learning in the everyday and learning in school in contrast to other theories of learning (Lave 2008) Rather a sociocultural perspective draws our attention to an analysis of the affordances and constraints in relation to learning and the factors impacting on these that are present within the arena, settings and opportunities for participation in question.

In adopting a sociocultural analysis of children's ICT practices and identities it is critical to give some consideration to the constitutive order, or, socio-cultural/political/economic landscape. At a global level, whilst significant variance and inequality exists in relation to access to ICT it is difficult to ignore the potential impact of developments in ICT in social, cultural and political terms (United Nations Children's Fund, 2014). According to the 2016 report of the World Economic Forum (WEF) we are:

> …at the dawn of the Fourth Industrial Revolution, which represents a transition to a new set of systems, bringing together digital, biological, and physical technologies in new and powerful combinations.
>
> (World Economic Forum, 2016, p.xi)

The power, role and accessibility of ICT and its connection to economic growth is widely recognised and acknowledged, alongside the role education can play in support and preparing children for their engagement in an increasingly digital world (Kozma (2005).

2.1.1 The curriculum context

The dialectical relationships between Lave's and Rogoff's levels or planes requires that schools and teachers' actions and intentions are understood in the policy and local contexts in which they are embedded. In the UK there has been a period of unprecedented change in curriculum specifications, at the level of the constitutive order over the last two decades. The various specifications represent moments in an historical process of the reification of what a society considers to be an educated person. These reifications function as a cultural resource and as they are statutory and have associated assessment systems that purport to measure the

performance of schools, teachers and pupils, they exert a strong vertical pressure on practice. Curriculum policy documents are reifications; they offer representations of knowledge which are never theoretically neutral. They reveal how different theoretical perspectives, whether implicit or explicit shape what is valued knowledge, how pupils are understood to learn and what being an educated person means.

Different theories of learning and knowledge have held sway at different points in time. Darwin's theory of evolution, for example, suggested that humans were not radically different fromother animals. This reinforced the possibilities to apply scientific inquiry to understand human learning. Applying scientific inquiry to human learning justified a shift away from trying to understand 'inner knowledge and mental functions' (Richardson, 1998, p.50) as these were unobservable and unverifiable, an important requirement of scientific research. Behaviourism or learning theory with its roots in biology brought to the fore biological explanations for how people learn, legitimising the continuing belief that innate ability determines pupils' potential. In behaviourist views of knowledge, it is assumed that through drill and repetition basic skills combine to make a more complex whole. Behaviourism declined in influence in the second half of the twentieth century but it spawned a vast technology of experimental studies of learning (Wood, 1998). Such a legacy does not disappear, it shapes educational thinking and can be seen to surface in numerous ways.

Traces of behaviourism can be seen in certain enduring practices advocated in curriculum policy. For example, drill and repetition in developing pre-requisite basic skills is evident in the rationale for the focus on phonics in literacy lessons and in national assessment tests for school children aged 4 to 6 years-old in England (Ellis & Moss, 2014). In this approach learning to read is viewed as a process of decoding symbols not meaning making. This is evident in the separation in the policy guidance between the process of decoding (reading) and the process of developing vocabulary; words that children use with the 'correct' meaning or comprehension and acquire through discussions about the books that are read to them. Consequently, word level work and comprehension can be taught independently. Views about knowledge that see it as building blocks that can be interrelated or combined into more complex structures have been resilient to change, as is the view that learning is a process of inputting or transmitting knowledge and skills from teacher to pupil. These legacies of behaviourism were taken up in information-processing theories of mind in the 1960s and 70s with the advent of the modern computer.

Problem solving in this view of mind is symbol manipulation (Langley et al., 1987). The brain receives a pre-given problem that is then related to existing symbol structures in the brain in a search for correspondence and difference. The brain decodes the symbols, searches for similarities to recognise the problem, and solves it by identifying and following the selected rules or algorithms that are retrieved for solving that kind of a problem. Applied to education, children and young people are understood to be limited information-processors. An information-processing approach underpins the type of teaching where a common practice is to follow and learn step-by-step processes which are then applied to solve different types of problems. Another legacy of behaviourism is the continuing belief that the teacher controls learning and that learners are passive imitators in the teaching and learning process and require extrinsic motivation to learn. Policy in England that advocated a three-stage structure for lessons (DfES, 2004) emphasised the need for pace to keep children on task and this has been an enduring feature of policy on pedagogy (DCSF, 2008).

Piagetian theories have been, and continue to be very influential in shaping educational policy and teachers' practice (McPhail, 2015; Murray and Passey, 2014; Fosnot, 2013; Richardson, 1997). Two important shifts occur in moving from behaviourist and information-processing views to cognitive, Piagetian theories of learning. The first is ontological; mind remains individual but is no longer conceptualised as a passive receptor and processor of information requiring extrinsic motivation to learn, but is understood to be agentive. An agentive mind is intrinsically motivated (Bruner, 1996). Agency in Piagetian constructivism is both being able to act and being able to construct meaning from the consequences of those actions. The second shift is epistemological, away from knowledge as rules and algorithms for routinised problem solving towards knowledge as subject-specific processes and procedures related to activity and

the practical problems associated with it. Consequently, the outcomes or goals of learning change from the capability to memorise and recall to the capability to understand and apply that understanding with judgement. The National Curriculum Level Descriptors for Subjects (QCA, 2010) for England reflect aspects of a constructivist view of knowledge. For example, in the descriptors for 15 - 16 year olds in maths pupils are expected to choose to use processes to solve problems and in that choice, demonstrate understanding of the purpose and function of the process. In English pupils are expected to understand linguistics, structure and presentational devices, and cultural and historical perspectives, and use them to create effects and to convey ideas and information.

Social constructivist theories of learning and knowledge like constructivism foreground the subject, its structure and logic whilst also recognising that knowledge is socially negotiated and constructed (Fosnot, 2013). This theoretical perspective began to influence curriculum specifications so that in subjects like science pupils were expected to understand how the scientific community construct and validate knowledge claims, and how uncertainties about scientific knowledge and ideas change over time. The social model of science was seen to more faithfully represent the nature of science. The social constructivist view that meaning making is dialogic and subjects should be taught in ways that equip pupils to make informed future judgements and decisions was reflected in the expectation that pupils would question and discuss the effects of scientific and technological developments on the environment and in other contexts and consider their impact on the direction of society and the future of the world (DfES/QCA, 2004).

These changes in subject specifications occurred at the same time that educational goals were being reconceptualised to emphasise functional skills of numeracy, literacy and ICT, and skills for learning and life. In the Rose curriculum proposal (DCSF, 2009) these skills are pre-requisites for functioning in subject domains. Reinforcing this belief in the value of decontextualised learning, and challenging the influence attributed to social constructivist theories, the then Secretary of State considered that past curricula had focused too much on relevance and context to the detriment of rigour: "...teachers need a curriculum which helps them ensure that every child has a firm grasp of the basics and a good grounding in general knowledge" (Schools minister Nick Gibb cited by Patton, Telegraph 7 June, 2010, www. telegraph.co.uk/educationnews). In the curriculum review before the development of the 2014 framework it was stated that the new National Curriculum: "should embody our cultural and scientific inheritance, the best that our past and present generations have to pass on" (Department for Education, January 2011, para 10). This is reflected in the curriculum specification. For example, in the specifications for reading the primary emphasis is that pupils read and appreciate the depth and power of an English literary heritage defined by high quality classic literature. Implied is that both literary quality and what constitutes a classic is uncontested and unchanging. In the History specification, there is further evidence of this epistemological shift. Like the English reading specification, the content and how it is structured indicates the importance of a British cultural heritage to be passed on to pupils. There is a strong emphasis on chronology which represents a move away from the practices of doing history towards the facts of history. This retreat from what is claimed to be the influence of social constructivist theories has seen a more general claim for school curricula to be based on 'powerful' knowledge' (Young, 2011). As part of this social realist approach it is argued that schools must become places where the world is treated as an 'object of thought' and not as 'a place of experience' (Charlot, 2009, p.91, cited by Rata, 2016, p.175). While the curriculum changes represent a different ontological and epistemological position to those underlying previous specifications there remain traces of constructivist and social constructivist views of knowledge creating theoretical tensions where mind is both a receptor and constructor and pupils are both passive and agentive. Such tensions create dilemmas for practice for all teachers but the extent of these dilemmas and the consequences for how they respond to them will be mediated by their professional histories and their theoretical commitments. How schools respond can heighten or alleviate these tensions for individual teachers.

2.2 Children's ICT Practices at Home

Until recently, much research into children's ICT practices outside of school was with older children aged 9-16 years (Chaudron et al., 2015). Some examples of research with older children includes the EU Kids Online research network (e.g. Livingstone, Haddon, Görzig & Ólafsson, 2011) and UK Children Go Online (Livingstone, 2006). However, this has been redressed more recently with research with younger children in the early years aged from 0-8 years (Johnson, 2010; O'Hara, 2011; Edwards, 2014; Vittrup, Sinder, Roe and Rippy, 2014; Marsh et al 2015; Marsh et al., 2017). This project built on and aimed to add to this growing body of research into children's home digital practices.

2.2.1 Access to digital devices and the internet

Recent research into children's home experiences of ICT in several EU countries (UK, Belgium, Germany, Czech Republic, Finland, Italy and Russia) suggests that children aged from 0-8 years old are living in homes described by the researchers as 'media rich' with a number of digital devices (Chaudron et al., 2015). When available, tablets were the children's favourite digital device, followed by smartphones which the authors described as 'melting pot' devices due to their versatility. Data from other research highlights how the pattern of ownership and access to different digital devices varies between countries and with age. For example, Findahl (2013) suggested that in Sweden between 25-30% of children aged 0-7 had access to and used a tablet to go online and approximately 20% used a smartphone, whilst in the UK in 2013 the proportion of children aged 3 to 7 using a tablet to go online was 33% and only 18% used a smartphone (Ofcom, 2016). By 2016 these figures had changed in the UK with 75% of 3 to 7 year olds using a tablet to go online and 35% of the same age group using a smartphone (Ofcom, 2016). The rapid increase in young children's ownership or access to tablets and smartphones in the UK was mirrored amongst children aged 8 -11. Older children using a tablet to go online increased from 27% in 2013 to 57% in 2016 and smartphone use increase from 18% to 35% (Ofcom, 2016). The change in the proportions of children using a tablet in the UK highlights the dynamic nature of the digital landscape, so although research findings of quantitative studies on access to digital devices are useful they need to be treated with caution as they rapidly no longer present an accurate picture of the current digital landscape. Furthermore, there does not appear to be a simple relationship between access to digital devices and children's patterns of use (Chaudron et al., 2015) and this reflects the diversity of families and how digital technology is taken up and used within different social and cultural contexts (Burnett, 2016; Marsh et al., 2015; Stephen, Stevenson & Adey, 2013).

2.2.2 Patterns of children's home digital practices

Chaudron et al.'s (2015) wide-scale research study into children's digital practices suggests that the most typical digital practices amongst 0-8 year olds were gaming and watching videos (including music and dance videos), but children also took photographs and used ICT to communicate with others. The study suggested that it tended to be the older children who used ICT for creative purposes. This finding contradicts earlier research in the UK by McPake, Plowman & Stephen (2013), which showed pre-school children regularly utilising ICT for creative and communicative purposes. These pre-school children used photos, videos and emoticons to communicate with others beyond their immediate community, re-enacted and transformed narratives viewed on digital devices, and also created music and made up dances after listening to music and watching music and dance videos using a range of digital sources (e.g. YouTube, specific websites, digital radio, SmartTV and MP3 players). Whilst ICT is an important part of young children lives research suggests that it is integrated into non-ICT activities (Marsh et al., 2015; Chaudron et al., 2015).

Chaudron et al. (2015) found that parents' and children's understandings of how children learn during their ICT practices was based on an understanding of learning that was wider than simply school learning. Parents characterised the learning benefits of children's ICT use as including "… fostering creativity, imagination, social skills, knowledge acquisition, hand-eye coordination and educational provision for future" (Chaudron et al., 2015, p.8). Parents throughout the EU however, also reported that they felt they had little knowledge of their

children's use of ICT in school and would value more information and advice on children's ICT use, particularly in relation to the positive educational benefits (Chaudron et al., 2015). Some parents have also stated that they no longer believe the traditional ability to read and write should be valued above other skills and that in the contemporary education system, being digitally literate should be more highly valued (Palaiologou, 2016).

Amongst 9-16 year olds in several European countries (Austria, Belgium, France, Germany, Greece, Italy, Hungary, Ireland, Portugal, Spain, Turkey, Cyprus, Finland, Netherlands, Poland, Slovenia, UK Bulgaria, Czech Republic, Denmark, Estonia, Lithuania, Norway, Romania, Sweden) the most common on-line activities were doing schoolwork and playing games alone or against the computer (100% of children), followed by watching video clips 'for entertainment and information' (86% of children) (Livingstone, Haddon, Görzig & Ólafsson, 2010). Interactive communication using social media and reading/watching news was found to be popular amongst 75% of children (Livingstone et al., 2010). Less common purposes for online engagement included playing with others online, downloading films and music and sharing content with peers (56% of the children) (Livingstone et al., 2010). The least common purpose amongst children in the study, and mentioned by only 23 % of the respondenets, was to use the internet for going into chatrooms, file-sharing, blogging, and 'spending time in a virtual world' (Livingstone et al., 2010).

The findings of a UK-based study of the online digital practices of children aged from 7-11 years old suggested a slightly different pattern of ICT use (Broadbent, Fell, Green and Gardner, 2013). This study revealed that whilst 22% of seven year olds did not engage in any form of online communication, by the age of eleven only a very small proportion of children (5%) were not communicating online. The same study found that 86% of 7-11 year olds communicated online through: social networks (e.g. 30% had Facebook accounts); chatrooms in online games; virtual worlds; and through the use of webcams. In common with the younger children in other research studies in the UK (e.g. McPake et al., 2013), Broadbent et al (2013) found that children aged from 7 to 11 used ICT for creative purposes and that almost a third of this age group (31%) had created a game online, whilst 12% had created an app. This age group also felt that the internet was crucial for homework and 94% used the internet to find information (Broadbent et al., 2013).

Time constraints play a role in shaping the pattern of children's home digital practices (Storm-Mathisen, 2016). Parents frequently have explicit rules which impose limits on when and for how long a child can engage with digital technology (Haddon and Vincent, 2014; Sonck & de Haan, 2013). Factors in the child's own life and family routines may also result in time constraints (Storm-Mathisen, 2016). Children's after–school activities, the possible need to share a digital device with others in the family, forgetting to charge a device, and/or family routines that mean a child cannot use their tablet, smart phone or games console are important but less obvious ways in which a child's opportunity for engaging with digital technology may be curtailed (Storm-Mathisen, 2016).

2.2.3 Concerns about screen time in the home

One motivating factor for limiting children's access to digital technology centres around concerns about the potentially negative effects of children spending significant periods of time looking at screens. These concerns relate to children's social and emotional development and their physical health (Sweester, Johnson, Ozdowska, & Wyeth, 2012).

Early Studies (e.g. NAEYC 2012) suggest that when screen time is used 'suitably', there are ways to encourage forms of collaboration and social interaction between children and their peers. In fact, recent research reveals that some newer forms of ICT enable children to be creative, and communicate and collaborate with others, anywhere, any place and at any time in ways which were not feasible or affordable in previous decades (Chaudron et al., 2015). Yet, while there is evidence to show that our children benefit greatly from exposure to a digitally rich landscape with technology constantly at their fingertips (Parmar, 2017; Roseberry, Hirsh-Pasek, & Golinkoff, 2014), there is also a great deal of concern about the amount of screen time which is considered acceptable for young children. Statements by Aric Sigman (2011) suggests that while technology has a part to play in education and is the future for our

children, there are reports which show that too much screen time can make it harder for children to sleep, give rise to attention deficit problems as they get older and also lead to problems of anxiety and depression and increase the chances of weight gain.

What is becoming more of a concern is the amount of screen time available before bedtime. The increasing use of digital devices in children's bedrooms has been found to create a culture of evening engagement and blue light exposure in the hours before bed which has a negative impact on sleep time and sleep quality (National Sleep Foundation, 2014). The findings of a review by the National Sleep Foundation (2014) suggested that sleep is hampered by screen time, primarily in relation to shortened sleep duration and a delay in the timing of sleep and as a result, the National Sleep Foundation has called for immediate parental awareness.

2.2.4 Children learning to use ICT at home

The phrase 'digital natives' continues to be used by some researchers in commentaries on young children's digital practices: for example,

> children as young as two are becoming experts at utilising technology and will become the first generation of active digital natives from an early age
>
> (Haughton, Aiken & Cheevers, 2015, pp.504-505)

The concept has been used uncritically in the Select Committee report, 'Growing up with the internet' (House of Lords, 2017), which suggests that policy around digital technology and e-safety will be led by the view that children are growing up in a world where "user-friendly digital technology surrounds them, which they can learn to use intuitively" (House of Lords, 2017, p.11). This perception however, has been problematised by others on a number of grounds. Firstly, it masks the changing nature of the digital landscape and the diverse ways children engage with ICT (McQuillan & O'Neill, 2009; Bennett, Maton & Kervin, 2008). Secondly, children, in common with other users of ICT, need to learn how to use the digital technologies to which they have access (Helsper & Eynon, 2010). Research looking at how children develop their use of ICT highlights how this learning takes place within a social and cultural context (Chaudron, 2015). Young children learn from observing parents, siblings, grandparents, and others, at home, when out shopping, when travelling, and when visiting places outside their home. Parents and others, especially if frequent users of ICT themselves, scaffold and mediate children's learning (Mascheroni, 2016; Chaudron, 2015). The NP3 research aimed to take account of this complex, socially and culturally situated web of learning when collecting data about children's home practices.

2.2.5 Children's rights and e-safety

Children's access to and use of ICT, particularly the internet, can be understood as beneficial insofar as it has the potential to remove barriers to accessing information, interaction and participation, and increasing skills linked to use (Ólafsson, Livingstone & Haddon, 2014). However, at the same time it can be seen as posing a threat in terms of opening children to the potential dangers of unfettered access to Internet content, and people who may harm children's development (Livingstone, Davidson, Bryce, Millwood, Hargrave, & Grove-Hills, 2012). The various articles in the UN Convention on the Rights of the Child (1989) have been categorised as protection, provision and participation rights, but these create clashes and tensions when considering children's access and use of ICT and the internet (Livingstone & O'Neill, 2014). It would seem that the tendency is to uphold children's rights to protection at the expense of their participation and provision rights (e.g. children may be denied access to the internet on the grounds of fears about inappropriate content or contact but in so doing children's rights to participate in communities or make their own friends and their right to opportunities for recreation and leisure are compromised).

The discourses of advancement and risk associated with children's ICT use position children as both competent users of ICT and potential victims. E-safety has become a significant issue in research on children's ICT practices, arguably reflecting wider societal concerns and understandings of children as vulnerable rather than capable (Craft, 2010). However it is important to recognise that the risks and harm perceived by adults are not necessarily

congruent with children's experiences (i.e. exposure to inappropriate content may not necessarily result in harm (Ólafsson et al., 2014)).

Opportunities to join chat rooms on the internet and use social media have made it easier to remove the barriers between a young person's public and private self. Children may be viewed as vulnerable online, and online sharing can possibly lead to harm due to new forms of bullying ('cyber bullying'), sharing too much personal information online with the public and becoming vulnerable to predatory adults. The UK Child Exploitation and Online Protection Centre (CEOP) recommends that all social networking sites and others emerging in the market should only be used by young people within the set respective age ranges and privacy settings should be configured to only allow contact with people that they know and trust in the physical world.

Research evidence shows that some children have experienced inappropriate online material (Chaudron et al., 2015). Parents of 0 to 8 year old children are particularly anxious about children being exposed to violence and inappropriate language, and therefore seek to control and regulate children's use of ICT (Nikken & Jansz, 2014). On the other hand, Chaudron et al. (2015) argue that parents underestimate the risks children are exposed to at this age, often postponing more robust strategies for minimizing risk until children are older. Yet parents of older children have also been found to underestimate potentially harmful materials online (Livingstone et al., 2010). The parents of many of the older children who had been upset or bothered by material online were unaware that this had happened (Livingstone et al., 2010). Parents of younger children, are also often unaware of children's ability to bypass measures designed to limit their use and access such as passwords and time restrictions (Livingstone et al., 2010). Research has highlighted that parents in the UK had acute anxieties about the harms of ICT use both in terms of inappropriate materials and excessive screen time (Livingstone et al., 2010). Yet some evidence indicates parents of younger children in the UK are often ineffective in limiting children's ICT use (Marsh et al., 2015). This is in contrast to older children for whom parental restrictions and rules have been shown to be effective (Livingstone et al., 2010). In the UK , e-safety appears to be an issue for families to deal with on an individual basis. In Finland, however, parents tended to agree collective rules for children's use of ICT with neighbours, which meant that children were less likely to attempt to circumvent the rules (Chaudron et al., 2015).

2.2.6 Social justice and children's home digital practices

The digital landscape is not culturally, socially or politically neutral and digital technology is accessed and taken up in diverse ways, some of which are related to or may exacerbate inequities within society (Marsh et al., 2015). It may appear that access to digital devices is becoming the norm for most children at home, but individuals and groups will access them and use them in ways shaped by a range of factors. These factors include societal and culturally-based expectations and interpretations of the purposes of children's digital engagement and parents' attitudes towards and own uses of digital technology (Mascheroni, 2016; Bertolozzi & Lee, 2007). Other factors influencing children's access and use include parents' perception of the need to protect children, balanced against enabling children to learn through taking some risks (Nikken & Jansz, 2014; Plowman & Hancock, 2014). The emphasis on protection is another way in which inequities are experienced and sustained. Livingstone & O'Neill (2014) have argued that only a small proportion of, already advantaged, children are in families which enable them to use the internet for a wide range of interactive, participatory and creative purposes. Children's access to and use of ICT and the internet is also shaped by: parenting styles and views of childhood (Dias, et al., 2016; Nikken & Schols, 2016); views about the value of ICT (Dias et al., 2016; Genc, 2014); gender (Becta, 2008) and socio-economic status (Mascheroni et al., 2016); and children's personal preferences and interests (Burnett, 2016; Mascheroni et al., 2016; Marsh et al., 2015; Stephen et al., 2013).

Research in the UK has highlighted the ways in which inequities related to ethnicity, gender and income are reflected in the access to and use of digital technologies (Stephen et al., 2013). Mascheroni (2016), who conducted research with 70 families in seven European countries, concluded that parents who used ICT themselves, and perhaps could be described as 'techno-enthusiasts', engaged more with their children's online activities irrespective of their background. In contrast, Masheroni (2016) found that for other parents, factors such as family

income impacted negatively on parents' confidence in supporting and scaffolding their child's use of ICT. Children's gendered identities may be apparent in their choices of games. One small-scale research study (Grant, 2010) provided an example of a six year old girl wanting a pink iPod and enjoying 'princes games' or 'fairy games' in contrast to slightly older boys (aged eight and nine) in another school who enjoyed playing war games. The author highlighted that the boys' choice of games, whilst possibly an expression of their gendered identity, needs also to be understood in the context of family and community concerns and experiences, as many of the children's parents in this school were in the armed services. Whilst game choice in itself may seem innocuous and unlikely to lead to inequities, it is worth considering how, for example, girls' engagement with particular virtual worlds facilitate opportunities for them to form and perform aspects of their gendered identities with little scope for explorations of different ways of 'being' (Marsh, 2008).

In looking at children's home practices, the NP3 project adopted a qualitative rather than quantitative approach as it aimed to collect data on children's home digital practices (RQ1) that would lend themselves to fine-grained analysis and a more nuanced understanding of how children engaged with ICT within the social and cultural context of their family and local community.

2.3 ICT in primary schools

2.3.1 Current context

The demise of Becta, the removal of the Harnessing Technology Funding, and the disapplication of the Programmes of Study for ICT in 2010 all suggested a reduction of importance of ICT in schools within the constitutive order. The subsequent focus on Computer Science within the New National Curriculum, and reduction in scope for using ICT across the curriculum added to concerns about the role of schools' in developing children's digital wisdom (see http://edfutures.net/PeterT%27s_bliki for an analysis of the changes to the educational ICT landscape in England between 2010 and 2013).

However, the new National Curriculum for Computing states one of its aims as being to "ensure that all pupils … are responsible, competent, confident and creative users of information and communication technology" (DfE, 2013, p.178). There has also continued to be considerable investment in ICT in schools; for example, Coughlan (2016) stated that the annual spend on ICT in UK schools was £900million and quoted the British Educational Suppliers Association (BESA) as identifying that schools had £619million in their current budgets for ICT, with an additional £95million for software and content. However, there is evidence to suggest that some schools have not made the best use of resourcing for ICT. For example, Caroline Wright, director general designate at BESA commented that "it is certainly true that there have been many unwise investments in technology" (Paddict 2015). The OECD (2015) found that:

> These findings, based on an analysis of PISA data, tell us that, despite the pervasiveness of information and communication technologies (ICT) in our daily lives, these technologies have not yet been as widely adopted in formal education. But where they are used in the classroom, their impact on student performance is mixed, at best. In fact, PISA results show no appreciable improvements in student achievement in reading, mathematics or science in the countries that had invested heavily in ICT for education.
>
> As these results show, the connections among students, computers and learning are neither simple nor hard-wired; the real contributions ICT can make to teaching and learning have yet to be fully realised and exploited.
>
> (OECD, 2015, p.15)

2.3.2 ICT use in primary schools

In contrast to research literature on children's home digital practices, there is an extensive body of research literature looking at digital technology use in education, spanning more than 30 years, which NP3 built upon. This included research about mobile devices in schools, which started with laptops (e.g. Robson, Wagstaff, & Watson, 1990; Passey, Steadman, Hutchison, Scott & Forsythe, 1999), and progressed through early work on Tablet PCs (Twining et al., 2005; Twining & Evans, 2005), to research on Tablets (e.g. Falloon, 2015; Kucirkova, Messer, Sheehy, & Fernández-Panadero, 2014; Kucirkova, Messer, Critten & Harwood, 2014; Passey, 2010; Passey and Zozimo, 2015). Twenty-two case studies in England, known as the Vital Studies (Twining, 2014c) and 13 similar studies in Australia, known as the Snapshot Studies (Clark, Twining & Chambers, 2014; Fluck & Twining 2014; Jamieson-Proctor, Redmond, Zagami, Albion & Twining, 2014; Maher & Twining, 2016; Newhouse, Lane, Cooper & Twining 2014) looked more broadly at digital technology strategies in schools (e.g. 1-to-1 computing and Bring Your Own Device (BYOD)) and associated pedagogical developments (e.g. digital leaders; flipped classrooms).

A major focus within the literature has been on the impacts of digital technology use in education. However, the research evidence about the impact of digital technology on learning and teaching is at best equivocal (Luckin et al., 2012). There are a number of reasons for this.

Firstly, identifying the impacts of the use of digital technology on learning outcomes is problematic (Twining et al., 2006). In part this is because demonstrating this causal relationship is not straightforward, because it is impossible to control all of the variables (Higgins, Xiao & Katsipataki, 2012; Passey, 2014a). For example, data from Vital Study 3 showed that following the introduction of mobile devices (iPods in 2009 and iPads in 2012) students' GCSE pass rates in one school nearly doubled, with 97% of students achieving 5+ A* to C in 2012. However, it also indicated that the school moved from a dilapidated old building to a new state of the art facility in October 2011, which was accompanied by a range of other changes (e.g. new school uniforms, extensive professional development for staff, updated school policies and practices, etc.). In such circumstances, it is impossible to attribute a causal link between the introduction of the mobile devices and the GCSE improvements. Unlike most research in this area, which treats mobile devices as a variable, NP3 attempts to situate the use of mobile devices in an understanding of the diverse digital activities that pupils engage in and the mediational influences of these and of institutional practices to consider how these enable and or constrain teacher and pupil agency in school-based activities where digital technology is used.

Secondly, the literature tends to focus on using standard forms of assessment to identify the impact of digital technology use on learning outcomes. However, these standard metrics are unable to capture many of the learning outcomes that digital technology use may support (ETAG, 2015; Luckin et al., 2012). This was evidenced in Vital Studies 3, 5, 9 and 16, in which staff identified that there was a mismatch between the collaborative, project based and/or independent learning being supported by mobile devices in their schools and the learning that is assessed in national examinations. The assumption that there is only one kind of knowledge enshrined in psychometric perspectives underpinning national assessment regimes is at odds with a sociocultural epistemology which requires an expansion of what is recognised as epistemic and within that, recognition that individual and collective explicit and tacit knowledges are distinct forms of knowledge which do different epistemic work (Elwood & Murphy, 2015). A further issue is whether a view of learning as leading to outcomes is an appropriate way of understanding learning in digital activities outside of school settings where both knowledge as epistemic tools and knowing, that is the epistemic work done as part of action (individual and group) matter. To understand this requires understanding what digital knowledge children have, and use and what they 'do' and do well as they participate in digital activities of their own choosing (Cook & Brown, 1999).

Thirdly, demonstrating the impact of digital technology in education is complicated by the fact that what works in one situation may not work in another (Zammit, 1992). This is perhaps not surprising as teachers may implement uses in quite different ways, even though affordances are common, and the effects of digital technology depend upon how the technology is used (Wegerif, 2003) and the possibilities for new action that this creates. Thus, the only robust conclusion one can draw based on the literature is that specific technologies can enhance learning if used in specific ways in particular settings (Moseley et al., 1999; Passey, 2014a).

Twining et al. (2006) argued that we need to re-evaluate the research questions we ask and what we attend to and the tools we use to collect evidence to understand digital technology use in education and how it impacts on children and their learning. NP3 moves forward from this to examine the use of mobile devices in the home and in school with a particular focus on the activities that are engaged in and their potential for digital learning, the affordances perceived and taken up in schools' and teachers' practices and whether these have resulted in opportunities for innovative and inclusive pedagogic practice. To understand the presence or absence of innovation this research considers some of the influences that mediate this potential by adopting a sociocultural view of context.

Research into the role of teacher identity in the pedagogic use of ICT in schools, suggests that teachers' orientations towards ICT and beliefs about their own capability with ICT play a key role in the extent and nature of ICT use within classrooms. This research argues that school leaders need to develop their school vision with teachers and to factor their ICT identities into actualizing the vision (Abbott, 2016; Hatlevik, 2016; Mertala, 2017). Other research has highlighted some unexpected patterns in teachers' practice in relation to teachers' identities.

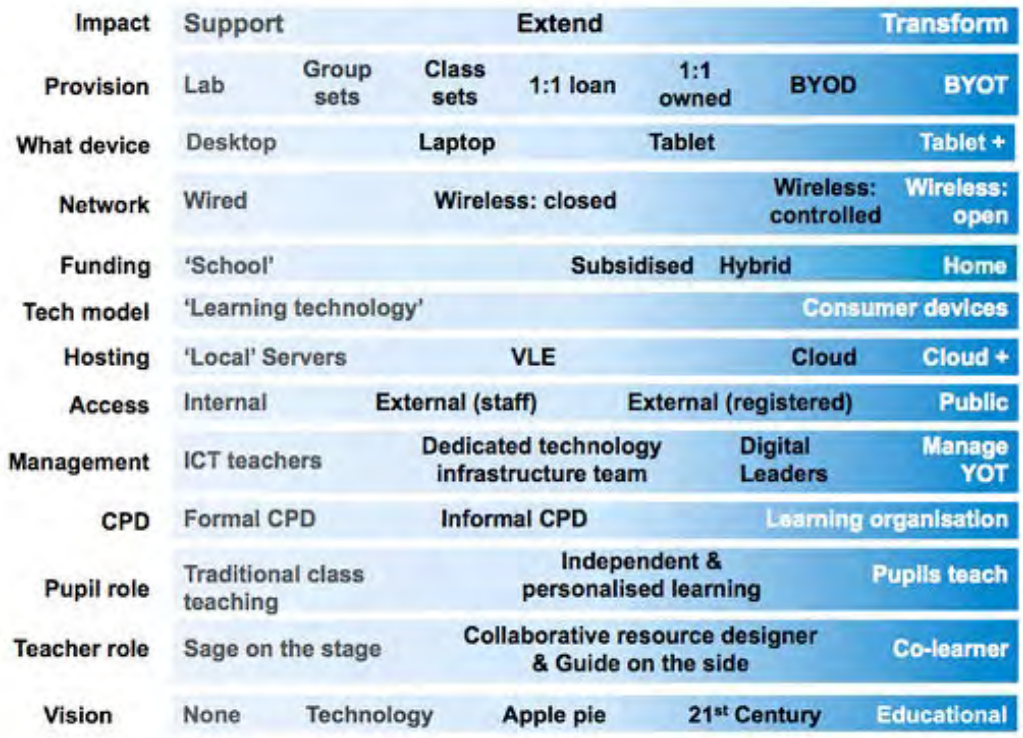
Project Tomorrow (2016) found that just over a third (34%) of teachers in their first year of teaching view themselves as having 'advanced' ICT skills compared with 27% of teachers with 11 years or more teaching experience. However, teachers in their first year of teaching were less likely to use digital games or create investigations for pupils using digital tools, in addition to being less likely to use ICT for reviewing pupils progress, differentiating lesson content, facilitating pupils learning through collaboration and using an online curriculum (Project Tomorrow, 2016). These research findings highlight the possibility that teachers' identities and their enacted practices within the classroom are mediated by additional factors such as the content of initial teacher training courses.

A pre-cursor to identifying new practices is being able to describe practice, so that one can compare practices in different institutional and classroom contexts over time. Meta-analysis of the literature and data from the Vital and Snapshot Studies resulted in a framework for describing practices related to digital technology use in schools (Twining, 2014d). This is illustrated in Figure 2.3.1, in which each row represents a dimension of practice made up of a number of categories. The Impact dimension, which is taken from the Digital Technology Impact Framework (Twining, 2013), has three categories related to the impact of digital technology use on teachers' practices:

Support	Teaching is more efficient and/or effective but what and/or how the children are taught is fundamentally unchanged
Extend	What and/or how the children are taught are different, but these changes *could* realistically have taken place *without* digital technology
Transform	What and/or how the children are taught are different, but these changes *could only* realistically have taken place *with* digital technology

Descriptions of each of the other dimensions/categories of the ICT dimensions of practice are provided in Twining (2014d).

Figure 2.3.1 Overview of the ICT dimensions of practice from the Vital and Snapshot Studies (Twining 2014d)



This framework and subsequent extensions to it (Twining et al., 2015) focus primarily on facets of digital technology infrastructure. However, the research upon which it is based highlighted a number of findings related to changing pedagogy, changing pupil digital practices, and the blurring of boundaries between school and home. Specifically, the research provided evidence:

- to support the view that the introduction of mobile devices facilitated and amplified, changes in existing pedagogical practices, where those were aligned with the school's overall philosophy and educational vision (Clark, Twining & Chambers, 2014). For example, one primary school teacher commented:

  > The way I approach my teaching hasn't changed. But it's the tools it's the tools that I've got at my fingertips that have really changed. … I mean it's a constructivist approach {Yeah}. That's never changed for me but I can do it to a greater, it's constructivism on steroids.
  >
  > (Snapshot Study 8, Teacher interview)

- of a shift from using digital technology to present information to pupils, to pupils using mobile devices to find and represent information, often using multiple media (Passey, 2010; Twining et al., 2015)

- of enhanced collaboration and communication between pupils (Naylor & Alvarez-Hevia, 2013; Passey, 2013; Maher & Twining, 2017), including younger children talking and discussing with their peers when using open-ended iPad apps (Kucirkova, Messer, Sheehy & Fernandez-Panadero, 2014)

- of pupils being given responsibility for teaching other pupils either directly (e.g. showing them how to operate some software) (Murray, 2013) or indirectly (such as in Snapshot Study 7 where children in Year 6 created multimedia books for children in Year 1; Snapshot Study 8 where pupils created multimedia artifacts to explain aspects of science, which were then used by the whole class)

- that where pupils felt ownership of their mobile devices this enhanced their independence (Clark & Svanaes, 2014; Reeve, 2014) including in terms of more spontaneous use of tablets, apparently due to factors such as their size, rapid booting, and long battery life (Freedman, 2013)

- of changes in assessment emerging, including: teachers providing formative audio feedback; peer-peer assessment; and a focus on assessment of process as well as content (e.g. Maher & Twining, 2017)

- of pupils using their devices to enable them to abstract and project meanings through creating reifications that demonstrate learning through their participation, and make it available for collective learning, for example creating a video to explain planetary motion then evaluating and refining their explanation (Maher & Twining, 2017)

- of changes in 'off-task behaviours', for example, pupils' in Snapshot Study 9 claiming that they were 'flipping the classroom' (in that they were spending class time socialising and claimed that they would complete the class work when alone at home[4])

- that some pupils were much more engaged in school work, evidenced by them spending more time on tasks set by the teacher (outside school time) and producing a higher quality of work (e.g. Snapshot Study 7, unpublished). This reflects fairly consistent evidence that use of mobile devices enhances pupils' motivation and engagement (e.g. Argueta et al., 2011; Bebell & O'Dwyer, 2010; Clarke, 2012; Clark & Svanaes, 2014; Fluck, 2011; Heinrich, 2012; Twining et al., 2005; Passey & Zozimo, 2015)

[4] This is not how flipped classrooms would normally be defined.

- of parents knowing more about what their children were doing in school, through having better access to their children's school work (Passey, 2010; Naylor & Alvarez-Hevia, 2013)
- of pupils bringing multimedia artifacts that they had created at home as part of their informal learning into school to share with peers and teachers (Passey, 2010; Maher & Twining, 2017)

- of teachers being aware that their pupils' practices and competences were changing outside school, although they rarely capitalised on this inside school other than in terms of using pupils to provide technical support (e.g. Maher & Twining, 2017)

In addressing Research Questions 1 and 2 (RQ1 and RQ2) this study goes beyond the ICT dimensions of practice framework (Twining 2014d) to develop richer accounts of the digital practices that pupils bring to their learning in school (RQ1) and teachers' intended and enacted pedagogic practices across subject domains (RQ2), enabling more systematic analysis of how pupils' digital practices are recognised and valued by teachers (RQ2). It also addresses one of the limitations of much of the research about mobile devices in schools, including the Vital and Snapshot studies, which is that it focuses on contexts in which mobile devices have been introduced relatively recently. This is important if, as seems likely, "long-term use of the tablet has a profound effect on pedagogy" (Clarke, Svanaes & Zimmermann, 2013 p.2).

2.3.3 Institutional circumstances and the impact on ICT use in schools

The literature on the use of digital technology in education is replete with information about barriers to and facilitators of effective implementation. For an example of guidance for schools thinking about implementing a 1:1 or BYO mobile device strategy, based on a review of the literature combined with meta-analysis of the Vital and Snapshot Studies, see Twining (2013a).

Despite the availability of this extensive guidance on the implementation of digital technology in education, schools have continued to struggle with its effective deployment and use. Based on a literature review and over 60 interviews with senior leaders and ICT coordinators in schools about the implementation of the government's e-strategy, Twining et al. (2006) concluded that:

> the major issues concerning the organisations in our sample related to management of change issues rather than to technological ones. …
> The findings presented here reinforce the existing literature on the implementation of ICT in education. Their importance comes not from their originality but from the fact that, despite our having been aware of them for several decades, our interviewees still saw them as representing the most significant problems that we need to overcome in order to bring about the changes envisaged in the e-strategy.
>
> (Twining et al., 2006, p.65)

Failure to embed ICT in pedagogy may be attributable to regulatory frameworks and the education policies from central government rather than a resistance on the part of teachers to embrace new technologies (Somekh, 2008). More recent evidence (e.g. Flewitt, Messer & Kucirkova, 2014; Kucirkova, 2014) shows that many of the same issues persist in relation to the implementation of mobile device strategies. There is a range of possible explanations for why this is still the case, from schools failing to learn from the existing knowledge base, through to problems with the theoretical underpinnings of the research (such as an assumption that 'effective practice' in one setting can be transferred unproblematically to another setting).

The NP3 research helps to ameliorate at least some of these issues, through the provision of theoretically informed applied research. NP3's findings have relevance across contexts that are similar to our study sites.

2.3.4 Social justice and ICT use in primary schools

Existing studies on the use of mobile devices in teachers' and learners' practices are also limited in relation to the sociological aspects of practice, particularly in relation to educational social justice. Little is known about the digital learning practices of learners who are disadvantaged and marginalised and how their teachers respond to this. Children's ethnicity and social class are known to be the most significant predictors of inequality in educational outcomes (Francis, Skelton & Read, 2013; Rollock, Gillborn, Vincent & Ball, 2014). Understanding children's identities also requires an understanding of the diverse funds of knowledge of children's families and communities and how children actively use these funds of knowedge to develop their identities (Esteban-Guitart and Moll, 2014). These understandings will enable new digital practices to disrupt the role of pedagogy in producing educational inequalities and ensure that they are inclusive of all learners.

In sociocultural theory as in constructivist and social constructivist theories, agency is central to learning in that learners actively engage in processes of knowledge construction and meaning making with the support of teachers (Bruner, 2000). What is different in sociocultural theories is how individual agency is understood to be enacted and enabled. The self in sociocultural theorising is a relational self as autonomy is achieved by building relationships with others (Boreham & Morgan, 2008); thinking is inherently shared rather than taken-as-shared (Roth & Radford, 2011). Dialogue is therefore a foundational process for learning (Freire & Macedo, 1995; Mercer & Littleton, 2007). This raises questions about the role of mobile devices in enabling pupils to collaborate and negotiate understandings and to create common knowledge objects which enable children's agency, and fosters active citizenship and social justice (Hempel-Jorgensen, 2015). This is important in English schools where research into pedagogic practice finds learners placed in a passive position, in schools with high proportions of working class children (Hayes et al., 2009; Lupton & Hempel-Jorgensen, 2012). The dominance of individualised performative practice - a 'pedagogy of poverty' (Haberman, 1991) - is frequently identified in research on disadvantaged learners (see also Hayes, Johnston & King, 2009; Lupton & Hempel-Jorgensen, 2012; Hempel-Jorgensen, 2009; Thomson, 2002). This is often a response to the pressure to improve low attainment, resulting in a pared-back curriculum and a strong focus on discipline (Hempel-Jorgensen, 2009). There is emerging evidence from the Learner Agency in Disadvantaged Urban Primary Schools project at The Open University (funded by Society for Educational Studies) that use of iPads in lessons increases socio-economically disadvantaged learners' agency and engagement with learning (Hempel-Jorgensen, 2015). Research with children living in poverty in Australia (Munns, Sawyer & Cole, 2013; Orlando, 2013) found that teachers using particular strategies with digital technology, for example positioning teachers and learners as equal users of digital technology, and enabling learners to work collaboratively as a learner community, increased disadvantaged learners' engagement with learning on intellectual and affective levels.

Other research (Ivinson & Murphy, 2007; Murphy, 2000) looks at how subject knowledge construction is mediated in classrooms on the basis of signs of identity extended and taken up or resisted. This provides a complementary theoretical perspective on learning (Wenger, 1998; Holland et al., 1998) and methodology (Rogoff, 1995) that informs the study about questions to ask, observations that are salient and practices that enable or disempower in the ways that different pupils' knowledge and expertise is ceded authority and rendered visible or invisible. In this approach the study rejects essentialist positions constructed through normative performance metrics (Murphy & Ivinson, 2004; Gipps & Murphy, 1994) and is mindful of similar associations of value accorded by teachers often unconsciously to the digital practices and expertise that pupils bring with them from their membership in other communities (Littleton, 1996). Consequently, the study framed all learners as knowledge producers and diversely knowledgeable.

In problematising sub-groups, the NP3 research adopts the view of social justice as non-distributive, challenging the assumptions of equality of access underpinning distributive justice within a meritocratic view of society (Boyles, Carusi & Attick, 2009). Distributive justice assumes learning is purely an epistemological problem concerned with 'the conceptual–mental rather than the social-material side of human being' (Lave, 2008, p.3), locating marginalisation in the individual; 'marginal' people become responsible for their marginality.

Learning understood as a fundamentally social process and knowledge as a matter of competence with respect to valued enterprises, such as critical digital literacy, aligns with the notion of education being for the formation of human capabilities that enable particular freedoms (Sen, 1993). Knowing is a matter of participating in the pursuit of such valued enterprises and social participation is simultaneously a process of learning and knowing (Wenger, 1998, p.4). This means that for the use of mobile devices to be successful in enabling all learners to exercise agency, all children's funds of knowledge (Gonzalez, Moll and Amanti, 2005) and digital practices need to be valued within learner communities in schools. This requires building positive relationships to underpin pedagogies of mutuality between teachers and learners (Bruner, 1996; Alexander, 2000; Murphy & Wolfenden, 2013). Such relationships may require trust and respect for children to take an "equally important role [to teachers] as users of mobile devices in the classroom" (Orlando, 2013, p.141). It is likely that there are challenges associated with valuing children's funds of knowledge and digital learning practices outside of school as learning resources, as these may not be seen as commensurate with the outcomes the English National Curriculum requires children to achieve. However, due to the greater sense of alienation and disengagement with school that many disadvantaged children experience (Francis & Mills, 2012), and the evidence of teachers' perceptions of disadvantaged children and their more negative relationships with them, their practices and knowledge may be even less likely to be recognised and valued in school (Lupton & Thrupp, 2013).

A sociocultural perspective assumes a significantly different epistemology to that of psychometric, constructivist discourses and approaches that underpin current models of assessment. The research recognises the potential of the use of mobile devices to make more visible what learners know how to do, which is not reducible to forms of knowledge reified in current assessment metrics but requires understanding of the epistemic work done by human action (Elwood & Murphy, 2015). To bring together notions of individual and collective action and to begin to expand what is understood as epistemic requires in addition an epistemology of practice. Hence there are two dimensions that are 'mutually enabling': the distinct forms of knowledge used in action which are typically assessed, and knowing as 'part of action' which typically are not assessed (Cook & Brown, 1999, p.53). From a formative assessment perspective, it is the interplay between these dimensions, mediated by mobile device use, that is potentially generative and it is within this that formative action is enabled. For summative assessment metrics, it suggests a need to consider ways of valuing achievements related to digital wisdom but also and importantly to recognise how such literacy is embedded in children's performances or 'ways of doing' (Lankshear & Knobel, 2006).

2.3.5 Innovative pedagogies

As noted above, whilst pupils do appear to be developing new digital practices outside of school, this does not appear to be valued within schools. This divide between how learning happens in outside-school and inside-school settings is problematic; changing pedagogy to capitalise upon pupils' new digital practices is important to enhance learning in the classroom (Gurung & Rutledge, 2014). Constructivist pedagogy has highlighted the crucial role pupils' prior learning plays in shaping the possibilities of new learning. To take account pedagogically of pupils' evolving digital practices, the study requires a theoretical approach to pedagogy that gives value to a wider epistemic conception of competency and a concern with not only what pupils know but their histories of participation with mobile devices. That is why RQ5 is so important.

Passey (2014a) called for a rethinking of pedagogy, re-balancing activities across learning settings to incorporate all learning activities. This might be seen as simply asking for a redefinition of the term pedagogy. The term currently suggests a focus on school-based learning activities, with school-specific methods of support, in school settings. There are, of course, problems with simply broadening the scope of pedagogy to include all learning, which is why our focus is on how practices might migrate between different settings where learning occurs. However, Passey is also concerned with 'where learning starts' and who holds the 'power for learning', which reflects our socio-cultural stance.

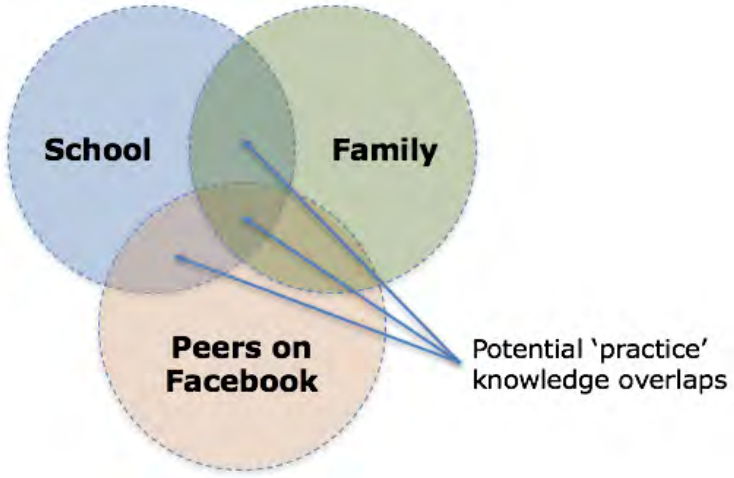
Socioculturalists conceive of learning as a movement toward greater participation in both becoming (competence) and belonging (community identity) (Wenger, 1998). From a sociocultural perspective, differences between informal, non-formal and formal learning relate to distinctions between communities and their purposes or joint endeavours. In school there are communities of learners and communities of teachers. Teachers belong to a community of practice but learners do not belong to a similar community of practice within the classroom as children's motivations, interest and learning trajectories are not aligned. If part of the role of schools is to prepare children for the lives outside school then one of the goal of schools is, or at least should be, the enculturation of learners into domains (subjects) that bridge to activity in the world. Children also learn through 'community activity' (which may be with family or peer group) and which may not necessarily have explicit learning goals, but culturally valued learning occurs through participation in social activity.

A sociocultural perspective therefore highlights the communities in which these forms of learning have been identified – it is all learning through participation in socially productive activity, but the activity and its purpose and hence what is made available to learn and by whom differs (Lave & Wenger, 1991). By considering how people learn in a community foregrounds the purposes and the associated practices and their situated nature and the basis for membership and who holds the 'power for learning'. As Figure 2.3.2 highlights, in schools, pupils can struggle to be extended an identity of legitimate peripheral participation (Lave & Wenger, 1991). In informal settings their participation is negotiated quite differently and they can be quite central participants often as a consequence of being the 'expert' in digital literacy in their family, peer and other social communities. A move by teachers to approaches which involve 'listening to rather than listening for' and which uses dialogue as a way of opening up rather than closing down possibilities may help change the nature of teacher-pupil relationships and enable more participatory pedagogies (Barrow, 2015). It is the potential overlap in terms of digital practices and expertise between the boundaries of the different communities that pupils are members of that the study is interested to explore, in asking how the overlap is perceived, brokered and enacted by pupils and by teachers.

In exploring (RQs 1-3) this overlap, where productive affordances between community practices and purposes might be realised, the study considers:

- Is there an overlap and what practices and purposes exist for pupils and for teachers?
- What is the potential overlap to be realised from what pupils, parents and teachers tell us about the changes in digital practices there are, i.e. both new practices that can be leveraged for formal learning and lost practices that can be revitalised?
- What is observed in practice, i.e. what do teachers and pupils do and what does this imply about the pedagogic movement that has occurred that needs to be supported?

Figure 2.3.2 Diagrammatic representation of three potential communities



From this perspective, pedagogy is the theorising about how people learn that is deployed in the community of practice of teachers supporting learning. RQ5 is therefore about how valued knowledge in communities of practice that are seen as non-formal or informal can be recognised and become valued in the community of practice of teachers supporting learning (i.e. on pedagogy/formal education). It requires teachers to develop both meta-cognition and social metacognition capabilities (Chiu, 2013; Law, 2008) in order to develop innovative pedagogies. This also encompasses issues about where learning that is valued in the school ('formal') arena is initiated and transacted, and who controls its initiation and transaction.

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3 Methodology

The project evolved through three phases:

- Phase 1, set out to identify schools that were considered likely to provide rich sources of data related to our research questions, in terms of the depth of evidence they would provide from a range of participants, and were willing to take part in our Exploratory Studies.

- Phase 2, involved ten Exploratory Studies, which were intended to: enable us to refine our data collection techniques; ensure we had a shared understanding of the sociocultural framework underpinning the research; identify schools in which we could collect further data; as well as providing initial data to inform our research questions.

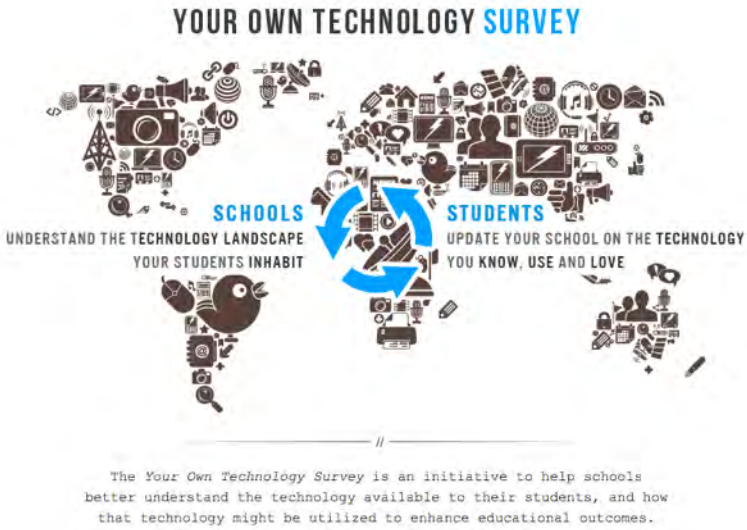
- Phase 3, involved seven schools, in which we collected data to inform our research questions, in the light of our learning from the Exploratory Studies.

The methodology used in each of these phases is briefly outlined below (supplemented with material on the EdFutures.net website – http://edfutures.net).

3.1 Phase 1 – Identifying Exploratory Study schools

Phase 1 started in June 2015 and ended in September 2015.

The initial criterion for selecting schools to take part in NP3 was that they had embedded extensive use of mobile device within their practice. This was based on the claims (reported in the Introduction and Literature review) about the impact that mobile devices, and in particular 1-to-1 or Bring Your Own (BYO) strategies, were having on the relationships between home and school. In order to ensure that the data collection would address all of the research questions the following additional criteria were also specified:



Selected schools should span:

- Socio-economic status of catchment area/intake (e.g. low and higher socioeconomic intakes), specifically to help address RQ4

- Geographic area of the United Kingdom (UK)

- School types (e.g. community/academy/independent, infant/junior/primary, mainstream/special, mixed gender/single gender, etc.)

- Ages of learners

Two key strategies were employed to identify schools that met these criteria. Firstly, Naace, the subject association for ICT in schools, were subcontracted to recruit schools to respond to the Your Organisations Technology Strategy Survey (YOTS2). YOTS2 was designed to collect data about schools' ICT strategies, with a particular focus on the degree to which they were integrating the use of mobile devices. Secondly, the researchers used their social networks and personal contacts to identify potential participant schools. For each potential school that was

identified, additional information was collected about their suitability, from their website and by making personal contact via email and/or phone.

In practice, the number of schools that were identified that met the original criteria and were willing to take part in the research was very limited. This led to two changes in the methodology. Firstly, the initial criterion was loosened in order to include schools that made more limited use of mobile devices than had originally been intended, but overtly claimed that they advocated learner agency and/or were implementing innovative pedagogy supported by ICT use. Secondly, the original plan to collect data in one class in each of twenty schools was changed to involve data collection in two classes in each of ten schools. Ultimately, none of the potential schools that were identified in Northern Ireland or Wales agreed to take part. Table 3.1.1 provides a summary of the Exploratory Study schools.

Table 3.1.1 Overview of the Exploratory Study schools

Name	Type	Year(s)	'Context'
Camfeld Special	Special school	Year	Urban, West Midlands
Fairfield Lower	Community	1, 2, 3, 4	High socio-economic village, Midlands
Byrne Primary	Primary	P5, P6, P7*	Low socio-economic area of town in rural Highlands, Scotland
Holme Infants	Academy	1, 2	Mainly low socio-economic area of London
Glenville Juniors	Community	6	High socio-economic village, Central England
Villiage Primary	Community	Early Years 3,4,5,6	High socio-economic village, East England
City Primary	Community	2,4,5,6	Mainly high socio-economic area of South West London
Norgate Primary	Foundation	Early Years to 6	Low socio-economic, suburban, Northern England
Highden Primary	Community	3, 4, 5	Low socio-economic, urban, North East England
Coast Prep	Independent girls'	5	High socio-economic, urban, South England

* P5 equates to Year 4, P6 equates to Year 5, P7 equates to Year 6

Collecting data in Camfeld Special School proved problematic, which meant that data were only eventually collected in nine schools.

Ethical approval for YOTS2 and for the Exploratory studies was obtained from the Open University Human Research Ethics Committee (HREC/2016/2252/Twining/1) and subsequently from Lancaster University (UREC ref:S2015/25). Information sheets and informed consent forms were provided for all participants, and where participants were children, for their parents as well. Copies of all the information sheets and consent forms can be downloaded from http://edfutures.net/NP3_Exploratory_Study_data_collection_documents.

3.2 Phase 2 – The Exploratory Studies

Data collection started in October 2015 and was completed by the end of February 2016.

The methodology used was based on the Vital Studies Methodology (Twining, 2014c), which in turn was based on the methodology used in the original Becta tablet PC research (Twining et al., 2005), and was subsequently adapted for the Snapshot Studies (Twining, 2013). Table 3.2.1 provides an overview of the data collection model.

Table 3.2.1 Overview of the Exploratory Study data collection model

Day 1	**Mins**	**Aim**
Meeting with Facilitator		Confirm schedule/arrangements Collect permission forms
Interview Head Teacher	30	Politeness! School vision/priorities
Tour of the school		To explore the school context
Log briefing, with 4 Log pupils and their 4 carers	30	Explain the Adult Log and Pupil Log Collect permission forms (where necessary)
Interview Facilitator	60	Overview of pedagogical context
Pre-observation interview Teacher A	60	Explore perceptions of RQ1 Explore RQ2
Observation of Teacher A and 6 Focus group A pupils	60	Observe practice in school (RQ2)
Debriefing interview Teacher A	15	Debrief following observation. Probe how typical lesson was for her/compared with colleagues - RQ2
Post-observation interview with 6 Focus group A pupils	60	Explore ICT use in school Pupil perceptions of the observed lesson (RQ2)
ICT Coordinator	15	Explain ICT Coordinator questionnaire
Between school visits	**Mins**	
Initial analysis of data		To identify areas where further data were needed
Digital logs compiled by 4 Log pupils and their 4 carers		To log the child's digital practices outside school using digital cameras provided by NP3 (RQ1)
Teachers A and B complete their questionnaires		To provide additional information about the teachers and how they use ICT (RQ2)
Other teachers complete the staff questionnaires		To provide additional information about the teachers and how they use ICT (RQ2)
ICT Coordinator questionnaire		To provide data about ICT provision within the school
Day 2	**Mins**	
Individual interviews with each of the Log pupils	30 each	To describe the home context and the child's digital practices outside school (RQ1)
Individual interviews with each of the carers	30 each	To describe the home context and the child's digital practices outside school (RQ1)
Pre-observation interview Teacher B	60	Explore perceptions of RQ1 Explore RQ2
Observation of Teacher B and 6 Focus group B pupils	60	Observe practice in school (RQ2)
Debriefing interview Teacher B	15	Debrief following observation. Probe how typical lesson was for her/compared with colleagues - RQ2
Post-observation interview with 6 Focus group B pupils	60	Explore ICT use in school Pupil perceptions of the observed lesson (RQ2)
Group interview with other teachers (who were not observed but filled in questionnaires)	30	To gain additional information about school context and how the teachers use ICT (RQ2)

The data collection was undertaken by members of the core team, supplemented by additional staff (see Table 3.2.2).

Table 3.2.2 Details of the Exploratory Study researchers

Name	Background	Schools
Peter Twining	Professor of Education, The Open University. Ex primary school teacher. Extensive research experience with ICT in education	Glenville Juniors
Amelia Hempel-Jorgensen	Research Fellow, The Open University. Specialising in learner agency, pedagogy and social justice	Holme Infants, Villiage Primary, City Primary
Fiona Henry	Lecturer in Education, The Open University. Ex secondary mathematics specialist. Extensive experience with ICT in education	Byrne Primary
Julia Gillen	Senior Lecturer in digital literacies and Director of the Literacy Research Centre, Lancaster University	Northgate Primary, Highden Primary
Felicity Fletcher-Campbell	Senior Lecturer, The Open University. Specialising in inclusive education	Camfeld Special
Saraswati Dawadi	PhD student, The Open University	Fairfield Lower
Els De Geest	Consultant. Ex secondary mathematics teacher	Coast Prep

Prior to the data collection starting the researchers attended a whole day briefing, in which they explored the sociocultural underpinnings of the project, and worked through the guides that had been provided for each aspect of the data collection.

Copies of these guides can be downloaded from http://edfutures.net/NP3_Exploratory_Study_data_collection_documents.

The data collection methods were designed to provide a rich picture of:

- children's digital practices outside school (RQ1, RQ4)
- the school context, including ethos, priorities, policies, views of 'good practice', etc. (RQ2 and RQ3)
- teachers' and pupils' digital practices inside school (RQ2, RQ4, RQ5)

Inevitably, the data collection varied across the Exploratory Study schools, reflecting the practical realities of conducting research in primary schools.

3.3 Phase 3 – The Case Studies

Data collection started in June 2016 and was completed by early December 2016.

As anticipated, and despite the care taken to select schools that were perceived to be embedding the use of mobile devices in ways that seemed likely to be associated with innovative pedagogy, some of the Exploratory Study schools provided very limited evidence of ICT use in school and/or of opportunities for pupils' digital practices 'outside school' to be recognised within the school. As such they were of limited value in addressing the research questions. Some of these schools sought to position themselves as schools that were developing innovative pedagogy incorporating ICT, but were at the beginning of developing this.

Three of the Exploratory Study schools declined to take part in the case studies, primarily due to changes in staffing (e.g. the head teacher in one of the schools had retired and the head teacher and two key staff in another school were on long term sick or maternity leave).

A number of new schools were therefore identified, through networking activities (e.g. introductions to head teachers of potential schools at conferences where members of the NP3 team were sharing emerging data from the study). The retiring head teacher of one of the Exploratory Study schools provided introductions to a number of other schools in her network who were all seen as being 'ICT leaders'. Three of these schools agreed to come on board, though one subsequently dropped out as they could not accommodate the researchers during the period in which the data needed to be collected. Table 3.3.1 provides an overview of the final seven Case Study schools, and indicates whether they were new to the project or an extension of an Exploratory Study.

Table 3.3.1 Overview of the Case Study schools

Name		Type	Years	'Context'
Stepside Primary	New	Primary	2, 4, 6	Low socio-economic area of North London
Riverview Prep	New	Independent	5, 6	High socio-economic catchment, Rural, East England
Park Primary	New	Academy	3, 4	Low socio-economic urban, West midlands
Highden Primary		Community	3, 4, 6	Low socio-economic urban, North East England
Northgate Primary		Foundation	Foundation 6	Low socio-economic suburban, Northern England
Holme Infants		Academy	1, 2	Mainly low socio-economic area of London
Keyston Primary	New	Community	5, 6	Low socio-economic urban, South of England

The Exploratory Studies also highlighted ways in which the methodology needed to be strengthened for the Case Studies. Firstly, there was inconsistency in the richness of the data collected across the Exploratory Study schools, at least partly due to differences in constraints in individual Exploratory Study schools. Thus, for example, one researcher made extensive video recordings of all observed 'lessons' as well as audio recording all interviews and discussions (such as during the school tour), whilst, at the other extreme, another researcher relied primarily on field notes and still photographs of observed 'lessons'. Secondly, there were differences in foci between researchers, which seemed to reflect differences in understanding of ICT practices and/or the primary school context and/or of the sociocultural framing of the project. Thus, for example, some researchers probed deeply to understand the subtleties of the school context and/or aspects of practice, trying to unpick why and how particular practices were enacted, whilst others focussed more on the more explicit aspects of practice.

This led to changes in the research team, a decision to ensure that wherever possible two researchers were involved in data collection in each school, and additional support for researchers (e.g. shadowing a more experienced researcher before undertaking their own data collection). Table 3.3.2 provides information about the researchers and in which Case Study schools they collected data.

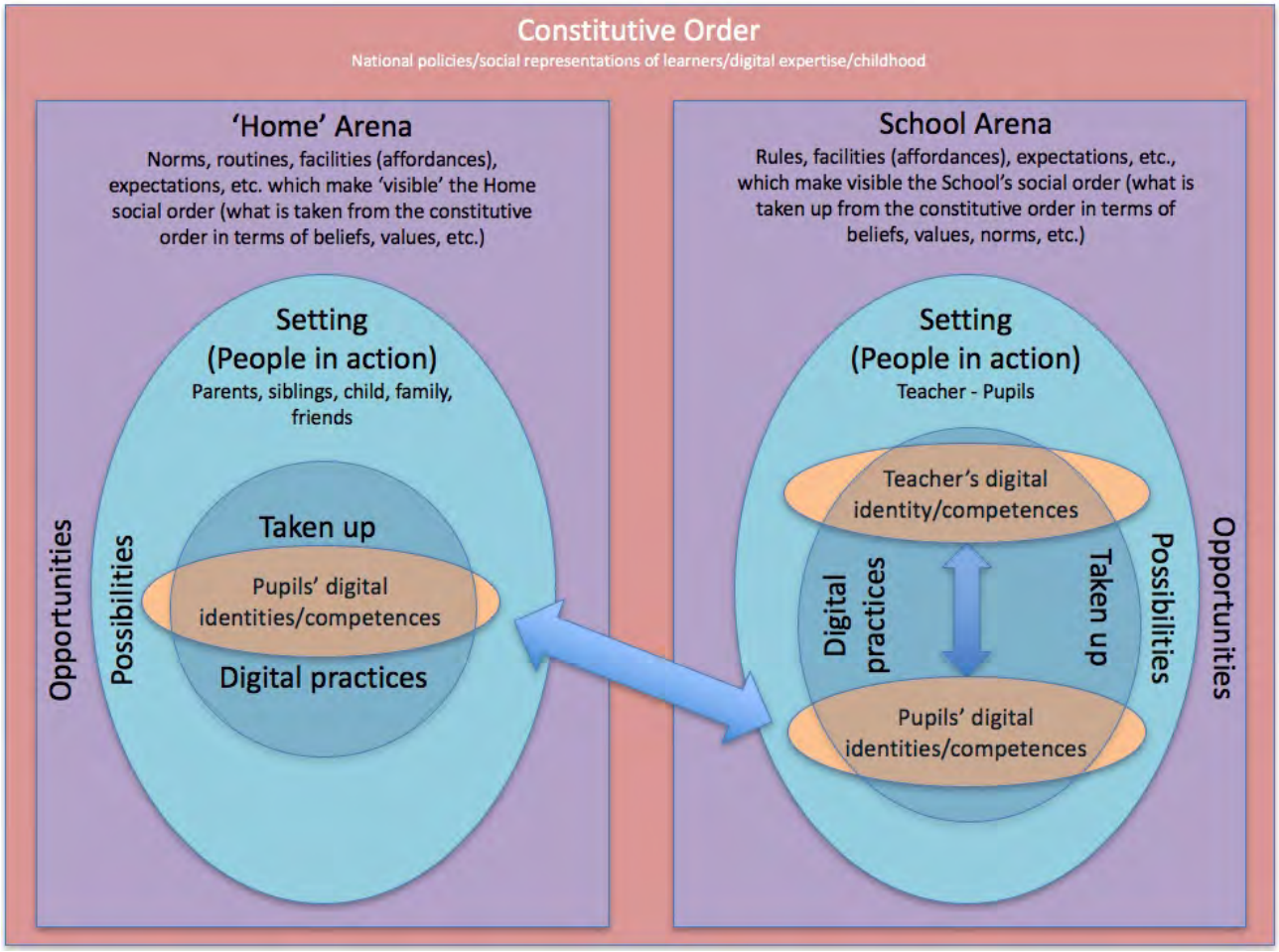
Table 3.3.2 Details of the Case Study researchers

Name	Background	Schools
Peter Twining	Professor of Education, The Open University. Ex primary school teacher. Extensive research on ICT in education	Stepside Primary, Riverview Prep & Keyston Primary
Neelam Parmar	Director of E-Learning, Ashford School	Riverview Prep
Amelia-Hempel Jorgensen	Research Fellow, The Open University. Specialising in learner agency, pedagogy and social justice	Holme Infants & Keyston Primary
Fiona Henry	Lecturer in Education, The Open University. Ex secondary mathematics specialist. Extensive experience with ICT in education	Park Primary
Steve Harrison	Lecturer in Education (Youth work), The Open University. Experience of working with young people outside school and in secondary schools	Stepside Primary, Park Primary & Holme Infants
Julia Gillen	Senior Lecturer in digital literacies and Director of the Literacy Research Centre, Lancaster University	Highden Primary
Natalia Kucirkova	Lecturer, Manchester Metropolitan University, then Senior Lecturer, Imperial College London. Psychology background, with particular interest in Early Years, literacy and ICT	Northgate Primary

Involving a member of school staff in the data collection raised a number of ethical issues. Revised information sheets for participants were developed that acknowledged the potential challenges and tensions that might arise, for example in terms of the extent to which anonymising the data would actual conceal the participants' identities. Ethical approval from the OU's Human Research Ethics Committee was explicitly sought and granted for this change in the research. The power relationships between participants and the researcher, as well as any biases the researcher might bring to the data collection also needed to be taken into consideration throughout the data collection and analysis. It also had implications for the reporting of findings, including, for example, providing the school with the opportunity to review the descriptive vignettes (in Section 5) and add a brief response to them for inclusion in this report.

The team also spent a considerable amount of time clarifying their understandings of the sociocultural framework and explicitly linking the research questions and specific data collection instruments with that framework. A simplified diagrammatic representation of the key elements, from a sociocultural perspective, identifying data needed to be collected, was developed (Figure 3.3.1).

Figure 3.3.1 Simplified representation of the key elements that data needed to be collected about in each case study



The Constitutive order is the broader context within which the participants within the research are situated – as explored in the literature review section of this report.

Each child has a different home arena which consists of the norms, routines, expectations, and facilities available to the child. These 'make visible' how the constitutive order has shaped it through the participants' beliefs, values and interpretations of policies (such as the legal age at which people can use certain apps or watch certain films). The home arena creates (or restricts) the opportunities to learn that are available to the child.

Within the home arena there are people, such as parents and siblings, who interact with the child. They may through their activities and actions involving digital technologies model ways of being, digital identities that the child can by association imagine as future possibilities for herself. They may also provide varying levels of support for different digital activities that the child might want to undertake. Within this context, the child will have views about herself and what it is possible for her to do (in conjunction with others or on her own). The child will take up some of those possibilities if arena practices facilitate this by engaging in activities and associated practices. These might extend the child's digital learning beyond that of other participants, if for example through gaming or social media they engage with communities beyond the family and connect to the know-how and digital wisdom of these communities. All of these elements exist in a dynamic equilibrium, with changes in one aspect influencing (to a greater or lesser degree) other aspects. For example, if a child succeeds in solving a digital problem this may change their perception of their ability to act and increase the possibilities that they perceive to exist for future ways of using ICT.

Similarly, schools are situated within a constitutive order which underpins the policies, rules, norms, values, beliefs and expectations of the school, which make up a school's arena. Schools

will be shaped by the ways in which people take up influences in the constitutive order in various and divergent ways; this will be evident in arena practices and policies and in participants' experience of the school arena. For example, school staff because of their different histories of participation and views of education and their view of digital technology in supporting their professional activity and their pupils' learning will mediate responses to external narratives about ICT. For example, some will be more influenced by narratives about the dangers of screen time and the risks of the Internet, whilst others are more influenced by more positive narratives about the ways in which ICT can enhance learning, or by concerns about doing a disservice to pupils if they fail to equip them to use ICT in a world in which ICT is portrayed as being fundamentally important to employment and economic success (at both an individual and societal level). Thus, some schools will invest in ICT resources whilst others do not; some schools will focus on keeping children safe by restricting access to the Internet whilst others will focus on keeping them safe by providing opportunities for them to experience and learn how to deal with some of the issues that arise as they use the Internet. These influences that shape the practices and structures in schools create (or limit) opportunities for its members. Those opportunities will be perceived differently by different people (e.g. teachers, pupils, parents), reflecting their own identities, and resulting in each individual perceiving different possibilities within the school arena. Figure 3.3.1 inevitably provides a static and simplified view. Teachers' mediation can consolidate arena practices, resist them or subvert them. Children will experience these differences in settings and will appropriate different views of how digital technology is understood and used. In practice, within a school there will be multiple settings. Thus, for example, each teacher will mediate the school arena within their own class, creating different settings within which their pupils operate – what I can do in Ms Smiley's class is not the same as what I can do in Ms Dragon's class. The teacher's digital identities are important here. Ms Smiley may be very kind, but may lack confidence in using ICT and thus restrict its use in her class, whilst Ms Dragon may be very strict, but may be very comfortable allowing children to make extensive use of ICT, going so far as to encourage them to teach her how to solve ICT problems. Layered alongside this is each child's identities, which colour their perceptions of what they can do within their classroom setting (for example). A child's identities within school are not the same as their identities outside school – the way they see themselves and their ability to act may be different in each setting – though how they see themself in one setting may influence how they see themself in another. The teacher's perception of individual children's competence will also impact on what she makes available to the child and thus different children may be provided with different opportunities and will see different possibilities within school.

The research questions address the ways in which the different elements in this framework influence and interact with each other. RQ1 is focussed on children's digital practices outside school (in the 'home arena') and what they bring that might influence practices in school (the blue arrow between the home and school arena). RQ2 is about practices (and in particular pedagogy) within the school (in the school arena), recognising that these may vary across subjects, and the extent to which these are influenced by pupils' digital practices outside school. RQ2 is also concerned with pupils' perceptions of practices (and in particular ICT use) within school. RQ3 is concerned with how the constitutive order shapes aspects of the school arena (and nested within that classroom settings) which impact on the extent to which pupils' out of school digital practices influence pedagogy (teachers' practices in school). RQ5 is concerned with the extent to which the research found evidence of innovative pedagogy, and how that might be explained from a sociocultural perspective. In order to strengthen the methodology, explicit links were made between elements of the framework and individual data collection instruments.

Analysis of the data from the Exploratory Studies also indicated a number of other changes that were needed in the methodology. For example, it became clear that requiring both a child and carer to be interviewed about the child's ICT practices outside school was limiting the children who could be involved. This requirement was therefore changed so that for some children only the child compiled a log and was interviewed about their home context and digital practices. Table 3.3.3 provides an overview of the Case Study data collection model.

Table 3.3.3 Overview of the Exploratory Study data collection model

Key link with framework	Who	What
Home Arena, Taken up/practices	8 Log children	Briefing (30 minutes) to give out digital cameras and explain what they are meant to be recording outside school – audio recorded
Home Arena; People in action/Taken up; Child's digital identity and practices **School** Arena; People in action; Pupil's digital identity and practices		Children record ways in which they use ICT at home
		Individual log interview (60 minutes – may be split across more than one session) – audio record and video examples of child using ICT (which they have reported they do outside school)
Home Arena, identities, Taken up/practices **Home/School** Relationship	4 carers of Log children	Individual carer interviews (45 mins per interview)
Home Children's digital identities **Home/School** Relationship **School** Arena (opportunities) and People in Action (Possibilities/Taken up)	6 pupils from the older year group	Pupil group interview with (60 minutes) – audio recorded
School Arena		Background information from school website, Ofsted reports, and Facilitator
School Arena – generally and then in relation to ICT	Head teacher	Interview (30 minutes) – audio recorded
School Arena - practices and representations		School tour (spend time in as many classes as possible) - audio record and take photos/video
School Arena – vision for ICT, how vision realised, resourcing ICT Coordinator Identity	ICT Coordinator	ICT Coordinator questionnaire
School People in action/Taken up/ICT Practices	Teachers who are not being observed	Staff questionnaire
School Arena; People in Action (Taken up/ICT practices)		Staff interview (60 minutes) – audio recorded
School Arena; People in Action/Taken up (enacted curriculum); Pupils' digital identities and practices	6 pupils in each observed lesson (A and B repeated for each observation)	A: Observation (45 minutes) – video record these 'observed' pupils as part of the lesson. Audio record 'clarification discussions' with pupils during the 'individual/group work' part of the lesson
School People in Action/Taken up (pupils' perceptions of enacted/unintended curriculum, missed opportunities		B: Post-observation group interview (30 minutes) – audio recorded
School Arena; People in action; Teacher's digital identity in school; Teacher's perceptions of pupils' digital identities and practices in school	At least two teachers each of whom were observed three times (A to C repeated for each observation)	Initial teacher interview (60 minutes) - audio recorded
School Arena (information about the class); People in Action (intended curriculum); Pupils' digital identities and practices inside school (Teacher's perceptions)		A: Pre-observation interview (30 minutes) – audio recorded, collect lesson plans etc.
School Arena; People in Action/Taken up (enacted curriculum); Pupils' digital identities and practices		B: Observation (45 minutes) – video recorded
School People in Action/Taken up (intended/enacted/unintended curriculum, missed opportunities); Teacher's perception of pupils' digital competences		C: Post-observation interview (30 minutes) – audio recorded, collect samples of work etc.

Where a school had taken part in an Exploratory Study then the overall number of participants, interviews and observations (combining those from the Exploratory Study with those for the Case Study) should have been as shown in the model. Inevitably, there were variations in the data collection across schools in practice, due to on the ground realities (e.g. a child being ill or forgetting their digital camera). In particular, where very young children were involved, the nature of the data collection was changed to be more focussed on talking with them and video recording them as they engaged with activities within the classroom context rather than having discrete interviews. These conversations were usually short and on a one-to-one basis while the child was engaged in the activity being observed. This was in recognition that young children may prefer to be active while conversing with the researcher and that formal group interviews are less likely to be successful with very young children who are unlikely to be used to this format of interaction (Einarsdottir 2007).

Interviewing children raises epistemological issues around how children's accounts are understood and valued as data in comparison to adults' accounts. From a developmental psychology perspective, children's accounts may be seen as less reliable than adults whereas in the sociology of childhood perspective, children are seen as equally competent to adults in constructing accounts of their experiences (Christensen & Prout, 2005; Greene & Hill, 2005). This project takes the latter perspective on data from children's interviews and treated these in the same ways as that developed in interviews with parents and carers. This includes very young children, in the early years settings that were participants in the study (Einarsdottir 2007).

In constructing data with children during the interviews, the researchers needed to be conscious of the child's expectations of them as an adult within the school arena (Hill, 2005). While they may not have been seen as teachers, there was still a power imbalance as the researchers access to children within the school was facilitated by teachers and the researchers were still positioned as adults in relation to the children. This power imbalance was to some extent redressed by interviewing children in a group as children were more able to shape the interview through discussion with each other (Hennessy and Heary, 2005). During the log interviews, children were interviewed individually as the focus was specifically on their practices outside of the school. Because the log children were asked to photograph their home digital practices and the interviews were structured around these, this gave children some influence over the direction the interviews took. In this way, photography as a data collection method empowered children as research subjects through using their digital competences as part of the research process. The researchers also made an effort to not inhabit teacher roles by not directing children during lessons, not expecting children to put their hands up in the interviews and taking an active interest in children's ICT practices outside of school.

As before, a briefing day was held with all of the researchers involved in the data collection to ensure that they had a shared understanding of the underpinning sociocultural framework, the intentions behind each of the data collection methods and instruments, and the need for all observations to be video recorded and all interviews to be audio recorded (with additional video recordings where children were demonstrating how they used ICT). Copies of all the guides provided to the researchers can be downloaded from http://edfutures.net/NP3_Case_Study_data_collection_documents.

Ethical approval for the Case Studies was obtained from the Open University Human Research Ethics Committee (HREC/2016/2252/Twining/1 update). Information sheets and informed consent forms were provided for all participants, and where participants were children for their parents as well. Copies of all the information sheets and consent forms can be downloaded from http://edfutures.net/NP3_Case_Study_data_collection_documents.

Following the guidelines on conducting and reporting qualitative studies, published by the then Co-editors in Chief of Computers and Education (Twining, Heller, Nussbaum & Tsai, 2017), the next section of the report describes and illustrates how data were analysed, prior to sharing findings in Sections 5 to 11.

4 Data analysis

Data collection inevitably involves an element of both 'on the fly' analysis as well as an iteration between reflecting upon data that has been collected and areas where further data is needed in order to fill a gap or answer an emerging question. However, the main data analysis activities took place after the Exploratory Study data had been collected and then again after the Case Study data had been collected. The way in which the data were analysed evolved through these two phases of the project.

4.1 Initial data analysis

Towards the end of Phase 2, once the Exploratory Study data had been collected, individual researchers used an Emergent Theme Analysis (Wong and Blandford, 2002) approach to identify what they perceived as being key themes (related particularly to RQs 1 to 3) evident within their studies. They also produced descriptive syntheses of their data. These emergent themes and descriptive syntheses were then shared with the wider team, and similarities and differences between the individual studies and emergent themes were identified.

Three core members of the research team (Peter Twining, Amelia Hempel-Jorgensen, and Fiona Henry) then proceeded to enter data from the Exploratory Studies into Maxqda. Maxqda was selected in preference to other qualitative data analysis tools such as Atlas TI and Nvivo, because Maxqda:

- worked 'seamlessly' across Windows and Mac computers (which was important because of the variety of platforms used by members of the NP3 team)
- was available in a self-contained USB drive configuration so that the application and associated data files could be stored and run directly from a USB drive, without having to install the software on a particular computer (which meant it provided greater flexibility at a reasonable cost rather than buying licences to install the software on multiple devices and/or having the technical issues of setting up a server based installation)
- supports the use of a foot pedal, with auto 'rewind', which significantly reduces the time taken to transcribe audio and video
- enables the transcript (and/or notes) to be synchronised with the audio or video, so that when you click on a specific part of the transcript it simultaneously plays that part of the audio or video, whilst also showing the corresponding section of the transcript or notes
- it provides all the normal analytical tools you would expect, such as coding, adding memos, searching, etc.

Once the audio and video files for an Exploratory Study had been imported into Maxqda they were transcribed by members of the core team. Where the material seemed to be of tangential relevance to the research questions the transcripts were in note form. For the majority of the material they were verbatim transcripts. Building upon the initial themes that had been identified by the whole team, the three core researchers individually developed coding schemes which they applied to subsets of the data. These were then compared and discussed to produce one core coding scheme, which the core team members then went back and applied to their data. This was an iterative process, as new themes and codes emerged, some of which were theoretically driven, the core coding scheme was refined (see https://docs.google.com/document/d/1dED-5kHY2dCW-g7zgMYdSmJpFZRJf0d1rvjtlIVMMgA/edit?usp=sharing for the final version of the coding scheme).

However, problems emerged with the use of the coding scheme. Firstly, it was proving impractical to rigorously apply the codes to all of the data because it was very time consuming to do given the extensive data set. Secondly, and more importantly, the appropriate level of

abstraction of the codes was difficult to establish. Thirdly, and most importantly, the coding was tending to atomise the data, removing extracts from their context, which meant that their meaning became distorted. From a sociocultural perspective this was a fundamental flaw. The approach to data analysis therefore changed, to a more holistic one that aimed to retain the relationships between elements of the data, whilst still highlighting where the data illuminated key themes, linked back to the sociocultural framework. This involved creating vignettes focussed on individual children, individual teachers and individual schools.

Figure 4.1.1 Extract from the original coding scheme

Organisation	
Organisation\Individual	Doing a task on their own, other people in their group are doing different tasks (not to be confused with Parallel)
Organisation\Pair	
Organisation\Parallel	Two or more people doing the same task, but working individually
Organisation\Group	smallish group 3 to 10
Organisation\Class	Whole class - whole scout group - whole clan
Organisation\Large	Whole year group, whole school, combination of groups, other large group/coalition
Behaviours	Only applies when interacting with others - refers to behaviours of the children About the organisation of the people involved in the current activity (which may be a subset of a sequence of activities)
Behaviours\Observing	Respondent actively watching what one or more people are doing who are co-present
Behaviours\Competing	
Behaviours\Cooperating	Two or more people working together (co-operate) while working on selfish yet common goals
Behaviours\Collaborating	Two or more people working together (co-labor) on a single shared goal
Behaviours\Monitoring	
Behaviours\Teaching	Respondent is teaching someone else

4.2 Data analysis for Section 5 - Vignettes

These vignettes were descriptive reconstructions based closely on all of the relevant data for each particular vignette. To facilitate the process, a data grid was produced for each study school which summarised all of the data that had been collected, see Table 4.2.1. The names of any data files (e.g. audio recordings, photographs, video recordings, samples of work) were noted in the grids. This made it relatively easy to see what data was available that related to each participant in each study.

Creating each vignette involved going through all of the relevant data files line by line and either summarising the content or, where summarising might distort the subtle nuances within the data, quoting directly from it. This resulted in a long list of summaries intermingled with quotes. These were then merged into a coherent narrative, built around an agreed structure that reflected the project's sociocultural framework (Figure 3.3.1). Thus, for example, the child vignette started by focussing on the home arena, gradually focusing down on people in action (settings), identities, and practices, before moving to look at the school from a child's perspective. Sometimes, for example if the notes in the grid referred to an example, the researcher would go back to the transcript to extract that example for inclusion within the vignette.

The vignettes in Section 5 were created as a set of three, which between them addressed the home and school and allowed comparison between a child and teacher perspective (recreated by the researcher from the data collected). The themes that had been identified through the earlier data analysis were also clearly evident in the vignettes, which also highlighted the importance of the ways in which these themes related to each other.

The three vignettes, for Rory, his school (Riverview Prep), and one of his teachers (Ms Peak) are presented in Section 5.

Table 4.2.1 Data grid structure

Section 1: Data related to the School excluding data related to teachers who were observed

Participant Id	Pseudonym	Files	Notes
Head		*Includes head interview*	
Facilitator		*Includes any interviews/discussions with the Facilitator*	
ICT Coordinator		*Includes ICT coordinator questionnaire plus any interviews that the ICT coordinator was involved in*	*If the ICT coordinator was also an observed teacher, then note that here and record the data related to the observation in the second part of the grid*
Staff 1		*Includes staff questionnaire plus staff interview*	
Staff 2			
Staff 3			
Staff 4			
Staff 5			
The School		*Includes notes of all other data related to the school, such as: background info; photos taken on school tour; audio or video recording taken on school tour*	

Staff = Other teacher (i.e. not observed)

Section 2: Data related to pupils, including data related to carers and to teachers who were observed

id	Pseudonym	Log data	Carer data	Year	Teacher & Focus, Observation	Group
Pupil 1		*Includes log briefing, photos child took plus other records they compiled of out of school use of ICT, log interview(s)*	*Includes carer interview*	6	*Includes:* • *Teacher questionnaire and all interviews with the teacher who taught the lesson(s) in which Pupils 1 to 6 were involved* • *Observation(s)* • *Pupil post-observation interview(s)*	*Includes group interview if these pupils took part in one*
Pupil 2						
Pupil 3						
Pupil 4						
Pupil 5						
Pupil 6						
Pupil 7				2	*Includes:* • *Teacher questionnaire and all interviews with the teacher who taught the lesson(s) in which Pupils 7 to 12 were involved* • *Observation(s)* *Pupil post-observation interview(s)*	*Includes group interview if these pupils took part in one*
Pupil 8						
Pupil 9						
Pupil 10						
Pupil 11						
Pupil 12						
Pupil 13						
Pupil 14					~~Etc.~~	Etc.
Etc.						

4.3 Data analysis for Section 6 - RQ1

4.3.1 Extracting data against the Sociocultural framework (Figure 3.3.1)

The next stage of data analysis involved summarising the data for each child in relation to relevant themes, structured around the sociocultural framework (see Table 4.3.1). Table 4.3.2 provides an example of what this looked like for one child (Rory). The data collection for Highden Primary during Phase 2 (the case studies) had deviated substantially from the ideal model, which meant that there was insufficient data about the home arena for each child. The Highden Primary data from Phase 2 was not included in this analysis therefore.

Table 4.3.1 The key themes related to children's ICT practices outside school were:

Arena	
Cultural, social background	e.g. age, gender, religion, socio-economic status, who they live with (parents, siblings, pets, etc.)
Views of …: • ICT (inc. screen time) • learning • the child • family live	Values and beliefs that may impact on other aspects of the home arena. (e.g. Should be running around outside; too much screen time is bad for you; it's addictive) Highlight where the parent/child is expressing tensions/inconsistencies between views. May include things such as belittling the value of digital practices (e.g. 'only playing games … not educational' – valuing particular kinds of knowledge), seeing ICT as being isolating/anti-social.
Access to ICT resources • own (perception of ownership) • shared	Highlighting what ICT resources the child has access to, and the nature of that access – do they need permission, can they add apps or configure the system, how frequently can/do they use it?
Rules/supervision	Any explicit rules about ICT use, including use of parental controls (which the child may not be aware of). To what extent does the parent (or other family members) oversee or check up on the child's use of ICT?
People in Action (Settings)	
Family members'	What family members do with child
Friends	What friends do with child
Support	What the child does and/or who she turns to for help if having problems with ICT
Identity	
of others (Family members, friends)	ICT practices and how the child positions/perceives others in relation to ICT (e.g. how 'good' they are with ICT)
of the child	How the child positions/perceives herself in relation to ICT (e.g. how 'good' they are with ICT)
Taken up	
Routines • School day • Weekend	What a typical day (school day, weekend day) looks like, including highlighting any constraints on digital practices (e.g. lack of time)
Practices	What child does, with whom, for what purposes
Intermingling and/or multitasking	The extent to which the child mixes physical and virtual activities and/or uses multiple devices/applications 'simultaneously'

Table 4.3.2 An extract from the completed key themes table for Rory

Arena	
Cultural, social background	**Rory**: Male, white 10 years old. Lives with mum and dad and lots of pets. Both parents work partly from home. Dad travels a lot.
Views of …: • ICT (inc. screen time) • learning • the child • family live	**Rory's Mum:** *it's his downtime; it's time that is to himself. … And I find that important, we stay out of that a little bit as well. It gives him a bit of a freedom to do what he wants to do.* + Only able to concentrate on one thing at a time + *I'd rather have him discover something and then we talk about it, … and I find this better than putting restrictions on. They'll just get nosey and think there's something fantastic there that they are not meant to see.* + mother's views of social networking sites as being dangerous places … *Our motto is a little bit if you haven't got anything good to say don't say it.* … permanent record online + ICT *has enriched him and it sort of draws out the creativity side.* + RM: *What I think is a little bit of a downside is that Rory's handwriting is not particularly great. And I think with the use of the iPads there's no necessity to hone that anymore. So that's probably the downside.* Researcher: *How much does that worry you?* RM: *How much does that worry me? Probably not too much. I mean it's legible, his spelling is all right, he's doing fine at school. He is in a good skillset. It doesn't worry me unduly I have to say. And we still do some handwriting stuff, I'm very particular when he has to write thank you cards, it has to be written thank you cards personalised ones, because it has a bigger impact to express your gratitude than just a WhatsApp or an email. So he does have to do things like that.*
Access to ICT resources • own (perception of ownership) • shared	**Rory**: Own: XBox 360; a Wii Mini; an old iPhone; a small android tablet; a school iPad, iPad keyboard±±Shared: Windows 10 laptop in mum's office, with high end mics etc. + Mum's phone and personal iPad (both of which he uses) + Smart TV, another TV, Sky box + Mum and dad both have two iPads each (work and personal). +Unfiltered WiFi. **Rory's mum**: Laptop set up as *his complete studio*
Rules/supervision	**Rory**: not many explicit rules about ICT use + no filters or banned websites + parents allowed him to play games that were rated for older people and allowed him to have a YouTube Channel + *My parents feel that they trust me*, + Few barriers to ICT use at home + *I just like play, do my chores and then I get to play again*; *If I do my chores it's fine* [spending big chunks of time using ICT]. He didn't think there were things he would like to do that he doesn't/couldn't - if he wants to do something he just gets on with it. **Rory's mum**: *So on my iPad I have no restrictions on it, and that has a reason, that was deliberate*. + they had a pin number on the Sky box that he didn't know the code for, so he had to ask permission to watch 12 rated films. + Few barriers to ICT use at home + he always asked her before doing things (*He asks, he asks every time. 'Mummy is that OK, can I do that?' He doesn't do much where he just goes ahead and does things. Just asks or I'm letting you know, that's OK then)* + They now review on a weekly basis what he has watched/found and talk through any issues + His mum told him that she trusted him

Continued on next page …

Table 4.3.2 continued from previous page

People in Action (Settings)	
Family members'	**Rory**: Mum and Dad both play games with Rory (mainly on the Wii) + Help him with homework if he gets stuck + if he sees something that he isn't sure about he turns it off and shows his mum or dad **Rory's Mum**: he has stumbled across a website. … And then we talked about it, and I find this better than putting restrictions on. + gave a couple of examples of times when Rory had come across inappropriate content, … mum talked with him about why they weren't suitable + his mum joins in with Musically … RM: *I also joined with the video with the Halloween, I was magnificent.* Researcher: *You were magnificent, are you on the YouTube channel?* T: *Not on [Rory's YouTube channel] one but on the Musically I am actually yeah*. *… Yeah, so he'll take a Justin Bieber song and then he goes and tumbles down the stairs. And he actually takes the lyrical content and makes something funny with it. And then they have their little followers and their likes and dislikes. And he always gets very excited. Or he takes the dog, when we trained the dog, I had to phone him and he puts that on YouTube: how to train your puppy* + When he was seven or eight his mum bought a couple of books about Minecraft and worked through them with him initially, *and from then onwards he developed quite quickly, and he left me far behind quite quickly*
Friends	**Rory**: has a gmail account and a school Office 365 account and said that he uses email quite a lot = Rory felt that 'strangers' you interact with online *can't exactly really contact you or hurt you. All they can do is chat, putting chat in the Chatbox. And you can always turn off the Chatbox*, which he has done on occasions. **Rory's Mum**: *he met other children like Ashish who knew already a little bit more, and then he put that into practice. And yeah, it just went from there.*
Support	**Rory**: If he can't solve a technical problem, he will sometimes turn to his dad (for example related to the WiFi). If his dad is away he will ask Ashish. However, there were times, such as recently when trying to use some new recording software, he wouldn't ask his parents or Ashish for help because "*they wouldn't know much about it. I'd be better off* [sorting it myself] + If Rory couldn't solve an ICT problem, even with the help of his Dad or Ashish, then *I'd try and bring it back to the school and just try and ask someone who really knows about IT* **Rory's Mum**: watched videos (Minecraft and DanTDM) which "*weave in stories, and he follows the stories as if it was a TV series. And he learns a little bit* + competence in making videos was self-taught, again through *talking to children who are a little bit more advanced, Rory says he always seeks somebody out where he can learn something from. And then he takes that and tries to put it into practice. That's just him*

Rory's entries go on for several more pages but are not all reproduced here.

4.3.2 Synthesising the RQ1 data

Having completed these grids for every child, Comparison of each of the children's digital practices and identities 'outside school' (i.e. data related to Identities and Taken up in Table 4.3.1) led to the development of the Digital Practice Framework (DPF) which is summarised in Figure 4.3.1 and exemplified in Figure 4.3.2. Further explanation is provided below these two Figures.

Figure 4.3.1 The Digital Practices Framework (DPF)

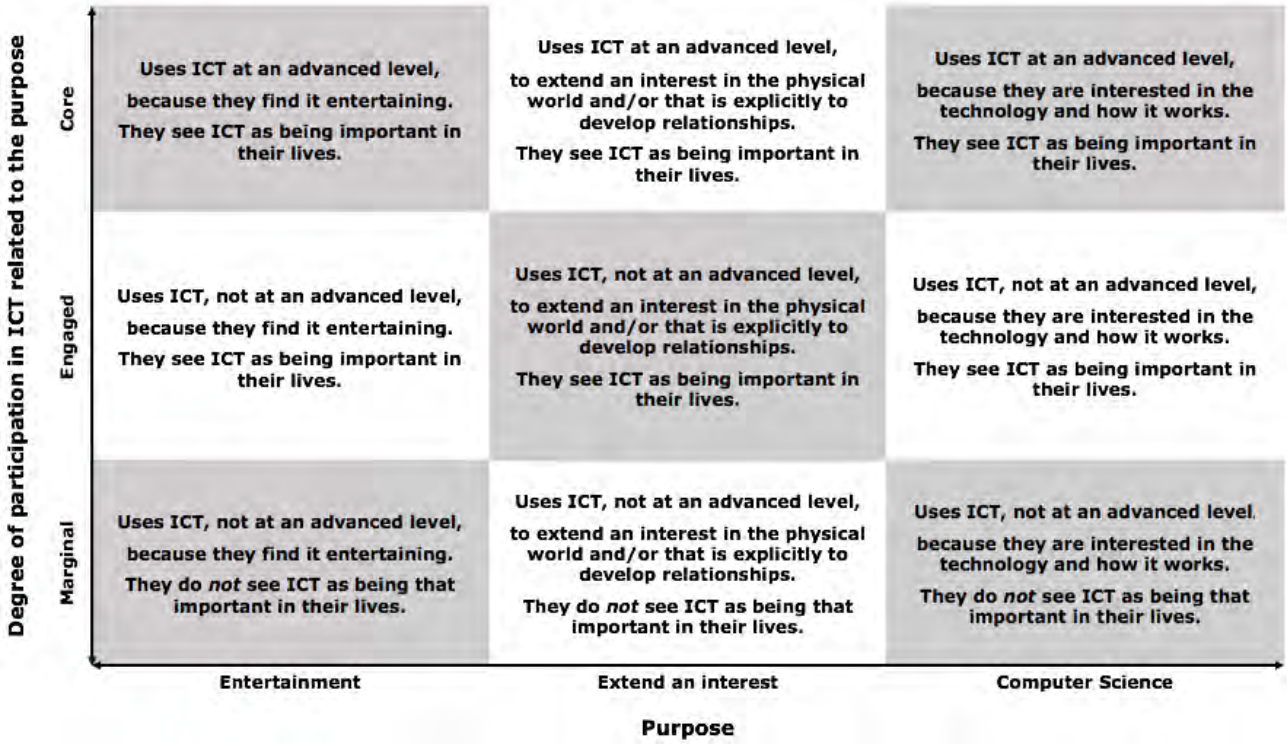
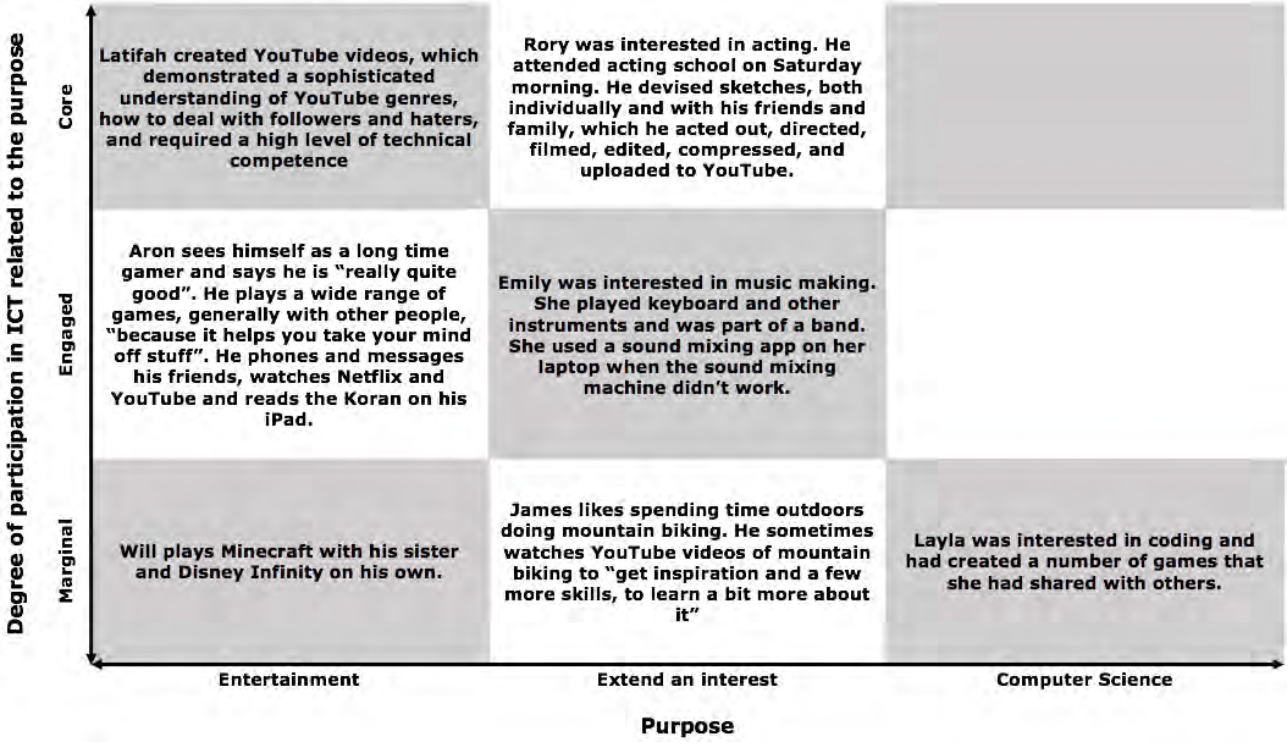


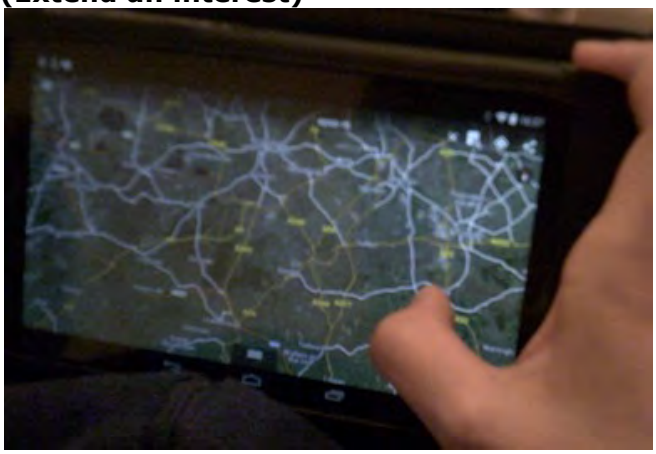
Figure 4.3.2 The Digital Practices Framework (DPF) exemplified



Initially the ways in which children used ICT were categorised (see Section 6.1). However, this proved unhelpful so the project director and full time research fellow each independently categorised the children's digital practices. They then discussed the key characteristics they had identified to develop the original version of the Digital Practice Framework (DPF). Whilst not overtly driven by theory, the sociocultural lens through which the data was being examined perhaps inevitably resulted in both agreeing that the key differences related to the purposes children had for using ICT, their degree of engagement, and the level of sophistication in what they were doing. The project director and full time research fellow then independently assigned each child's digital practices to a cell in the initial grid. They then discussed their categorisations, which highlighted some ambiguities in the definitions of each dimension. The definitions were adjusted, and the process was repeated until independently they categorised all of the children's ICT practices in the same way – this took four iterations of refining the definitions of the categories on the two dimensions of the framework. The result was the final version shown in Figure 4.3.1.

Central to the Purposes dimension of the Digital Practice Framework is an assumption that these are things that the child/ren are intrinsically motivated to engage with and thus would opt to do if given a 'free choice'.

Aran planning the route to the airport (Extend an interest)



Where a child could fit into more than one category a decision was made about the relative priority to allocate. Where a child could fit into Computer Science or either Entertainment or Extend an interest on the Purpose dimension then a judgement was made about the extent to which their interest in Computer Science was serving their other purpose(s). For example, Latifah described herself as a "tech nerd" and could have fitted into the Computer Science category. However, her main purpose was to engage with YouTube for fun, and her technical competence appeared to have developed in service of that overriding interest in YouTube. Therefore, Latifah's use of ICT was categorised as Entertainment/Core. Where a child could fit in either the Entertainment or Extend an interest categories on the Purpose dimension, then the one which was rated more highly on the Participation dimension was selected. Where their use of ICT could have fitted in the same category on the Participation dimension, then Extend an interest was prioritised over Entertainment. This was the case for Rory, whose use of ICT would have fitted in both the Entertainment/Core and Extend and interest/Core cells in the DPF. Rory's use of ICT was therefore categorised as Extend an interest/Core. This prioritisation of Extend an interest over Entertainment was agreed upon to create a better reflection of the diversity of children's purposes. The data suggested that whilst all the children engaged with ICT at home for Entertainment, albeit to differing degrees, not all the children used ICT to 'Extend an interest', or because they were interested in technology and how it works (the 'Computer Science' category on the Purpose dimension).

The final categorisations, for all the children where there was sufficient data to be able to carry out the next stage of the analysis, are presented in Figure 6.3.2. The exception was Layla who is included in Figure 6.3.2 even though there was insufficient data relating to her home arena and settings. Layla was included because she was the only child who fitted in the Computer Science category on the Purpose dimension of the DPF.

Once all of the children's digital practices had been categorised on the DPF, the data for each of the children in each of the cells in the framework were examined to see if there were any patterns within or between cells. For example, the data for all the children in the Entertainment/Marginal category were examined to see if there were any recurring themes within the arena, people in action (settings), taken up (practices) and identities for those children. This was repeated for each of the cells which children's ICT practices had been

allocated to (there were not children for whom there was sufficient data to carry out this analysis in the Computer Science category on the Purposes dimension). Similarities and differences were then looked for between the different cells in the DPF. For example, the arena, people in action, taken up and identities of the children whose digital practices had been categorised as Entertainment/Marginal were compared with those whose digital practices had been categorised as Entertainment/Engaged.

The results of these analyses are presented in Section 6.

4.4 Data analysis for Section 7 – RQ2

RQ2 focussed on the alignment between teachers' use of ICT as part of their pedagogical practice with children's digital practices outside school, and how children experienced the in-school use of ICT. The first stage of the analysis, following transcriptions of audio files, was to extract summaries of all of the instances of observed or reported ICT use for each school. Each item was logged in a table with the structure shown in Table 4.4.1.

Table 4.4.1 Table headings in the school ICT use grid with one example row

Id	Source	Year	Subject	Description
Fairfield 1	Ms Smith Observation	3	Literacy	Teacher settles children (3 minutes) Teacher input using IWB - children reading off IWB (briefly) - teacher claps hands - explains task. Asks them for words or sentences beginning with the letters (POPPY). Children raising hands and offering suggestions. Teacher completes first two sentences (for P and O) based on children's suggestions. Then children in pairs have to think about the sentences for the other letters (PPY). Teacher and LSA float. Teacher asks children to share sentences - she completes them on the IWB. Then children given a worksheet and asks them to write sentences for the letters on the worksheet individually (REMEMBERANCE). LSA takes photos of completed work. Plenary - did you enjoy?

These data, with a shortened description for each instance of ICT use, were then imported into a School ICT use spreadsheet in MS Excel and columns were added for Type of use (e.g. Finding information, Games). The data were then sorted by type of use, and the types of use were grouped as summarised in Table 4.4.2.

Instances of ICT use within each of these categories were then examined to see the extent to which they aligned with children's digital practices outside school. More specifically, the extent to which instances of ICT use within each of these categories mapped onto the Digital Practice Framework (DPF) was determined, in terms of the degree of fit with the Purpose and Participation dimensions. See Section 4.3.2 for an explanation of the DPF.

Following this analysis, which is reported in Section 7, it was decided to add a new section that provided a broader view of ICT use in the study schools, before going on to look at the institutional factors that influenced ICT use in schools.

Table 4.4.2 Categorisation of ICT use in schools

Use of …	Description
Class display	This includes data projectors or large monitor connected to a desktop or laptop computer, sometimes with a visualiser; and interactive whiteboards (IWBs), and large touch screen monitors. Displays might have to potential to be 'interactive' through the use of Reflector, AirPlay, or other similar software that enabled a tablet or laptop screen to be mirrored on the class display.
Showbie, Airdrop, or similar	This includes file management and transfer systems which allowed files ('work') to be sent between the teacher's device and pupils' devices and visa versa.
Apple Classroom or similar	This includes any device management system that allows the teacher to view what is on pupil devices, lock their devices, install apps, etc..
Games	
'Educational' games (e.g. MyMaths, Kahoot!)	This includes any app which has game-like elements (e.g. competition) and is designed for 'educational' purposes. It includes drill and practice, quizzes, as well as overtly educational digital books (e.g. as part of a reading scheme, but excluding 'real books')
Real (commercial) games (e.g. Minecraft, Wii Fit)	This includes any game that was produced for entertainment purposes. It spans all genres of games from Tetris through simulations such as Roller Coaster Tycoon to open virtual worlds such as Second Life™ (which technically are not games at all).
VLE (inc. G Suite for Education) and/or 'Walled garden'	This was used to include both learning platforms, such as Fronter, collections of tools such as those from 2simple, collections of content, and other 'walled garden' systems which provide a 'safe area' separate from the Internet. The Google Suite for Education was included in this category!
Blog(s) or Twitter by pupils	Includes any blogging, including micro-blogging that is visible to people outside the school.
Video conferencing	e.g. Skype, Facetime, Google hangout or similar
Subject communities	The only one mentioned was NRICH.
ICT to find information	This included finding information from a 'closed content system' or from the Web.
Software to represent 'information'	This included word processing, spreadsheets, presentation software such as PowerPoint, note taking tools such as OneNote, etc.
Animation/Comic strips	This included things such as Blabberize as well as stop motion animation software, software for creating timelines and comic strips, etc.
Explain Everything, ShowMe or similar	This included tools which were designed to enable users to capture how they perform a process.
Still or moving image capture / editing tools (e.g. iMovie)	This included the use of the camera (stand alone or as part of a tablet or laptop), still or moving editing software (including painting and drawing programs)
Audio recording or music making tools	This included using stand alone or integrated audio recording devices, audio editing tools, and music creation tools such as Garage Band.
Other ICT tools	This was a catch all for other (often subject specific) tools such as data logging software, Google Earth, Augmented reality apps or systems, etc.
ICT for programming	Programming tools (Programming is being used to include coding) such as Scratch
Mobile devices at pupils' discretion	This was less to do with the type of software being used and more to do with instances of children being allowed to decide for themselves when to use ICT, but excluded using it as a dictionary or thesaurus
Dictionary or thesaurus	This was specifically about children using a device to 'look up words'
Digital Leaders Programme	Was there a digital leaders programme – or similar scheme that included an element related to ICT
Radio station	Did the school have/use a school radio station
School app	This related to one school who had developed an app that allowed them to share information and examples of children's work and get comments.
Assistive technology	This includes use of software to support children who are labelled as having 'special educational needs'.
Iris connect or similar with pupils	This includes the use of video recording systems (and two way audio) to record and reflect upon practice in the classroom, or to scaffold learning.

4.5 Data analysis for Section 8 – ICT uses in schools

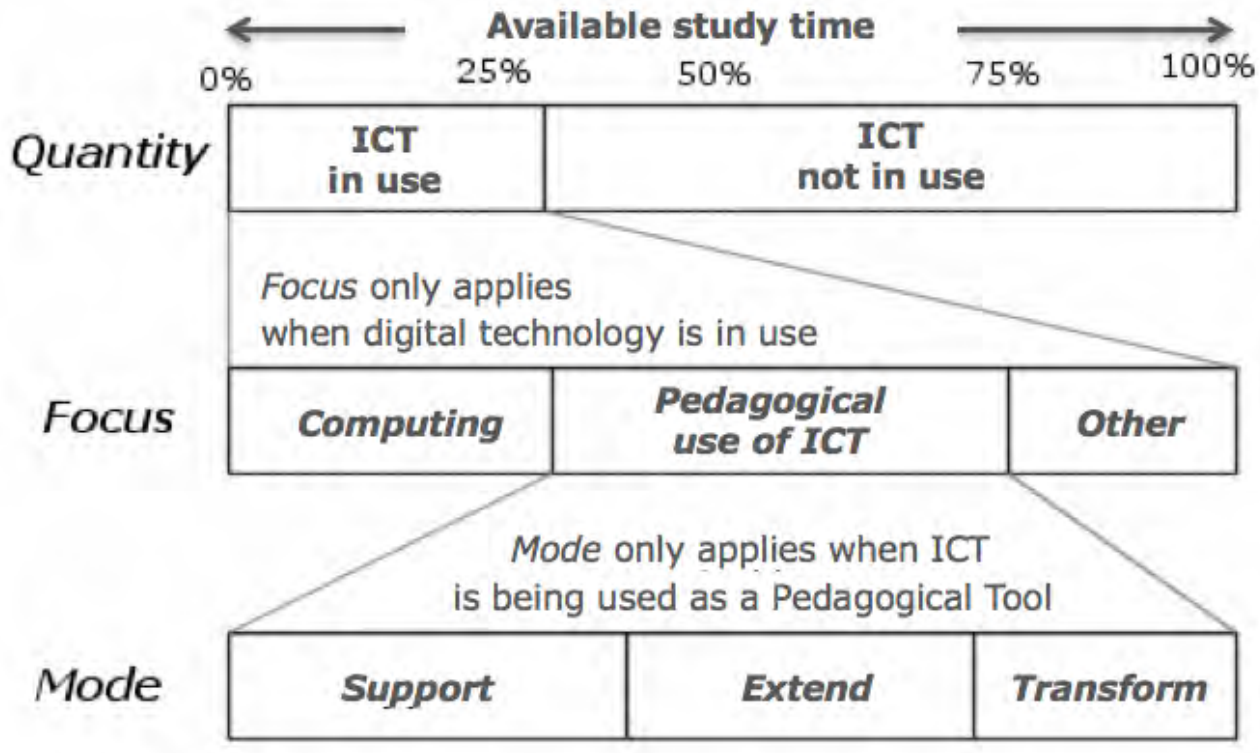
As a result of the outcome of the analysis for RQ2 it was decided to further examine the extent to which ICT was impacting on what and how children were taught, even if it was not aligning with children's digital practices outside school. The intention being to highlight (in Section 8) examples of ICT use in schools that impacted on how and/or what children were taught in ways that could not have been achieved without ICT. The way in which the instances of ICT use were analysed to see if they impacted on what and/or how the children were taught is explained and illustrated below.

4.5.1 Introducing the ICT Innovation Framework

The impact of ICT use was evaluated using the ICT Innovation Framework (ICTIF), which is a version of the Computer Practice Framework (CPF), which was originally developed in the late 1990s (Twining 2002a, 2002b, 2004, 2008). The changes relate to the labels used in the CPF, which have been updated to reflect changes in terminology relating to ICT in schools since the CPF was developed. For example, the label used to describe teaching about ICT has been changed from ICT to Computing, reflecting the change in the name of the corresponding subject in the English national curriculum.

Figure 4.5.1 provides an overview of the ICTIF, Table 4.5.1 sets out the definitions of the categories on the Focus dimension, and Figure 4.5.2 explains the categories on the Mode dimension.

Figure 4.5.1 The ICT Innovation Framework (ICTIF)



Quantity relates to the proportion of available study time that ICT is being used by the learner. This underpins the other two dimensions.

The ***Focus*** categorises the key purpose underlying the use of ICT. When ICT is not in use the Focus does not apply.

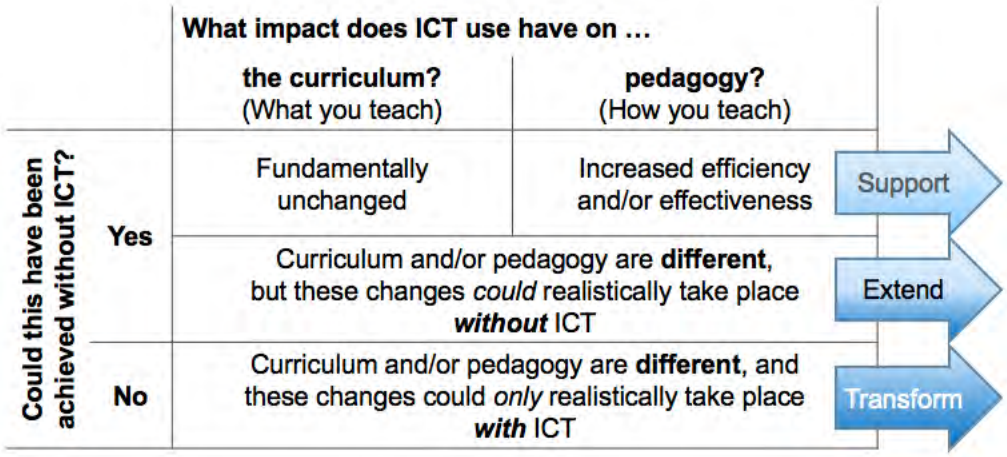
Table 4.5.1 The Focus dimension of the ICTIF

Focus	Definition
Computing	Using ICT in order to help children to develop their Computing skills, knowledge and understanding
PICT*	Using ICT in order to enhance any aspect of children's learning other than Computing itself
Other	Using ICT for any reason not covered by Computing or ICT e.g. as a reward, to transfer work between the teacher and children.

* PICT = Pedagogic use of ICT

The **Mode** builds upon the Focus dimension, and relates to the impact that ICT has when the Focus is the pedagogical use of ICT (PICT). The Mode specifically looks at the impact of using digital technology in relation to changes in the curriculum and pedagogy, as illustrated in Figure 4.5.2.

Figure 4.5.2 Diagrammatic overview of the Mode Dimension of the ICTIF



4.5.2 Estimating the Quantity of ICT use

The first stage of applying the ICTIF involved estimating the proportion of available school time that pupils spent using ICT. Data about ICT provision was extracted for each school, as this could give a baseline indication of the opportunities available for ICT use. This was complemented by extracting all the data for each school that related to ICT use, for example any mention by children, teachers or parents of ICT having been used in school, estimates by teachers and children about how often they used ICT in school, observation data about ICT facilities being (or not being) used, and so forth.

The Quantity of ICT use refers to ICT use by the children. It does NOT include the teacher using ICT, for example showing information on the class display, unless the children are playing an active role in controlling the display (e.g. coming up to the touch screen and inputting data; mirroring their iPad on the screen) or they are doing something on their iPads in response to something on the class display (e.g. taking part in a Kahoot! quiz where the questions are displayed on the class display and they are answering on their individual devices).

Using Ms Peak (Riverview Prep) as an example. There was a considerable amount of data about ICT use in general in Riverview Prep. From which it was clear that there was considerable variation between teachers in the quantity of ICT use, as evidenced by this comment by Ms Gupta, who sat in on one of the pupil interviews:

> It's interesting because the teachers, the subjects, they were saying maths, geography, history, science. Those are the teachers that are clued up. Mr Ryan, Mr Phillips, [Name of

> another teacher], Ms Peak. The other ones are not willing to use it. For instance music you never heard once, because he just won't use it. … or for instance some of the older ladies, they just don't want to use it, and they teach English and geography and history and French and DT. You won't hear it because they don't want to use it, they're not comfortable using the tech, so the kids are not using it because of that too. But they're using it in English and maths and science and geography. So the teachers that get it are using it.
>
> (Ms Gupta, Riverview Prep)

Ms Peak was one of the teacher 'who get it' and taught English in Year 6 and maths in Years 5 and 6. The fact that the school had specialist teachers in core subject areas meant that children had different levels of ICT use, depending upon which teachers they were taught by. Thus, in the Riverview Prep Group interview some of the children said the iPads were only used in a couple of lessons per week, whilst the others estimated that that they do research on iPads in around two lessons per week for roughly 15 to 30 mins per lesson, and having found the information on the iPad they write it in their exercise books (Group Interview 1, Riverview Prep). They went on to note that Ms Peak's maths group played TT Rock Stars for about 20 minutes every Friday, whilst Mr Ryan expected the children to go on TT Rock Stars if they had finished their work, or were waiting for any reason ("If there's nothing on the board", "or if he's not there" (Abigail, Riverview Prep)).

Ms Peak estimated in her questionnaire responses that children in her lessons used ICT about 30% of the time. However, teachers' reports of their ICT use are often not reliable (Mama & Hennessy, 2013) because they often overestimate their ICT use (Chalkey and Nicholas, 1997; Cuban, 2001). Experience within this and previous research on ICT in schools suggested that teachers use ICT more when they know they are being observed by researchers who are interested in ICT. For example, when asked what he would have done differently if he had not been being observed Mr Ryan (Riverview Prep) said "I probably wouldn't have put it on Showbie".

In Ms Peak's 45 minute maths lesson that was observed, Kahoot! was used for 15 minutes at the beginning, and the last 10 minutes of the lesson was focussed on sending homework to the children's iPads and then explaining the task to them. The children in Ms Peak's maths set noted that "we don't do Kahoot! that often, but sometimes when we're either starting a subject or finishing a subject we do one" (Riverview Prep Group C post-observation interview). Ashish noted that he used his iPad most in Ms Peak's lessons:

> mostly with Ms Peak in maths, because every Wednesday she Airdrops her homework to us rather than printing it off and giving us script, a sheet. In English sometimes she gives us some websites to look at, and get some ideas for writing some let's say diary entries or something
>
> (Ashish, Riverview Prep)

James thought that Ms Peak used ICT less than Mr Ryan, and Alex, who had Maths with Ms Peak said, "I would say [we use our iPads] about, definitely three times a week". It was clear that he meant in total, not just in his maths lessons because he went on to say that they use ICT in

> ICT lesson, SMSC [like PSHE/RE] we use that for searching, and {Maths?} and today because it's Friday in maths we go on times tables Rock Stars
>
> (Alex, Riverview Prep)

On balance, it seemed likely that Ms Peak used ICT regularly on Wednesday to send homework to her children, and on Friday her maths set played TT Rock Stars. Her children also used their iPads to search for information in English occasionally, and at the start and end of topics they might use Kahoot!. In her questionnaire response Ms Peak also mentioned using Reflector in a poetry lesson. Overall, it seemed likely that children in her lessons used ICT less than 20% of the time.

Having estimated the quantity of ICT use for each teacher, the next step was to categorise the observed ICT use on the Focus dimension of the ICTIF.

4.5.2 Categorising ICT use on the Focus dimension

Where ICT is being used by pupils the Focus dimension differentiates between uses that aim to teach about ICT (e.g. Computing lessons), uses that aim to support learning across the curriculum (i.e. in subjects/domains other than Computing), and other uses where the main purpose is not primarily educational (e.g. using ICT as a 'carrot or stick' or in order to occupy children who have finished other work).

All of the uses of ICT that had been recorded in the original School ICT use spreadsheet were categorised on the Focus dimension. A column was added to the spreadsheet to record the outcomes.

The uses of ICT that Ms Peak (Riverview Prep) mentioned were categorised as shown in Table 4.5.2 to illustrate how the Focus was applied.

Table 4.5.2 Categorisation of Ms Peak's uses of ICT on the Focus dimension

Use of ICT	Category on Focus dimension
Kahoot! to do a maths quiz	PICT
Airdrop to send the children their homework which they then read on their iPads	PICT
TT Rock stars to practice their times tables	PICT
Reflector to share children's poems and discuss their good aspects and ways they might be improved	PICT

For all of the instances of the use of ICT in schools that had been categorised as PICT (Pedagogic use of ICT) on the Focus dimension, the next step was to categorise them on the Mode dimension.

4.5.3 Categorising Pedagogic use of ICT on the Mode dimension

The Mode dimension looks at the impact that pedagogic use of ICT is having on what is being taught and/or how it is being taught. Figure 4.5.2 explains the three categories on the Mode dimension: Support, Extend, and Transform.

All of the uses of ICT in the Schools ICT spreadsheet that had been categorised as PICT on the Focus dimension were next categorised on the Mode dimension. It became clear that there were many instances where ICT was being used in a way that had the potential to fit in the Transform category. However, often the way in which the ICT use had been implemented meant that this potential had not been realised. In addition, there were a large number of instances where there was insufficient data to be sure whether the use of ICT had changed what and/or how the children were being taught. This for example, might have been because the only evidence was a brief comment about how ICT had been used in an interview or questionnaire that was not followed up. These uses of ICT were categorised as (Transform), to indicate their potential.

Table 4.5.3 provides examples of how Ms Peak's instances of ICT use were categorised.

Table 4.5.3 Categorisation of Ms Peak's uses of ICT on the Mode dimension

Use of ICT	Category on Focus dimension	Category on the Mode dimension
Kahoot! to do a maths quiz	PICT	Support
Airdrop to send the children their homework, which they then read on their iPads	PICT	Support
TT Rock stars to practice their times tables	PICT	Support
Reflector to share children's poems and discuss their good aspects and ways they might be improved	PICT	(Transform)

The Airdrop activity involved the children in receiving their homework on their iPads, and then using their iPad as a worksheet to tell them what to do. Thus, it was categorised as Support. The 'Reflector' activity was categorised as (Transform) – having the potential to change what and/or how the children are taught in ways that could not realistically be achieved without ICT – because sharing work in a way that helps students to understand or negotiate the criteria for evaluating a piece of work, and share each other's creations (thus providing a larger audience for the work than just the child and the teacher) could represent a change in how the children are taught. However, whether or not it actually does, depends upon how the sharing of that work is transacted. This doesn't fit in the Extend category, because it would be difficult to share and collaboratively edit one child's piece of work with the whole class without ICT.

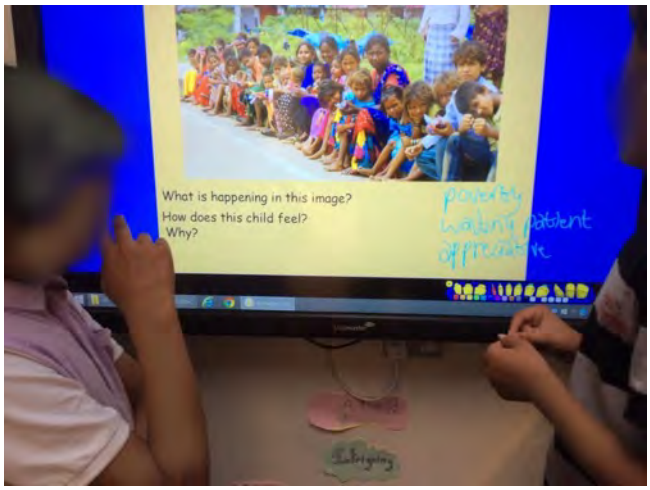
The short vignette below (Vignette 4.5.1) describes a lesson in which ICT was used in a way that was categorised as Extend. The use of ICT in this lesson did engage the children in collaboration and discussion (albeit sometimes group members contributed by writing on the board rather than speaking) and thus it did change how the children were learning. However, the same changes could have been achieved using large sheets of paper, post-it™ notes, and pencils, i.e. without ICT.

Vignette 4.5.1 – Stepside Primary Yr6 – 'Silent discussion'

This Year 6 class had three class displays, each of which was a large touchscreen device. They were located around the outside edges of the classroom. The children were divided into groups, one group around each of the class displays (referred to as 'the boards'). The teacher, Ms Harrison, introduced the activities, which were slightly different on each board.

Activity 1: Look at the image on the board. What is happening in the picture? How do the children feel? Why? What do you think? You can write your own ideas on the board or discuss your ideas in your group and then write on the board.

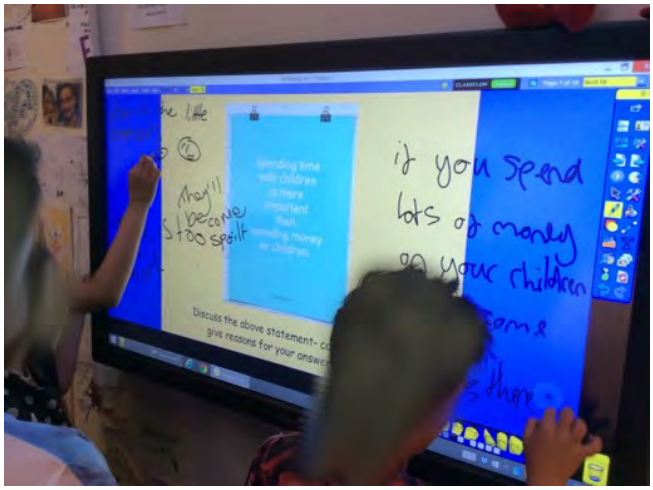
Activity 1



Activity 2: Discuss the statements on the board. Think about reasons for your views. Write your views and reasons for them on the board individually and/or as a group.

Activity 3: Think about the statements that are written on the board. Rank them in terms of importance. Put the most important ones in the middle circle, the least important ones in the outer circle. You must have something in each circle.

Activity 2



Ms Harrison argued that these activities could allow children to

> progress their point of view without having to verbalise their point of view. A lot of children find it quite difficult to share their opinions and their standpoints verbally in front of other people because they get a bit nervous a bit frightened. So doing it on the screen meant that the children could easily write without being known, because they can do it silently, however that also fosters discussion within their group because they write it up on the screen everyone can then see it. So everyone can see it and people can comment on it or they can have a verbal discussion dialogue about that.
>
> (Ms Harrison, Stepside Primary)

A further column was added to the Schools ICT uses spreadsheet to record the Mode categorisations.

Section 8 provides a number of vignettes to illustrate examples of ICT use that were categorised as Transform on the Mode dimension of the ICTIF.

4.6 Data analysis for Section 9 – RQ3

Section 9 addresses RQ3, which looks at the institutional factors that impact on the extent to which teachers' pedagogy aligns with children's digital practices outside school. That question was extended to include exploring the institutional factors that impacted on how ICT use in schools was categorised on the ICT Innovation Framework (ICTIF).

This analysis included the following stages:

- Extracting and summarising data according to key themes, structured around the sociocultural framework (Figure 3.3.1). This analysis is explained in Section 4.6.1.
- Comparing elements of the constitutive order which differed across schools and how the schools responded to these, including:
    - Location and type (analysis explained in Section 4.6.2, findings in Section 9.1)
    - Curriculum, assessment and accountability (analysis explained in Section 4.6.3, findings in Section 9.2)

- Comparing other elements of the school arena, including
    - Educational vision (analysis explained in Section 4.6.4, findings in Section 9.3)
    - ICT strategies (analysis explained in Section 4.6.5, findings in Section 9.4)
    - The relationship between ICT strategies and ICT use (analysis explained in Section 4.6.6, findings in Section 9.5)

4.6.1 Extracting the data relating to the schools

The first stage of the data analysis involved a similar process as that described in Section 4.3.1. The data relating to all of the schools was summarised in relation to themes, structured around the sociocultural framework (see Table 4.6.1). Table 4.6.2 provides an example of what this looked like for a small subset of the data from one participant in one school.

Table 4.6.1 The school data analysis table

Arena	
School info	E.g. School type, no. pupils, no. teachers, FSM, EAL, etc.
Ethos and Vision	Include info from school tour (e.g. do they only display the best work or all children's work?)
Views of purpose of education	Any evidence about what they thing the purpose of education is, what is the school's role?
View of learners & learning	Any comments or other evidence about how children are viewed (e.g. they need to run around a playtime) or what effective learning looks like (e.g. comments about motivation)
View of effective teaching	Views of their role as teachers, what a 'good lesson' looks like, etc.
View of ICT	Both generally (e.g. children view ICT as playing) or more specifically in terms of the school vision, effective teaching with ICT etc.
Rhetoric - reality	Evidence about the extent to which the head (and other staff) recognise how good a match there is between what is espoused (e.g. vision/views of effective teaching) and what is enacted
Curriculum	Note subject references
Spaces	This includes temporal (e.g. timetable) as well as physical (e.g. organisation of classrooms) and virtual spaces (VLE?)
Assessment	Note any references to formative or summative assessment
Accountability	Note any references to inspection, moderation of work, internal monitoring, etc.
e-safety	Note any comments about e-safety
School – home	How does the school communicate with home? How much parental involvement. How much do parents know about what happens in school? How much does school know about home?
Resourcing	Staffing (turnover), funding
Routines	3 part lesson, devices timetabled,
Rules	Especially relating to ICT
Teacher agency	Constraints (real and imagined)
Pupil agency	e.g. evidence of choice or involvement in decision making
People in Action (Settings)	
Staff	Roles within the school (e.g. Music specialist; ICT Coordinator)
Parents	Involvement in school (e.g. governor, comes in to read with children), talking with teachers, responding to blog posts, etc.
Support for staff	Technical support, CPD, digital leaders, e.g. of support provided
Support for pupils	Peers, teacher, other?
Support for parents	Advice, events, etc.
Identity	
of teachers	Backgrounds, personal use of ICT outside school, how they position themselves as ICT users
of pupils	Outside school digital identities, inside school digital identities
of parents	How they position themselves in relation to school, school ICT
Taken up (teacher, pupil and parent, perspectives)	
Quantity of ICT use	Any evidence indicating how much time ICT is in use for, and by whom
Focus of ICT use	What are the purposes underpinning ICT use, Computing, Cross curricula, classroom management, teacher professional activities (e.g. planning), etc.
Mode of ICT use	What impact does it have on what or how children learn/are taught?
Practices of teachers	What do they actually do (with ICT)?
Practices of pupils	What do they do in school with ICT?
Practices of parents	What do they do in school or related to school (e.g. helping with homework)?

Each participant's data was pulled out into a separate column within the spreadsheet. The example below shows just two cells, with the data from Mr Ryan (Riverview Prep) about his views of effective teaching and of ICT. Where data related to more than one thing, e.g. the description of using Morpho below, this was included in any row in which it was relevant.

Table 4.6.2 – Worked example part of the school data grid, showing a subset of the data related to

Arena	Mr Ryan (Riverview Prep)
View of effective teaching	*I think it's important that children are adaptable to a range of different, may be a checklist or a poster. I've got over there a poster on the wall with my hideous scrawl – but lots of things that you just keep them on their toes the whole time. If they know there's a robot coming up on the screen every time, it's not quite as useful for their learning.* + If he could teach the perfect way Mr Ryan wouldn't change how he uses ICT, but would do less [summative] assessment + He thinks people worry too much about having evidence that children have done particular tasks. *In my entire teaching career no one has ever gone can you just prove you have done that please? You know, can you just tell us whether so-and-so actually did that task? So I'm not a firm believer of keeping evidence.* + Mr Ryan didn't think they should set homework *It's the bane of parent's life, you know, 70% of parents, I think, loathe it, and it's the bane of teachers life because you never know whether they've done it on their own or whether their parents have sat them down and right you're doing it. … I think they should learn their times tables and learn how to spell and read every night, then other than that no.* + *added a competitive element which helps them get stuck in* (Post Obs 1 Interview) + *if you sit next to a child and mark their book with them, I think they get so much more out of it* (Pre-Obs 1) + Would be a good idea to get them making their own quizzes (Kahoot) (Pre-Obs 1) + *I'm not going back to stopping the whole class and explaining to the whole class what to do because it's just a waste of time for some children. Happy to do little groups but these skills should really be – they should just take the risk* (Post-Obs 2) + *but I'm really happy for them to discuss. I'm the last resort when they have a problem. I feel I think it's really important they use other cues in the class and their sort of their buddy they're sat next to is really good for them to have.*(Pre-Obs 2)
View of ICT	He tries to use new technology *if I think it's going to make some kind of positive difference, or if it's going to enable the children to progress slightly, or you get something done faster that might be perceived as boring if they were to write it down, I try to use new technologies to, I suppose the novelty effect quite often wows children, so I try to introduce, for example, String, have you not seen String AR?* String AR is augmented reality - "*a little alien pops out and he's walking around. You can get him to walk around your table, it's incredible. I think that's a really good starter for a fancy piece of writing. So it's a good starter quite often. So whilst it probably means they faff around for 10 minutes longer, then gives them a picture of an alien, at least it piques their imagination, slightly*. + He didn't think he would be a worse teacher if he didn't have ICT. *I'd probably be more innovative [if I didn't have any ICT], because I'm quite good at IT and I know quickly what I need to do and I can do it very quickly and perhaps that makes me complacent at the times. You know, my mother-in-law's a teacher, and you go round and she's like I've got these cards you can use in your lessons, and she's got these boxes of resources. So people, I suppose, are more creative. I've got a few thousand documents on my hard drive."* + He thinks having 1:1 iPads is good - it helps enhance learning - *it's an added tool; it's just one facet of learning* *... because the use of IT, it really helps their learning* (Post-Obs 2) + He thought that the online Encyclopaedia Britannica was better - safer, no danger of plagiarism.

Continued on next page …

	+ ICT *spurs them on to want to learn. I'm not sure that delivery through IT makes them learn better. It makes them more excited about learning. I think that if I had no access to IT, the keen ones would still learn. … It's a timesaver as well. Previously you would get your acetate wouldn't you and put it on…* + Mr Ryan felt that the ICT *It creates that competitive, using that creative competitive, a friction of excitement, and that to some of them who are slightly more reluctant learners – they're not, they're not massively reluctant, but it gives them, it peaks their interest I think.* (Post-Obs 1) + He thinks that ICT *redefines in lots of areas their learning, whether or not they're actually learning better because of that redefinition.* *Last year* [in a different school?] *we did World War I in year 5 history and I did World War I with them. And previously they would write a letter home from the trenches. So I said no we're going to do something different. Do it on the iPads. We had a crazy talk, used Morpho or something. So you get your face, they download so they've got a picture of a World War One soldier. They chose a World War One soldier and they animated him, then they videoed themselves asking questions. Then they used iMovies to cut it as a proper interview. They had credits and everything. They were still achieving the same thing. They still had to write a script in a way but that's redefining completely what they've done. And I suppose in that it does enhance their learning because I wager that they know a darn sight more about World War One now. That's a hell of a lot of work.* He noted that this took two or three weeks and required the integration of English, History and ICT. Using ICT may not redefine what they do but it does change it *I suppose they are excited and they go home with their iPads. They show their parents what they've done, their parents discuss it with them*. + Thinks doing the problems in the book is easier because it has clearer [discrete] questions 'Round these numbers to one decimal place'. The task he set was more complicated because they had to do the rounding and then add the numbers. + *We've also got the Apple classroom feature on it now: you can look at all their screens without them… … I've started to use it, yeah. Instead of going, put your iPads down, you just lock it and they're straight up, and you and lock certain iPads as well, which is good, so if you want a certain group to, to do something with you, so it's, and you push apps out as well, you can open apps from that, so it opens all on there, on the screen. … But if it's going to help their learning, it's brilliant. So I can go right Bobbo here has done a fantastic piece of work, let's just ping that onto your screens. They can turn it off. They know if they turn Bluetooth off, they can't the… … Yeah, they've done that, yeah. I say can you put Bluetooth on please, Jim, or whatever. Sorry.* + Frustration about having to use a different classroom, straight after another class, which restricted his time to set up/log in. + Showbie new to him - heard others rave about it - he's struggling with Office online (used to Google Classrooms - so easy) - *I love the voice notes in Showbie - I marked it by leaving a voice note saying how I'd agreed what they'd done, why would you do that. And then they came back and responded to it. But I can't think, it was really cool and it saved me blooming ages because to mark a set of books take I don't know, how long, compared to voice marking, it's brilliant*. (Pre-Obs 1) *My Maths doesn't work well on iPads and is a bit prescriptive - NRich is good for problem solving* (Pre-Obs 1) + Mr Ryan thinks they should get rid of the paper planners and do it all on the iPads (Post-Obs 2)

4.6.2 Data analysis for Section 9.1 – location and type

Data about the location of the schools and the nature of the area they were located in was extracted. A measure of their remoteness was calculated, based on both the number of miles and travel times by public transport from London. Schools were also classified by type and catchment area. Location and type of school fed into the analysis in the next section, because it impacted on the constitutive order by altering the curriculum, assessment and accountability regimes that schools had to operate within.

4.6.3 Data analysis – for Section 9.2 – curriculum, assessment and accountability

All the data that referred to the curriculum, assessment and/or accountability were extracted for each school from the school data grids (described in Section 4.6.1). Using the groupings of schools identified in Section 9.1, the data were analysed to identity the impact that the curriculum, assessment and accountability regime that applied to different groups of schools had on them. Examples and counter-examples were looked for to illustrate how schools 'took up' these elements of the constitutive order.

4.6.4 Data analysis for Section 9.3 – educational vision

All the data that referred to each school's educational vision and the values underpinning that vision were extracted. Comparisons were made across schools, looking for similarities and differences. As before contrasting evidence was sought and weighed up in each school, in order to come to a judgement about the overall picture of how the often conflicting values, views and beliefs played out as part of the arena of the school.

4.6.5 Data analysis for Section 9.4 – ICT strategies

Data about ICT strategies was extracted from the school data grids (described in Section 4.6.1). Often there were discrepancies between the accounts that different teachers gave of the ICT provision and how ICT resources were managed within schools. Judgements were made based on weighing up the available evidence for each school, and the outcomes are presented in a Table 9.4.1. The rationales for different ICT strategies were examined and compared across schools and where possible linked back to the school's vision and educational priorities.

4.6.6 Data analysis for Section 9.5 – the relationship between ICT strategies and ICT use

Table 9.4.1, which summarised the ICT resources in each school and how they were deployed, was extended to include summaries of the Quantity of ICT use (explained in Section 4.5.2 and presented in Section 8.1) and the analysis of instances of ICT use against the ICT Innovation Framework (explained in Section 4.5). This involved extracting data from the School ICT use spreadsheet, using filters in MS Excel. Limitations in the data meant that meaningful statistical analysis, even using non-parametric techniques, was inappropriate. For example, the number of instances of ICT use noted in each school was at least in part due to different amounts of time spent collecting data in schools (e.g. each Exploratory study involved two days in school, compared with a minimum target of 5 days in school for each Case Study). Similarly, some schools were clear that they were focussing on the cross curricula use of ICT when dealing with the researchers, and not addressing the teaching of Computing, whilst others encompassed all of their ICT use including teaching Computing.

4.7 Data analysis for Section 10 – RQ4

The analysis in relation to RQ4 involved trawling through the School data grid (see Section 4.6.1) and using filters in the School ICT use spreadsheet to examine differences in use across subjects and the extent to which schools used ability groups and the implications of this for children's learning.

The categorisation of children's digital practices outside school on the Digital Practice Framework (DPF) had included details of their ages and genders (see Table 6.3.2). As before there was insufficient data for meaningful statistical analysis, as too many of the cells in the DPF had values of zero.

4.8 Data analysis for Section 11 – RQ5

The pedagogic practices in each school were analysed to explore the extent to which they represented innovative pedagogy (RQ3). Innovative pedagogy was defined as the degree to which teachers' pedagogy, related to ICT, reflected a shift from a traditional model to an innovative (sociocultural) one.

The key features of a range of theoretically driven models of pedagogy, extracted from the literature (see Section 2), are summarised in Table 4.8.1. For ease of reference this has been called the Innovative Pedagogy Framework (IPF). This research, underpinned as it is by a sociocultural stance, adopts the view that pedagogy that maps onto a sociocultural model (the right-hand column in the IPF) is innovative.

It was clear from the data that teachers within the same school often had different espoused and/or enacted pedagogical views and practices. The data relating to individual teachers was thus analysed to see how it mapped onto the IPF. However, this was problematic for two reasons. Firstly, in many cases there was not sufficient data to be able to make confident judgements about how data for individual teachers mapped onto the IPF. Secondly, individual teacher's pedagogy did not sit neatly within one particular theoretical model. Not only were there differences between their espoused and enacted pedagogy, but their enacted pedagogy varied. Thus, one moment they might overtly use extrinsic rewards (fitting them in the behaviourist column), and in the next try to make connections with children's intrinsic motivations and interests.

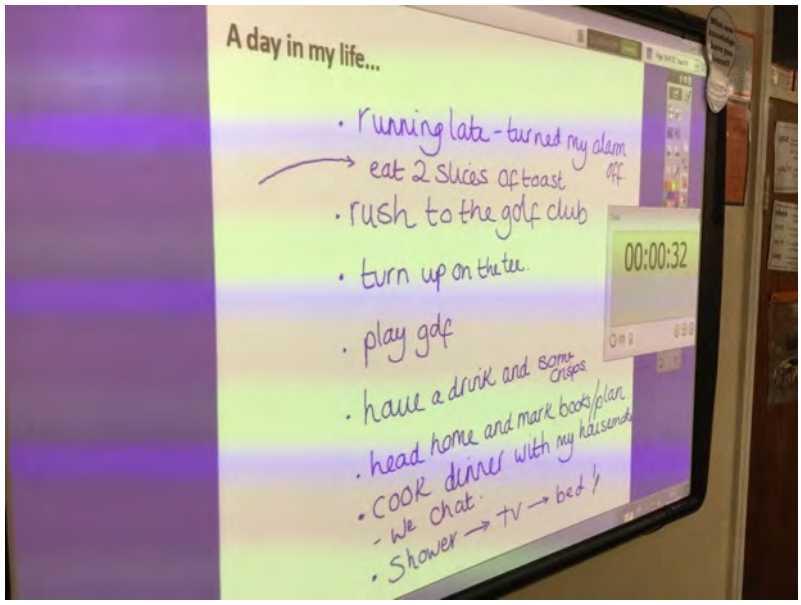
Even where data existed that might inform the mapping of a teacher's pedagogy to the IPF, on many occasions it was difficult to discern how the evidence should be interpreted, and thus how it would map onto the IPF. For example, when asked about the role of the child Ms Evans said:

> their role is to be engaged and work hard. Motivation should come from the task, children wanting to learn, having a real purpose
>
> (Ms Evans, Glenville Juniors)

Within that one short statement about motivation there are at least two conflicting views about motivation: "Motivation should come from the task" explicitly frames motivation as being extrinsic. Motivation should come from "children wanting to learn" could be referring to their intrinsic motivation to learn, or could be referring to the success of the teaching activity in extrinsically motivating them. It is extremely difficult to be clear which interpretation is most appropriate.

This problem was amplified in the observation of lessons, where there seemed to be clear tensions between what a teacher appeared to want to do and what she actually did. For example, Ms Evans (Glenville Juniors) went to great lengths in the observed literacy lesson to make connections with the children's interests and experiences – talking about pen pals they had had, things it would be interesting to talk with an old person about, and organising for them

to write to an old person in the local care home. All this would suggest a social constructivist or sociocultural stance. Indeed, throughout the class discussion following the initial stimulus video, she very successfully facilitated the discussion. However, each time the children were starting to become really animated, talking with each other and not just addressing their comments to her she would say "THREE, TWO, ONE" and cut off the discussion, using what appeared to be a conditioned response in the children (they knew they had to be silent by the time she got to "ONE"). These difficulties were magnified when you looked across different key features of the different theoretical approaches.



Part of the difficulty related to the fact that where practice in a particular setting fitted at any moment in time depended upon sometimes quite subtle aspects of how the interaction was transacted. Thus, for example, in Section 8 the practice of sharing children's work with the whole class, either using a visualiser or mirroring their tablet on the class display was often teacher directed rather than participative because of the sensitivity with which it was implemented and implicit messages conveyed to the children about what was actually going on, and the extent to which their views and knowledge was genuinely valued.

Nonetheless, there were noticeable differences across settings, and loosely aligning them with the framework seemed potentially illuminative. However, it should be noted that this was intended to illustrate often unrecognised differences in practice rather than to provide a robust analysis against the framework, and to highlight some aspects of innovative pedagogy that were evident in the study schools.

Two different sets of analyses were carried out, reflecting differences in the richness of the data available between the exploratory and case studies. For the case studies individual teacher's practices were examined and loosely mapped onto the IPF. For the exploratory studies all the available data, relating to the school as well as individual teachers was used to roughly map pedagogy within the school to the IPF.

Figure 4.8.1 The Innovative Pedagogy Framework (IPF)

Categories	Behaviourism / information processing	Constructivism			Innovative - Sociocultural
		Cognitivist Piagetian	Radical	Social	
Purpose of schooling/ educational goals	Forming habits, or rules and procedure and associations between them.	Organised, abstract mental models and procedures for applying them. Transferable across situations.			Becoming competent in productive and valued social practices. Competence relies on developing the shared repertoire of communities (concepts, terms, tools including symbols, procedures, routines, stories and ways of doing things) and understanding their joint enterprise and how to deploy the tools in achieving these
View of learner and learning	Learners are **receivers** and processors of information and **passive** in the learning process.	Learners are **active** constructors of knowledge			Learners are **agentive** but agency is distributed across people and tools both physical and psychological. Learning is mediated by the tools available that enable learners to take particular actions. A dynamic affordance is what becomes possible when knowledge is used as a tool in interaction with the social and physical world. Agency is relational; learning relies on productive relationships with others it is **collaborative**. Learners belong to different communities and have multiple identities and associated competences within those communities in which they participate. Learners' histories of participation are diverse and mediate their learning in school. Children's multiple identities mediate how they are positioned and how they position themselves in schools and classrooms
	Motivation is extrinsic, learners	**Motivation** is intrinsic as learners seek to understand and make sense		**Motivation** is intrinsic but it is to understand how others in	**Motivation** is intrinsic to engage with, and achieve stand-alone competence

	react to the environment Learning is by imitation or acquisition Learning is an individual activity	of the world and resolve cognitive conflicts. Learners are self-directed and self-regulating Learning is a process of mutual adaptation and internalization and self organisation of knowledge to better fit reality **Reciprocity** is crucial and depends on equality in knowledge and power between learners in interaction. Cognitive conflict for older children is enabled through **co-operation** with other learners. Meaning making remains an individual activity	society have constructed ways of seeing and understanding the world that provide the learner with power to be self-determined, make informed and socially aware decisions and be socially responsible - a literate citizen. Learning occurs in dialogue with others in activity. It is through dialogue that meanings emerge between people. Dialogue relies on **collaboration** between learners and learners and teachers actively establish joint contingency	in socially valued activities and to belong to particular communities. Learning occurs in **participation** with others as children move through understanding as their competence evolves. Learning is not towards outcomes, it is ongoing and evolving. Participation relies on mutuality, the ability to negotiate meanings which emerge between people and are social through and through. Accountability to the shared endeavour is a responsibility of all participants, children and teachers. Learning is an **appropriation** of shared social understanding. What is appropriated depends on what is made available and for whom. Learning is a transformation of identity and is a process of **belonging** to the communities where the practices are situated and **becoming** part of that community as competence evolves.
Views of teachers and teaching	Teachers are the holders of knowledge – the authority. Teaching is by drill and practice in behaviourism. Metaphors for the teacher – lion tamer, sculptor or petrol pump attendant. In information processing the teacher sets pre-defined	Learning occurs in activity. Younger children need concrete experiences older children can begin to abstract and create models grounded in practical problem-solving activity	Teachers are the authority in scaffolding learning to achieve established knowledge claims. Learners and teachers have responsibility for the reflexive co-creation of the classroom subject culture, the ground rules and ways of acting and problem solving. Both are reflexively agentive	Teachers construct learning opportunities from the perspective of the learner not the subject. Teachers connect classroom activities to mature practices in the world so children can bridge their understanding by recognising potential affordances between school activities and the lived world and vice versa. Teachers have to enable children to experience mutuality and recognise the identity work that entails. This involves

	problems solved by algorithms stored in the head. The teacher limits the information to be processed (stepwise pedagogy). Teachers use pace and competition often to maintain motivation **Metaphor** for teachers - **parent bird** regurgitating pre-processed information in sequenced blocks	Teachers **guide** learning they do not instruct, children direct their own learning **Metaphor** for the teacher – **gardener** providing the conditions for learning	Teachers **elicit** children's prior knowledge and **model** learners' knowledge through process of testing and retesting. They provide **contingent guidance** moving individual learning towards specified curriculum goals.	Teachers do not guide but actively direct experience through **scaffolding** and the dialogue between children until they achieve stand-alone competence in conceptual understanding and subject specific problem solving or ways of doing. Teachers direct learning through the zone of proximal development. **Metaphor** for the teacher – **tourist guide** or **Sherpa** negotiating learners' journeys across subject terrains	recognising what children bring into the classroom from their histories of participation in multiple communities. Teachers practice is shaped by institutional practices and values. Within a setting teachers **reify** emergent individual and collective meanings for all to use and make sense of within the context of the activity. The teacher with learners **orchestrates** support for different learning trajectories within the shared endeavor of the subject classroom. **Metaphor** for the teacher - expert in social valued practices and activities and reifier of collective and individual meanings.
View of knowledge	Knowledge represents how the world really is. The world is given not constructed	Knowledge is constructed it doesn't represent an objective external reality			Knowledge is used in action and knowing is part of action. Knowledge is a tool of knowing within situated action.
	Symbols like words and numbers carry meanings which are stable across all learners	Knowledge is **viable** if it fits experience		Symbols and words do not carry meaning. Meaning comes into existence between people in dialogue	Knowledge is possessed by individuals and groups in both explicit and tacit form. Each does different epistemic work. Knowing emerges in action and is part of it
	Knowledge is independent of context i.e. the situations in which it is acquired and is transferable	Knowledge is abstracted and available for transfer across situations		Knowledge emerges in social communities and is collectively verified and individually acquired	Learner competence is what they 'do' well not just how much they know
	Knowledge is explicit and a property of the individual				

5 Descriptive vignettes

The purpose of these three vignettes is to provide rich descriptions of snapshots of one child, the arena of the school that he attends, and limited view of the setting (one lesson that the child was involved in). The vignettes exemplify some of the themes that emerged from the data and the complex inter-relationships between them. The following sections present an analysis of the data across the research sites, based on the emerging themes.

These three vignettes are NOT intended to be representative and are not comprehensive pictures of the child, school or teacher. Whilst more data were collected about the child, spanning home and school, than about the teacher or school more generally, at best the child vignette is an inevitably partial snapshot.

The school were given the opportunity to comment on the vignettes and the Director of E-Learning provided this update on practice since the data were collected:

> The vignettes below represent the use of technology when it was initially embedded in the School. Since research and data collection began for the NP3 project, there have been significant developments for the use of educational technology in teaching and learning, in which there is now more impact on the level of use of iPads and the range of ways in which they are being used with the students. As a result of the Continuous Digital Professional Development programme set by the Director of E-Learning, most teachers are now using a common set of classroom management tools in which there is a greater focus on the pedagogical aspects of teaching to provide and improve areas of: feedback, marking and assessment, content curation and delivery, and flipped learning approaches in lessons.

5.1 Rory's vignette

(Based on: interviews 1 to 3 with Rory, interview with Rory's mum; Year 6 group interviews 1 & 2; Ms Peak's pre-observation interview; Ms Peak's observation; Ms Peak's post-observation interview; Group C pupil post-observation interview)

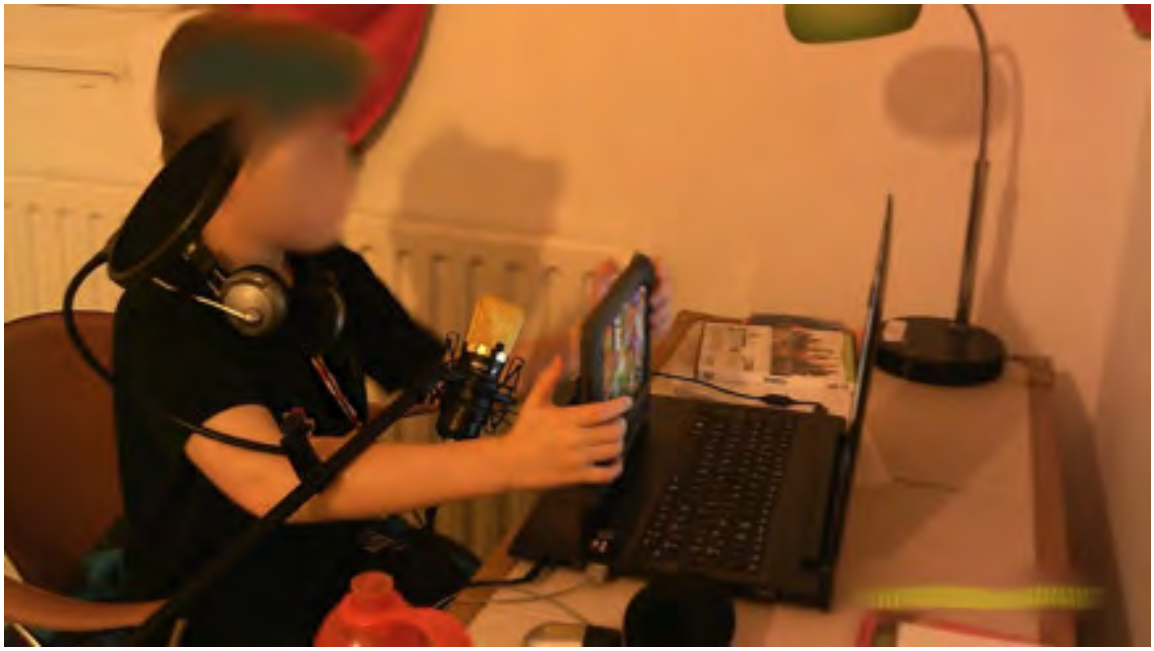
5.1.1 Outside school

Rory, who is 10 years of age, lives in South East England with his mum and dad. He has "lots of pets", including a hamster, two cats and a dog, and his main household chores involve taking care of them. His dad works at home two days per week, but also has to travel a lot. His mum works full-time, again partly from home.

Rory has access to a wide range of digital technology, including: an XBox 360 (which used to be his dad's); a Wii Mini; an old iPhone which he has because he sometimes walks home from school alone; a small android tablet which he rarely uses during term time; a school iPad which he has to hand back over the summer holidays; and a Windows 10 laptop in his mum's office, though she commented that "it's not mine, it's our laptop". There is unfiltered WiFi throughout the house providing access to BT Broadband, for which Rory has the password. He has a range of peripherals, including a Bluetooth keyboard for the iPad and high quality recording equipment set up as "his complete studio" (Interview with Rory's mum) in his mum's office (Figure 1). He also has use of his mum's mobile phone and personal iPad (which he uses in preference to his school one because it has no restrictions), as well as a smart television (TV) and another TV with a Sky box.

His mum and dad each have two iPads (one for work and a personal one). Rory's mum noted that ICT is important to the family. Both his parents use Skype and WhatApp to keep in touch with family abroad, as well as using ICT for work. His dad has a Twitter account, and his mum has a Facebook account which she rarely uses.

Figure 5.1.1 Rory using an iPad, laptop and recording equipment

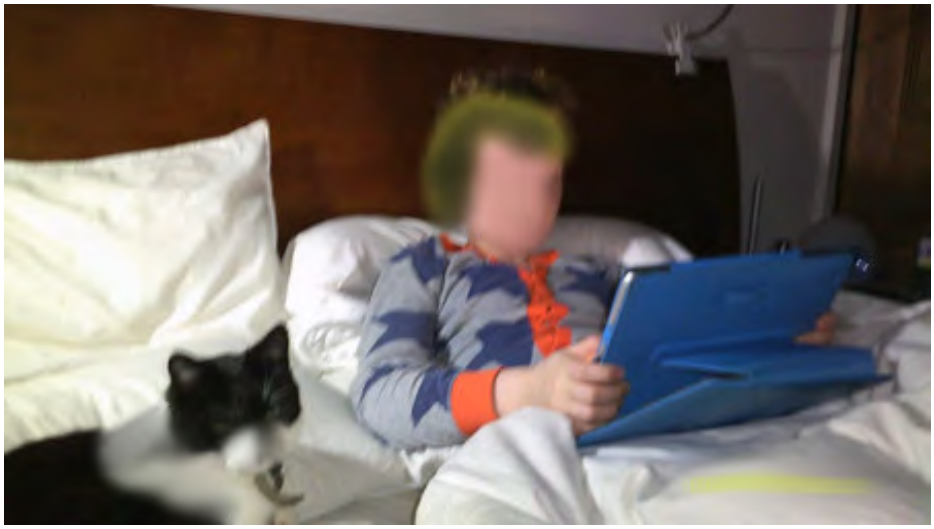


Rory seems to take this level of access to and use of ICT for granted, commenting that "there's not actually much" digital technology in his parents' cars, there's "satnav and all the basic things", but later on he notes that they watch TV on long journeys on the screens built into the tops of the seats. Thus, even in his parents' cars, he has access to screen technologies.

Rory said that he is the main user of ICT in his house. He did not think his mum used it much "because she normally works with people", although she does use it for her calendar and "searching up things". He said that his dad "does a lot of his work on the computer, because he's always also in a different country", he uses it for his calendar, for documents and stuff. His mum and dad both engage with his ICT activities, for example, they both play games with him – normally on the Wii. They will also help him if he gets stuck with his homework.

On a school morning when his mum is working from home, Rory would wake at about 7am and go into his parent's room to use his mum's iPad (usually to watch Minecraft-related videos), while his mum gets ready (Figure 2). If his mum has to go to work then there is less time so he does not get to use the iPad.

Figure 5.1.2 Rory in his parents' bed before school using his mum's iPad



Rory attends a private, coeducational school, which runs homework (prep) club and then sports and other clubs. He is also involved in competitive swimming which involves training every weekday, including some early mornings. So, he never gets home from school before 6pm and often it will be between 7.30pm and 8pm. When he gets home he has a shower (because of all the sports activities), does his homework and has some tea. If he is late home, then there is no time for TV or other technology. On other evenings, he is allowed 30 minutes to either watch an episode of something (on TV) or play on a device (usually an iPad).

On Saturdays, he wakes up at about 7am and plays games on his laptop with a friend (Ashish) over the Internet, until about 9am. His mum noted

> it's his downtime; it's time that is to himself… And I find that important, we stay out of that a little bit as well. It gives him a bit of a freedom to do what he wants to do
>
> (Interview with Rory's mum)

He then gets dressed, has breakfast and gets ready to go to drama school, which takes up the rest of the morning (until 1pm). On Saturday afternoons, Rory "does some stuff" then watches more TV and has iPad time. Saturday afternoon is "chilling out time, family time" according to his mum, when he cleans out the hamster and may go for a walk with his mum and the dog, then "He gets to do a little bit of what he wants as well" (Interview with Rory's mum). He may watch YouTube on the Smart TV ("it's a bigger screen") whilst cleaning out the hamster. Other than this his mum didn't think Rory multitasked, in the sense of watching TV whilst also doing something else such as using his iPad. Only being able to concentrate on one thing at a time was clearly something that she had discussed with him.

On Sunday mornings, he plays games on his laptop with Ashish over the Internet, until 10 or 11am, because his mum and dad sleep in on Sunday. If he has a swimming competition, then that might take up the whole day (usually Sunday). Otherwise they might go outside (with the dog, to the beach), though "in between there are always periods where he's allowed to do whatever he wants" (Interview with Rory's mum), which might include playing Minecraft or having friends round.

Neither Rory nor his mum perceived many barriers to ICT use at home. Rory commented that: "I just like play, do my chores and then I get to play again"; "If I do my chores its fine [spending big chunks of time using ICT]"). He didn't think there were things he would like to do that he does not/could not - if he wants to do something he just gets on with it. Though his mum noted that he always asked her before doing things

> He asks, he asks every time. 'Mummy is that OK, can I do that?' He doesn't do much where he just goes ahead and does things. Just asks or 'I'm letting you know, that's OK then'
>
> (Interview with Rory's mum)

It did appear that there were not many explicit rules about ICT use – whilst his parents did sometimes want him to do homework research or homework, they did not seem to direct his ICT use or limit the amount of time he spent using ICT (though clearly chores, school, swimming and drama club occupied substantial proportions of his time). There were also no filters or banned websites. Rory said that this was because "My parents feel that they trust me", and this trust seemed to be reflected in an openness about dealing with inappropriate material. Rory explained that if he sees something that he isn't sure about he turns it off and shows his mum or dad. He gave an example related to Justin Bieber/What do you mean.

This openness was reiterated by his mum:

> So on my iPad I have no restrictions on it, and that has a reason, that was deliberate. Because my opinion is that I'd rather have him discover something and then we talk about it, and we have done in the past where he has stumbled across a website… And then we talked about it, and I find this better than putting restrictions on. They'll just

> get nosey and think there's something fantastic there that they are not meant to see. And so far it has worked.
>
> (Interview with Rory's mum)

His mum gave a couple of examples of times when Rory had come across inappropriate content, once related to a video called 'Blue Candy Factory' (which was not about sweets) and another occasion where a man in a Minecraft video was being derogatory about women. In both cases his mum talked with him about why they weren't suitable. They now review on a weekly basis what he has watched/found and talk through any issues. His mum told him that she trusted him, commenting "So we haven't had any bad experience yet, it isn't to say that it might not come but it hasn't" (Interview with Rory's mum).

From Rory's account it seemed that his parents allowed him to play games that were rated for older people and allowed him to have a YouTube Channel – indeed when asked about what age you had to be to use YouTube he said "It's if your parents allow you". However, his mum noted that they had a pin number on the Sky box that he didn't know the code for, so he had to ask permission to watch 12 rated films.

When asked what his main uses of ICT are at home Rory said that he mainly played games, which he did not see as being educational ("not that many educational games"). He named a range of games, including Minecraft and Halo on the Xbox, Minecraft, SIMS4, and Robots on his laptop, and Steam (which allows you to play lots of games). He said that game playing with his friends is probably his favourite ICT activity. However, this emphasis on games belied the richness of his ICT practices.

On weekend mornings, he played multiplayer games over the Internet, such as Minecraft. However, this involved using services such as Mojang to download mods (modifications) for Minecraft (including, for example a Pokémon extension). As he played he communicated with his friends via Skype (as well as in-game chat). When building things, Rory tends to work collaboratively with Ashish and another friend called Henry:

> Like in high pixel when build battle we tend to either build one big thing or two separate things. Like when everyone's playing basketball me and Davin had to build like a basketball, something related with basketball. He built some basketball nets, I built the basketball

Rory's use of Minecraft overlaps with other activities:

> For example at the moment I'm building a town and a high school [in Minecraft], for a new YouTube series, which I'm starting with Ashish and Henry.

Rory has a public YouTube Channel to which he and his two main friends (Ashish and Henry) upload videos of what they do in Minecraft. This is in addition to his own YouTube Channel for other videos. His mum noted how keen he was on film making and how this merged in with his attending drama school:

> **Rory's mum**: And he's very much into the filming, actually what he does for example when we had the Halloween party last year, he filmed his friends and then made this into a film production. It looks like a trailer of a movie, a horror story. That was actually quite cool I thought. He likes that and he does that at school [in after school club] as well with some other friends. They do these short funny little clips about nothing really… and then if you get the right three or four kids together they will do that and Rory will direct the whole thing. He likes directing.
> **Researcher**: He likes directing.
> **Rory's mum**: He loves everything that's got to do with film, drama, music, directing, staging, lighting.
> **Researcher**: And of course you said he goes to drama on a Saturday.
> **Rory's mum**: Yeah he does, he's very much into that.

Researcher: So what's the relationship between his drama, physical world drama and his filming?
Rory's mum: He mixes them. He learns something at drama school or we go and see a musical, and then he gets ideas from it. It inspires him, and then he tries to put that into practice in a smaller scale obviously.
Researcher: And what does he do with his productions, the films he's made?
Rory's mum: He shows them. Sometimes he puts them on YouTube.
Researcher: Does he have a channel?
Rory's mum: He does actually, <name of YouTube Channel>.

(Interview with Rory's mum)

Rory also uses Musically, a video social network, in which he mimes to a song and does funny actions, which he shares publicly. This is something his mum joins in with.

Rory's mum: I also joined with the video with the Halloween, I was magnificent.
Researcher: You were magnificent, are you on the YouTube channel?
Rory's mum: Not on [Rory's YouTube channel] one but on the Musically I am actually yeah…
Yeah, so he'll take a Justin Bieber song and then he goes and tumbles down the stairs. And he actually takes the lyrical content and makes something funny with it. And then they have their little followers and their likes and dislikes. And he always gets very excited. Or he takes the dog, when we trained the dog, I had to phone him and he puts that on YouTube: how to train your puppy.

(Interview with Rory's mum)

Rory is also into watching and making funny videos – such as 'not to laugh' videos.

And he likes the exaggeration, the drama that comes with it and. You give him a role and he knows how to put a spin on it to make everybody laugh. You should see when he impersonates the teachers…
but you can give him any, and he picks up. He has got a gift where he observes people and he picks up the one thing that makes them stand out. And when he does these characters you can see what he means.

(Interview with Rory's mum)

Rory makes all his videos on his laptop, using Movie Maker to compress them. He says that Movie Maker is better than iMovie which

doesn't really compress it, because like this programme if you put that compressed video onto YouTube it only takes a minute to upload, rather than hours and hours and then it never uploads

He also used X Flip to record video and stream it live to YouTube. He has started to blog, and intends to do more of this.

Rory's mum noted how he is curious:

He wants to know anything and he looks it up, and he has access to it… He spends a lot of time looking things up… the iPad is probably constantly somewhere

(Interview with Rory's mum)

Rory confirmed that he keeps his iPad to hand so that he can use it to quickly search for information whilst he is using his laptop. He searches for information related to his other ICT activities, for example to check out whether a site or download is trustworthy/virus free before downloading it. Rather than using Google (or some other search engine) he uses YouTube –

Normally what I do is I go on YouTube and look up for a video, so that I can see like if they got a virus or something.

He seemed very conscious that "some things just lead you to a virus" so whether or not he downloads programs "depends on how much I rely and trust the software which I'm trying to deal with". Mojang was a site that he was confident in downloading from because it checks the mods for viruses. He also downloads music; for example, he found and downloaded music for a golden wedding that was coming up.

Rory prefers multiplayer games, and nearly always plays in multiplayer mode, because "it's more fun multiplayer" and "also when you're recording a video you have more stuff to talk about." His mum agreed that much of his ICT use was social. She noted that whilst he did have WhatsApp (which he used to communicate with her) he had not asked if he could be on Twitter, Facebook, Instagram or any of those social networking sites. This perhaps reflected his mother's views of them as being dangerous places:

> I think he realises quite a lot what kind of damage that can do… Because we talked about it. Our motto is a little bit if you haven't got anything good to say don't say it. And anything, what you sent, what you do, once it's on an electronic device it cannot be taken back, it is different. If you say face-to-face to somebody I don't like what you're doing, or you have behaved really nastily or you are nasty. But once you put it in writing on the cloud it stays on the cloud. You might not be able to see it but it's always there. And it will haunt you forever. And I think that's something that he very much understands.
>
> (Interview with Rory's mum)

Rory also has a gmail account and a school Office 365 account and said that he uses email quite a lot, though it was unclear who he communicated with.

His mum said that he only played online with school friends, though Rory noted that he sometimes interacted with people he did not know in the physical world. For example:

> **Rory**: On Pokémon I was just asking like has, this guy was just asking in chat can I do a job for anyone, and I said yeah me. And he came over and I asked can you go mining for me, he went, he got me like lots of diamonds and emeralds. And I was like what do you want in return? And then he was like nothing I just do it for fun, I'll be back another day to do it again.
> **Researcher**: Ok, what did you think about that?
> **Rory**: I think it was actually OK, because like he was very nice. He actually showed me where the diamonds and stuff were, and it's not really chatting face to face, it's just…
> **Researcher**: Has he been in touch again?
> **Rory**: No, it was just a one-off.

Rory felt that 'strangers' you interact with online

> can't exactly really contact you or hurt you. All they can do is chat, putting chat in the Chatbox. And you can always turn off the Chatbox

which he has done on occasions.

Rory's mum identified a range of different ways in which he had learnt to use ICT. When he was seven or eight years old his mum bought a couple of books about Minecraft and worked through them with him initially,

> and from then onwards he developed quite quickly, and he left me far behind quite quickly I have to say. And then he met other children like Ashish who knew already a little bit more, and then he put that into practice. And yeah, it just went from there
>
> (Interview with Rory's mum)

He also watched videos (Minecraft and DanTDM) which

> weave in stories, and he follows the stories as if it was a TV series. And he learns a little bit. Sometimes these series show people how to play a game, and he learns from that how to do certain things
>
> (Interview with Rory's mum)

His mum thought his competence in making videos was self-taught, again through

> talking to children who are a little bit more advanced, Rory says he always seeks somebody out where he can learn something from. And then he takes that and tries to put it into practice. That's just him.
>
> (Interview with Rory's mum)

Asked how he rated himself as a player Rory responded:

> It depends what it's in. If it's in like Redstone and stuff I'm quite good at that. If it's in building yeah. But like if it's sort of like shooting-wise, like with a bow, not very good.

He believed that other people thought he was good at game playing – indeed Henry had told him that he was awesome at building.

Rory said he was pretty confident using ICT: definitely when it comes to using his Wii and Xbox, and he could sort out most of the technical problems he has at home without help. His mum, noting his growing independence, recounted an incident when they had gone to a restaurant where there was a tablet on the table so you could order your meal:

> And ours didn't work, so Rory was very disappointed and was then a little bit bored. And then he cracked their password, hacked into their system, reset the whole thing and went da-da it works again, I've solved it for you. And I just sat there with an open mouth literally, it's like who are you?
>
> (Interview with Rory's mum)

If he can't solve a technical problem, he will sometimes turn to his dad (for example related to the WiFi). He didn't rate his mum's competence very highly (according to his mum),

> but then I surprise him every now and then because he thinks, a lot of the times, he knows a few more tricks on the devices than I do. So he thinks he's very smart about that. And then every now and then I solve something, especially if it's then ICT WiFi printer related, something that he hasn't been in contact with. And then all of a sudden it's like oh she does know something
>
> (Interview with Rory's mum)

If, as often happens, his dad is away he will ask Ashish. However, there were times, such as recently when trying to use some new recording software, he wouldn't ask his parents or Ashish for help because "they wouldn't know much about it. I'd be better off [sorting it myself]".

Rory also helped Ashish if he had technical problems. If Rory couldn't solve an ICT problem, even with the help of his dad or Pupil 9, then "I'd try and bring it back to the school and just try and ask someone who really knows about IT".

When asked why he played games he said "It's just fun, for fun". He reiterated this about building in Minecraft: "It's just fun and it's very competitive to see like who's better". He also commented that he recorded videos to upload to YouTube because he wanted to: "but if I don't feel like it it's not pressurised".

ICT clearly played a major part in Rory's life, occupying most of his time at home. He explained that he couldn't do much stuff in the garden because in winter it's too cold, their garden isn't very big, and they can't play games because the dog will steal the ball or jump on

the trampoline. However, when asked to rate the importance of ICT to him he 'only' gave it 8 out of 10,

> because sometimes the computer crashes and that makes me seriously mad if I'm on a call or doing something important which I haven't saved… like I'm trying to use the new recording software called Expert, and if I have that on and I have Skype on or whatever, and I hit record it crashes. And then it just comes up with a blue screen with a sad face going your computer crashed… it takes like 10/20 minutes to get back up

His mum thought that given a free choice Rory would choose to do something social:

> I think if you give him the option do something by yourself he will probably go on a device. If you give him the option of I'll come with you and we do something together, whether it's tidying up the garden or whether it's playing a game in the garden, he will do that
>
> (Interview with Rory's mum)

Rory seemed clear that he would be at a loss without access to ICT at home and if his parents stopped him using it "I'd feel so bored, and I wouldn't like them that much anymore." His mum thought that he would be bored initially, "and then he would pick himself up and do something else. He would find something else that he was passionate about." This reflected what had happened when they went on holiday and he didn't have access to ICT:

> If there's a pool to play in, there's somebody else to play with, or we play more with him because we have time. We do board games and all sorts of things. Then no, I don't hear any complaints at all
>
> (Interview with Rory's mum)

Rory's mum thought that ICT "has enriched him and it sort of draws out the creativity side." However,

> **Rory's mum**: What I think is a little bit of a downside is that Rory's handwriting is not particularly great. And I think with the use of the iPads there's no necessity to hone that anymore. So that's probably the downside.
> **Researcher**: How much does that worry you?
> **Rory's mum**: How much does that worry me? Probably not too much. I mean it's legible, his spelling is all right, he's doing fine at school. He is in a good skillset. It doesn't worry me unduly I have to say. And we still do some handwriting stuff, I'm very particular when he has to write thank you cards, it has to be written thank you cards personalised ones, because it has a bigger impact to express your gratitude than just a WhatsApp or an email. So he does have to do things like that.
>
> (Interview with Rory's mum)

Rory's mum was a little uncertain about how ICT was used in school, but identified that they used it for homework, research and presentations and certain maths problems. She felt that the children were quite strongly encouraged to use ICT, giving an example of how the ICT teacher had helped Rory when he asked her how to extract a segment from a song.

5.1.2 In school

As already noted, Rory had a school iPad, and, like all the other children in Years 5 and 6 he is expected by the school to take it to every lesson. This is in addition to text books, exercise books, pencil cases, and other kit - "It's heavy" (Year 6 group interview).

Figure 5.1.3 A typical example of the kit the children carry between classes

Rory said that the school iPad was used for homework, presentations and a few educational apps. This was expanded upon by other Year 6 pupils who mentioned: research, for example Henry VIII to help with homework; programming (in IT lessons); lots of educational apps for maths and English, and to a lesser degree other subjects; sending emails, pictures for projects, and presentations to teachers (sometimes for marking or "so that they can print it, and then you can stick it on") (Year 6 group interview)

Rory's maths and English teacher (Ms Peak – see 5.3 The teacher vignette) had started taking a photo of a worksheet and sending that as homework directly to the pupils' iPads via Airdrop. Rory explained that this was so that the homework could not get lost or crumpled up, which the teacher reiterated:

> We also have homework on a Tuesday where I have moved into the children, I'm fed up of sheets and scrumpled sheets and sheets that are half finished, and sheets that clearly they haven't done any working out. Because if they got a whole load of wrong answers I just cross the whole load and I don't know why they're getting it wrong. So they've moved into having a maths book, and so trying not to use so much paper I'm Airdropping the homework to them now.
>
> (Ms Peak, pre-observation interview, Riverview Prep)

Rory was a little unclear about how often he used ICT in lessons. He didn't think there was much ICT in lessons other than IT lessons, which he enjoys because he likes programming and thinks he is quite good at it. He was hesitant about whether the iPads were used every day in school - "I don't know, because every day is sort of a different lesson" - but concluded it was used quite a lot but not always - maybe three or four days per week. Other Year 6 children thought the iPads were only used a couple of lessons per week (Year 6 Group Interview). They identified a number of examples of use, which varied depending upon which groups they were in for maths, English and other subjects. Rory noted that some teachers used it more than others. Two of the Year 6 girls said they only used their iPads in school for research (in history, geography, and religious education (RE)), whilst others used some educational games too, and at least one emailed or texted friends even though that was not permitted (Year 6 Group Interview). Collectively they estimated that they do research on iPads in around two lessons per week for roughly 15 to 30 minutes per lesson, and having found the information on the iPad they write it in their exercise books (Year 6 Group Interview). One maths group played TT

Rock Stars (a maths/tables reinforcement game) every Friday for around 20 minutes (Year 6 Group Interview).

Some teachers let them have time to play on their iPads at the end of lessons if they had finished their work (e.g. the geography teacher ("she's nice"); on Fridays one teacher allowed them 5 minutes free time each week; and the IT teacher allowed them 'free use' of ICT at the end of lesson). Rory and the other Year 6 pupils noted that there were severe constraints on what you could do on the school iPads – most websites were blocked (including YouTube and Answers.com - there was some disagreement over whether Google search was one of them) and they cannot download or delete apps (Year 6 Group Interview) – so this 'free use of iPads' involved school-approved educational games, or 'good websites with games' (e.g. Cool Games) which the children had found (Year 6 Group Interview). Rory commented that sometimes the games were boring so you read a book instead.

All the children agreed that they could only use their iPad when told to by the teacher, but they commented that some pupils definitely were allowed to use the iPads more than others (Year 6 Group Interview). The Year 6 children thought there were three reasons why this happened: children who had 'learning difficulties' for whom ICT was an additional support; children who had found ways to access games on the web and were doing so when they were meant to be doing something else; and children who were being rewarded for not mis-behaving. Rory thought that this last rationale was particularly unfair:

> **Rory**: So some naughty people the teacher says look if you behave then you get some IT time in break or whatever.
> **Researcher**: Oh really, so that happens to the good people?
> **Rory**: They don't get rewarded.
> **Researcher**: That doesn't sound very fair to me.
> **Rory**: Exactly, so it just encourages people to start being bad.
> **Researcher**: So that they can get.
> **Rory**: Yeah.

Rory perceived that ICT use also varied across subjects. He said that you were allowed to use your iPad as a dictionary or thesaurus in English without having to ask the teacher. However, he did not use his iPad in history, drama or music. Other children (Year 6 Group Interview) said that they used it mostly for research (in science, history, geography and social studies/RE).

Research, which often seemed to be a homework activity, also often appeared to involve creating a presentation. Rory's mum thought that creating presentations was probably what he used ICT for most in school. She clearly supported him in doing this:

> He used for example, you give him a topic and he then wants to do a PowerPoint presentation with it. And then he figures out how to make this more interesting. And sometimes we talk about it. You can't use the same things over and over again because then people get bored with it. So how do you engage people, how do you engage a crowd to actually listen to what you want to say? So you make the presentation lively, interesting, exciting, and that's what he does
>
> (Interview with Rory's mum)

The children in the Year 6 focus group noted that the only time they write on their iPads is when making presentations. Some teachers ("the teachers who are not that good with ICT") allow them to choose what software to use for their presentations, and pupils will sometimes suggest better apps to teachers (Year 6 Group Interview).

> **Researcher**: And are most of the teachers happy for you to say I don't think that's the best one Miss?
> **Pupils**: Yeah.
> **Rory**: Either that or you just ignore what they've said about the app, use your app.
> **Researcher**: You're a bit of a trouble maker aren't you Rory?

Rory: No, you use your app and then you say look I did it on this, and I think this one's really good because you can get more transitions or…

(Year 6 Group Interview)

Asked when he had last used his iPad in school Rory said it was when Ms Peak sent their maths homework the previous week. Ms Peak seemed to make more use of ICT than many of the other teachers. She noted that "with the iPads as well I can use it as a carrot and stick" (Ms Peak, pre-observation interview, Riverview Prep).

In an observed maths lesson with the top Year 6 maths group, who Ms Peak described as 'ridiculously competitive'. She planned to use Kahoot!, TT Rock Stars and to Airdrop the children's homework to their iPads. The main focus of the lesson was on pie charts (which was not going to involve any ICT). The ICT was intended for "Consolidation of what they already knew, and continued repetition of their times table practice." (Ms Peak, pre-observation interview, Riverview Prep)

The lesson started with all 17 children seated around large wooden tables. Rory sat at a table towards the rear of the class, opposite Ashish and another boy. Rory had a wooden writing slope on which his exercise book and ruler were resting. He was holding his iPad and responding to the questions that the teacher was putting up on Kahoot!. The Kahoot! questions were about area and perimeter, which the group had been studying in previous lessons. The teacher read out each question as it appeared on the large touchscreen at the front of the class. The children had sixty seconds to respond individually, and were allowed to use their exercise book to work out the answers before pressing what they thought was the correct multiple choice response on their iPad. Each question was accompanied by music with a fast beat. Some children talked quietly. Some, including Rory, occasionally wrote something in their exercise book, before submitting their answer – the researcher noted that she thought Rory was sometimes guessing the answer. The teacher shushed children who were in danger of saying the answer. The correct answer was revealed on the main touchscreen to quiet calls of 'Yes!" and more muted mumbling. Ms Peak then asked individual children to explain each step to solve the problem, before moving on to the next question. The Kahoot! session lasted about 15 minutes in total.

The teacher then introduced the main pie chart activity, which built on work the previous year on fractions and percentages. The children then worked individually, answering questions from their text books about how to interpret pie charts, and writing their answers in their exercise books. Some children shared text books (even though there were enough for one each). Ms Peak circulated around the class making sure that individual children were making progress and providing support.

Figure 5.1.4 Layout of Ms Peak's maths room

Towards the end of the lesson the teacher explained that she was going to Airdrop their homework to their iPads, so they needed to make sure they were turned on. Rory put his iPad on his writing stand on top of his exercise book. He brought up Airdrop and waited for his homework to arrive, which it did about a minute later. Rory commented to the researcher that he liked getting his homework like this because "it can't get lost, it doesn't get scrunched up and you have less to carry". The teacher asked a couple of children to turn on their iPads as she had not been able to connect with them. Once all the children had received their homework, which consisted of photographs of two worksheets, Ms Peak started to talk through each sheet. Rory brought up the relevant worksheet photo on his iPad. The teacher explained that for the first activity they did not need to do any writing, just do the sums either in their planner (exercise book) or email them to her. She then explained that they had done a variation of the second task last year – drawing a Christmas tree from the coordinates provided – but this year she wanted them to produce the coordinates that another pupil would then use to draw the picture in the next lesson. She started to explain how to do this on the touchscreen at the front of the class. Rory put his hand up, as did several other children. Another pupil asked if they were allowed to do it on MS Excel. Ms Peak replied "well you can do or you can just do it on a large sheet of squared paper". Rory put his hand down and sat looking towards teacher, pencil in hand in front of his mouth as other children asked more questions (e.g. "Do we do this in our planners?").

After the lesson Rory commented that Kahoot!

> makes your brain think a lot quicker than usual. And it's just a lot more fun just being very competitive to hear all the buttons

He reiterated the benefits of Kahoot! in his individual interview:

> So like Kahoot!, if you're doing maths questions they're more interested with the pressing and answering the questions and being fast, which is good. Like when the teacher's reading them out people just take their time.

Rory went on to suggest that the competitive element of Kahoot! made lessons more exciting, and noted that "some of the not so smart people actually end up first" and "if you actually really are stuck then you can always guess what it's for". However, the Year 6 pupils noted that

> we don't do Kahoot! that often, but sometimes when we're either starting a subject or finishing a subject we do one
>
> (Group C pupil post-observation interview)

Ms Peak agreed that the children were highly motivated by Kahoot! (Ms Peak, pre-observation interview, Riverview Prep). However, she thought that Rory often guessed

> because he tries to be quickest. He never scores well ever. He wants to be the quickest, never ever scores well… He's one of those children that he hates working out, he just wants to get the answer. So as soon as you move on to something that is two or three steps, multistep problems, he just struggles because he wants to get to the answer quicker
>
> (Ms Peak, post-observation interview, Riverview Prep)

Reviewing the lesson, Ms Peak felt that she had tried to fit in too much, and so did not have time to do the TT Rock Stars activity she had intended. (Ms Peak, post-observation interview, Riverview Prep). In the group interview it appeared that Ashish had not understood the second homework task, perhaps because of the lack of time at the end of the lesson. Rory, however, had understood it and explained it to the researcher. He said he was going to do it in MS Excel on his school iPad "because that does, it's already got the coordinates there for you." (Group C pupil post-observation interview) In his final interview Rory confirmed that whilst they normally did their homework in their books he did this 'Christmas coordinates' activity, which

he "hated", on MS Excel and then put it into Notes to write the instructions on how to use the coordinates to draw a picture. He commented that he finds writing on his iPad easier than writing in his book and is quite good at typing.

When asked if he thought that what he did at home was similar to what he did in school and vice versa Rory responded clearly that it was not: "No, I use a lot more at home and it's for different reasons." This was reiterated by other pupils who did not think that the words technology and ICT meant the same thing in school as it meant at home - in school it was more limited (programming, more 'sciencey', more educational):

> but at home you just mainly play games so you're not really doing much.
> You wouldn't have like a home iPad filled with tons of games, or a laptop filled with loads of games at school. At school you'll be learning about, you'll be searching educational stuff…
>
> Because there are kind of two halves with it. The fun part and the more educational learning side of it. Also like you're more protected, like they only give you the games which won't give you virus or stuff that you shouldn't be looking at. It's the e-safety of the internet, the safety of it…
>
> Because most websites at school are blocked. At home you can just like…
>
> (Year 6 Group Interview)

Key differences between ICT use at school and home tended to focus on the degree to which their school iPads were locked down and websites were blocked. However, one child also noted that

> at school we have set lessons. As opposed to at home we can do, we can either try and find out what we want
>
> (Year 6 Group Interview).

Rory, like most of the other pupils in the post-observation group interview, did not feel that what he did at home with ICT helped him with his ICT in school (excluding homework). This was confirmed by pupils in the Group Interview, most of whom (other than Ashish whose mum works in the school) did not feel that their teachers had any idea what they did with ICT outside school. However, they did not feel the teachers needed to know as what they do outside school is not useful in school (Year 6 Group Interview). Rory did not think that he used the same apps at home and in school, other than for homework and

> Like on the bus, the 4.15 bus which we take from here to senior school, we do have AirDrop fights where we like just AirDrop lots and lots of pictures
>
> (Group C pupil post-observation interview)

The one exception to this was perhaps learning to type fast at home, which did help with school work.

Rory none the less felt that using ICT in school was "actually quite important, because children are actually more interested when you use IT." However, there was disagreement about the extent to which the school iPads enhanced their learning – some feeling they did not enhance it in any way and others thinking that doing research was beneficial (Year 6 Group Interview). None of the pupils in the group interview, including Rory, said they would like to spend more time using their iPads in school "because we don't want to play educational games" (Year 6 Group Interview).

5.2 The school vignette – Riverview Prep

(Based on: Background data; School tour; Head teacher interview; Teacher group interview; Mr Philips' interview; Ms Gupta's interview)

Riverview Prep is a co-educational private day school, catering for pupils up to Year 6 (10-11 years of age); it has a sister senior school on a separate site. The Prep school fees are in the region of £14,000 per year. Most children start at Riverview quite young, some as babies. There are 216 pupils in Years 3 to 6 (Prep), with 36 teachers and three teaching assistants. There is a roughly 50:50 mix of boys and girls. Mr Wilkinson, the head teacher described the intake as "Varied … some parents are old pupils, some have never been in an independent school before".

The original buildings have recently been extended to provide classrooms with large windows on the inside corridors (as well as to the outside), so that people walking through the school can see what is happening inside the classrooms (Figure 5.2.1), though some teachers have put displays over the internal windows (Figure 5.2.2).

Figure 5.2.1 A window from the internal corridor into a classroom

Figure 5.2.2 A display obscuring the window from the internal corridor

The school is well resourced, having extensive facilities including: dedicated subject teaching rooms (e.g. science, DT, Home Economics); sports pitches; an indoor swimming pool; changing rooms; a multipurpose hall with flexible seating, staging, and high quality lighting and sound systems. The head teacher's house and some other staff houses are also on site.

The school has extensive ICT facilities: every classroom has an interactive whiteboard (IWB) or a large touchscreen monitor; children in the Pre-Prep (up to Year 2) have access to sets of iPads stored in their classrooms; Years 3 to 4 have 1:1 iPads for use in school; Years 5 and 6 have 1:1 iPads which they can take home. There is WiFi throughout the classrooms, but not the outdoor areas. Some teachers noted that bandwidth was a problem when all the children are trying to access something at the same time (Teacher group interview). At the time of the visits, Riverview Prep was moving from having a PC lab to having an ICT room equipped with laptops (which can be moved 'out of the way') and a wide range of other resources such as Make Makies –

> So, it's [a computer's] not going to be sitting there on the desk as a focal point. We don't want that. But this will be kind of the multi media room
>
> (Ms Gupta Interview)

In addition, the school shares dedicated ICT staff with its sister school, including: Ms Tomar, the Director of E-Learning who sees her role as "to introduce applications or a workflow that will help you streamline your teaching … or enhance your classrooms" (Director of E-Learning Interview), whilst teachers are responsible for subject specific software. One of the dedicated IT technicians is always based at the Prep school site. All teachers are provided with an iPad, and they have weekly ICT CPD sessions built into their timetables as part of their school day. These are led by the Director of E-Learning, who has teaching experience in independent schools, but is not a qualified teacher. These sessions tend to predominantly focus on how to operate core applications (e.g. Reflector, Kahoot!), with pedagogical considerations, about how ICT might enhance teaching in a subject, being brought in by participants. For example, the Director of E-Learning might demonstrate how to use an application in one session, then ask the teachers to go away and try it and report back on how they used it at the start of the next session.

In the lower years (Pre-Prep) children are in class groups, which stay with the same teacher. In the prep school, they have recently moved to subject specialist teaching. The children have form groups, which provide them with a physical base and a 'link' teacher. They are 'ability' grouped for subjects such as English and maths. These older children move between classrooms for their different subjects. The school has a house system, and pupils can be given house points as an incentive or reward for good behaviour, good work, or anything else a teacher deems appropriate. Class sizes are small, the largest being around 18 children, with many being smaller, and some having as few as five or six children for certain subjects (e.g. the 'bottom' Year 6 maths set).

The Prep school starts at 8.30am (though pre-school clubs are available before this) and ends at 4.30pm. There are then homework (prep) sessions followed by a wide range of clubs (e.g. Pet keeping club) and sports activities, which go on until 6.30pm. The school provides busses to and from the local train station and their sister school.

Being a private school, they have "different service expectations" (Ms Gupta interview) in that they have to pay particular care to parental concerns and needs. This permeates much of their provision. They also do not have to follow the National Curriculum, and had decided not to do SATs from September 2016. However, these were replaced by a set of Key Performance Indicators (KPIs) for pupils. This had increased the focus on assessment and being more accountable for children's progress (Teacher group interview). Teachers were expected to provide baseline assessments at the start of the school year and then half-termly for English and maths (Teacher group interview).

Mr Wilkinson, the head teacher, set out the school's core values as being about respect, understanding, building up the qualities in children that they would like to see in them ("sort of Christian values but applying to all religions"), being inclusive. These values were reflected in professionally produced displays around the school and in the school rules which were also prominently displayed. "We're quite big on manners, likeness and respect.… And also, how the children are dressed" (Ms Gupta interview). Staff were expected to model the values "and refer to them constantly", which Mr Wilkinson said was reflected in the expectation that staff ate lunch with the pupils in the dining hall every day.

Figure 5.2.3 Part of 'I can display'

Mr Wilkinson was not only concerned with the curriculum, but also with the personal and social development of pupils. We're

> very inclusive, um, broad education, celebrating all aspects so that children feel, they can belong, and that we're teaching the way they learn, rather than the other way around.

Displays around the school included professionally produced 'motivational posters' (I can… make friends, be creative, concentrate, perform, co-operate, accept challenges, investigate, be adventurous, be motivated, be independent) as well as examples of work from all children, however good or bad, so long as it was good for that child (School tour; Ms Gupta interview).

Mr Wilkinson's vision was that

> every child who comes to us will be given the opportunities to develop the, the vital things of, in my view, which are long-term, skills to give them, the, the sort of possibility and motivation to be successful in the long term, and to have the kind of facilities and the skills in the staff, the quality of teaching and the quality of experience that enables anybody who comes to us to go to the next stage of their education and, and be ready to do it and be successful. But to know themselves and care about others, self-esteem, and self-motivated I suppose and to be mentally and physically prepared for a healthy life.

His priorities were "linked invariably to trying to get the best deal for every individual child, whether they're special needs or very bright or not so bright".

The teachers in the teacher group interview all agreed that they shared, had discussed and bought into the school vision; indeed, some of them had come to the school because of it. Several members of staff felt that the school tagline 'Adventurous Learning' encapsulated key elements of the vision:

> "I think from the strapline of having adventurous learning we have the vision that every child is individual". She went on to say it was about the whole child, not just maths and English, we "have a massive understanding of knowing the children and being able to, in small groups and individually, get to know children and follow them through the school" (Ms Proctor, Teacher group interview).
>
> Another teacher (Ms Whitlock, Teacher group interview) said Adventurous learning was about pushing every child out of their comfort zone so that they are progressing, providing lots of extra-curricular activities and a broad curriculum and "Providing them with an opportunity to think outside the box and use their problem-solving skills in a friendly environment".
>
> Ms Peak extended this, saying that Adventurous learning extends to the staff, "We're given the freedom to try things that we want to try, and no-one ever says oh no don't try it. There's the opportunity there. I mean you might succeed, you might fail, but no-one's going to blame you if you've taken a class outside the classroom and a lesson didn't work" (Ms Peak, Teacher group interview).
>
> This was reiterated by another member of staff who said, Adventurous learning it was not about schooling, being academic, "We want you to grow holistically. So, it's creativity and its daring and bold, and it's not just for the students. So, the way [the head] runs the show, he gets the teachers to also learn. And I learned to play the piano. I learned last year. I had free lessons offered by the school.… And it was very hard so it put [me] in a position where I understood what the children were going through, what my teachers were going through when they try to understand" (Ms Gupta interview).

Mr Wilkinson summed up the school's approach to learning as:

> I think it's up to us. We, we have a large Early Years and you can see there that if you get the environment right, if you get children wanting to engage, wanting to learn, want and giving them the support to follow their own paths as well as the paths the adults want them to follow, then you, you're maximising, the capacity for them to develop, both in the pathways that they need to and the ones that, the, the sort of core skills they need to develop. So I think our approach to teaching and learning is to try and get everybody to create a learning environment in which all pupils will make maximum progress and have, have, and have the opportunity to discover not just their strengths, but things that might become their passion. So I think that's our core, and using ev- all the various tools, of which technology would be one, would be used to make that, environment as engaging and as successful as possible, but broad.

Mr Wilkinson summarised key elements of effective teaching as teachers reflecting and children making progress.

> My latest passion is about, what have children learned in the last 20 minutes, not setting a task, collecting in the work, marking it, and handing it back next session." He identified a number of strategies to help ensure children made progress: "I think, getting the pace right. I think matching it to the individual needs. I think subject knowledge. I think, teaching children why they're learning things, and to connect up their, their learning and to learn the sort of high level stuff, the things like hypothesising and synthesising and analysing, so that all teachers, are reflective and see whether what they are imparting and presenting to their pupils is actually going in and building on prior knowledge, I think that's – understanding where your pupils are and where they need to go to next is pretty much a key part of great teaching.

Mr Wilkinson emphasised the importance of contextualising for the children what they are learning.

> So relevance has a high, and I'm lazy, so I think, you know, you need to tell children why they're learning. So if we're doing fractions, it's because you're going to have to pay 20% of your salary, you know, at some stage in taxes, you've got to be able to work out, you know, how much money you're going to have left.… I think it should be relevant and it, therefore exciting and engaging.

This was reflected in claims made by both Ms Gupta and Mr Ryan, who said that if something interesting was happening outside the classroom, which did not relate to that lesson's learning objective, teachers would still take their children outside to explore it.

> They much prefer engaging in what's happening around at that time.… Which makes a very big point about getting the children to learn when its relevant rather than just because it has to be done
>
> (Ms Gupta interview)

This was echoed by Ms Peak who talked about the importance of school trips and people coming into school, "So there is a hook there for whichever child you've got, there's a way that they can try and understand it" (Ms Peak, Teacher group interview).

Mr Wilkinson recognised that "none of us give a perfect lessons every time" and so good lessons were also ones which provided the teacher with sufficient feedback to know how to do better next time. He also recognised that practice was an important element of learning:

> for me practice is an absolutely vital skill. But repetition for pointlessness is not what I would call practice. It has to be intelligent practice supported by great teaching, which can, can point out where the practice is, is, is wasting time or it's not challenging enough or where it's just mindless repetition, if that makes sense.

Whilst he thought his staff would share his views about good teaching Mr Wilkinson was aware that he had been privileged to have lots of opportunities to see other people teach:

> I think you learn more from observing than you do being observed as a teacher.… I absolutely think they would [share my views about good teaching].… I'm not sure they all know what excellent looks like because some of them have, have never seen it.

So, whilst not all his staff would be sufficiently focussed on the progress children had made during each lesson, rather than over a longer period of time, achieving that was one of his aims.

When asked about the importance of ICT in the school Mr Wilkinson was enthusiastic and emphatic:

> it's massively important, because it's what so many children and adults use as their vehicle to find out stuff… it allows you to access a whole load of knowledge that you wouldn't have, but it's powerful knowledge if you know what to do with it.… as itself technology and pressing little buttons on something electric is completely irrelevant, but the capacity for it to be multimedia, for instance I think, I think the greatest example I've seen is watching children learn to dance. Because, you know, in the old days they would have been told, put your left foot forward to here then when you hear that duh-duh-duh. Now, you stick on a video, watch somebody else doing it in reverse and they can do it in about a tenth of the time.… So learning can be quicker, multimedia, engaging, high expectation setting, you know, showing people what can be achieved, it's unlimited from that point of view. So skills can be acquired more quickly, knowledge can be found and understanding in depth can become, through the

> sort of combination of, kinaesthetic things and, and different types of learning and visual memories are aided and, you know, just the, the whole thing is clearly, a wonderful opportunity for accelerating learning, I would say, and for providing practice and for differentiating things, both pace-wise and task-wise to a whole stack of different abilities. So individualising it, it's got colossal potential.

He went on to describe ways in which it was used within the school:

> it certainly helps people communicate through things like setting tasks and getting work emailed back and things. It's, it's a way of, certainly used for engaging pupils. It's used for mundane things like registering and, checking everybody's there. It's used, for teaching children fundamental skills and things like presenting through, PowerPoint and things – which in itself is not about technology but it's about presenting. So I think it, it, you know, thousands of reasons. I think there's a whole stack of things that it should be used for which it's not yet.

Whilst recognising that it was essential to have 'the right infrastructure, the right software', however, to achieve his goal Mr Wilkinson thought that the support for teachers needed to flip from focussing on the technology (e.g.is the network working?) to

> enabling teachers to see what can be done to either accelerate pace or, or, or improve learning or communication or whatever it is…. support needs to be more tied in with a vision of what the teachers are trying to do, rather than what the vision of the, what the technology can now do.

Mr Wilkinson thought that ICT could have a significant impact on teaching, and that the iPads were already impacting on the teachers' practice in Riverview. This ranged from using tools such as Reflector automatically to being "comfortable letting their pupils determine what they're going to use them for". He recognised that there were differences between staff in their confidence with ICT. He saw the main barrier to 'skilling up the adults' as

> this small-mindedness about time I think, but I think we've got to explain to the people the advantage and benefits, you know, that's, so they always have to see a benefit.

It's about working smarter not harder he argued. He gave the example of marking, with teachers repeatedly writing comments in exercise books that pupils didn't pay any attention to and suggested that by using tools such as Classroom Monitor teachers could save time. This was something that the Pre-prep teachers had started to use ("It speeds things up"), and whilst they seemed quite comfortable with having evidence of children's work digitally – "we can print it out if we need to" (Teacher group interview) – the ICT Director was more anxious about it because whilst Ofsted could look at evidence on iPads "they frown upon it" (Ms Gupta interview).

Mr Wilkinson also felt that the iPads were impacting on the children's learning.

> I think they're beginning to be allowed to follow their own pathways more. So if they're researching in things like history they're able to look for their own examples. They're learning to, to, research and sift and, and, and give evidence for arguments. And that's a very exciting way of doing it.… I think it's enabling them to be quite creative and they're learning about things, coding and stuff, which is important.… And I think it's also making them, it's, it's engaging them for longer and you can see with young children they can concentrate more on something that is visually exciting and, and theirs and in front of them, than they can listen to you and re-spout.

However, he didn't feel that the school was letting children own their learning experiences enough:

> Anything like enough. I think we, we should flip it much more often and say right, you know, what, what project do you want to do? You know, these are the things you need to do, how are you going to do that? So that they are delving into technology and finding where it's not satisfying them so that they can then ask the questions: is there a better bit of software for this; is there a better bit of hardware for this; can I find that out; I want to be able to do that.… I think I would like all children to have immediate access to it when it's useful and relevant and so on. I think I'd like to see it used in, more intelligent ways, like things in sport and music and drama, perhaps showing, showing children themselves what their work looks like in different sort of types of creative and aesthetic and, you know, artistic sort of ways, carry on, so that no child feels glass ceilings. I think, I think we should be train, using them more for practice in lots of different, things like tables and spelling and phonics and carry on and we're doing that a bit, but I think, I think we're crazy not using it more for that in the modern world. We used to chant tables. Now we can effectively do that. I think we should use individualised headphones, you know, comfortable probably, you know, Bluetooth headphones or whatever. I think we've got to get to the point where children are able to work individually when that works for them. And I'd love to see us more often being able to use that sort of almost language lab-y type thing, where a teacher can see what every pupil is doing at any one time and is able to intervene or illustrate to the rest of the class, lock down everybody or set them all a different task, different times. I'd love to be able to do that.

This was a direction the school was starting to move in with the introduction of the Apple Classroom.

Mr Wilkinson recognised that there was a mismatch between his vision and the current practice in the school.

> It's begun to move towards it.… I think that some people get it.… I think the technology support part has moved colossally in that direction and it, and I think they confused the use of iPads with, and Apple sort of thing with, with almost in opposition of their control. And I think most IT people wanted to control things through networking and knowing what's going on, and it's the same with, safety things, you know. Er, we, we got fixated on internet safety, which is absolutely vital, but in the end we're coming down to it's about this education, education, education, they've got to think safely. The roads, we haven't stopped people using roads because they're dangerous. We teach them to cross it carefully and, you know, stay off it when you're too young or look, look after them when they're too young to make those decisions themselves. So I think we, we've got to do that with technology,… There's still a bit of an obsession with stopping them playing games and stuff. I mean, I, I, and that all seems to me a bit artificial really, because if they're doing a physics lesson, you, they're, they're not going to be playing a game. If they're in a boring prep, I, I'm subscribed to far less control over children that if they haven't done their prep for tomorrow, then their, it's their loss. Um, and, you know, if they're in prep, get your English prep, because Mrs Bloggs is going to be disappointed if you haven't done it. So I think we need to put plenty of responsibility on children with proper supervision and guidance, rather than nanny them through that, because when they then go on to the next phase, you know, they'll just look for the freedom that we've denied them in the past. So I think we've got to teach them that time is valuable and, you know, if you waste your time doing that you're not going to be as good as you'd like to be. If you want to be a doctor you're going to play games for ten minutes, but now you're going to do your English prep or whatever.… I think it's all about in the end them developing their own choices. And the new inspection is, is very much about that, you know, making decisions in your – knowing why you make decisions in your own interest, you know, long-term health, wealth and mental wellbeing. That's what we should be teaching children, isn't it?

5.3 Teacher Vignette – Ms Peak

(Based on: Ms Peak's questionnaire; Teacher group interview; Ms Peak's pre-observation interview; Ms Peak's observation; Ms Peak's post-observation interview)

Ms Peak was Rory's maths teacher, and was observed teaching one of his maths lessons. Prior to this, she filled in a questionnaire about her use of ICT outside school and was interviewed both before and after the observation about her views on ICT as well as about the observed lesson.

Ms Peak had sole use of a laptop, a tablet and a smartphone, as well as shared use of another tablet and a games console at home. She had 13 years teaching experience and held a senior, teaching and learning position within the school. She taught English to Year 6, and maths to Years 5 and 6. She noted the importance of the school vision about Adventurous Learning, which was reflected in lots of people coming into the school and pupils going on lots of trips.

> I think things are just presented in lots of different ways. So there is a hook there for whichever child you've got, there's a way that they can try and understand it.
>
> (Ms Peak, Teacher group interview)

She also commented on the advantages of having small class sizes:

> **Ms Peak**: So I mean the massive thing in having a small maths group is that you can get round each child. So making sure that they're making progress, making sure that it's not too easy and they're being challenged – making sure that the children that need the support are getting the support
> …
> **Ms Peak**: I mean I mark, I make a massive thing that I mark in lessons, because it is totally pointless to let the children do a whole load of work and then get their books at the end. And so I make a thing that I sit, I think I make a thing of seeing each child three or four times, depending on what the activity is. Because otherwise you get a whole load of books at the end that are not marked, and a child that could have the whole lot wrong and they've made no progress.
> **Researcher**: Interesting.
> **Ms Peak**: And then that should be the way of everyone's lesson shouldn't it?
> **Researcher**: Maybe maths is slightly easier.
> **Ms Peak**: It is to circulate, and I've made more of an emphasis to try and do that in English. So that before where they were doing a long piece of writing I'd mark it at the end, which takes four hours sometimes when you've got a big group. So now I've been giving them feedback as they've gone along. So if they've written a sentence that's not quite right, you can feed it back there and then.
> **Researcher**: And do you find that there's improvement doing that?
> **Ms Peak**: Yeah, the children find it a little bit frustrating because it does stop their flow sometimes in writing. But what's the point in carrying on and not using any punctuation in a long piece of writing, if you can't then stop it right at the beginning and really focus them on that?

Asked about peer-assessment and collaboration Ms Peak commented that the children tended to write vague positive comments, but noted that "two of the 'really high ability' pupils had gone down to help in the middle set". Whilst

> sometimes the higher ability children do [work in pairs/small groups], but I tend to have the ones that need more support working independently, because otherwise they tend to misinterpret things or help somebody a bit too much.

However, she later gave an example, albeit involving children from the "top Year 6 maths set", in which:

> a lot in here, typical children that want to do it without doing any working out. So as soon as you get one bit wrong you've got the whole lot wrong. And there were two children here who absolutely nailed it. Not necessarily the children you'd automatically think, and they then went and helped somebody else
>
> (Ms Peak, Pre-observation interview)

If children had forgotten to bring in their iPads, or they were not charged, which had happened on a couple of occasions Ms Peak would lend them hers or borrow one from another class rather than let them share; "we rarely share one because that's pointless". She felt that having 1:1 iPads "are one way that we are also miles apart [from other schools]" (Ms Peak, Teacher group interview).

Ms Peak rated herself as very confident using ICT for professional purposes, including using it with pupils, though she thought that

> you know, a lot of these children are way ahead [of] some of the teachers of their knowledge and understanding of apps and the internet and things like that, and so it's pushing them and the teachers and making it like a learning thing together of how you can introduce it into lessons and not take over lessons, but put it, from a point of view of research or point of view of presenting it in a different way. I've got someone in my English group who is a massive reluctant writer and what he can produce on an iPad is completely different. He'll do it and it's a carrot and a stick, but also he'll write on there, using, he's learning how to touch type, so he goes to lessons here and touch types and he can also record his voice and therefore he's not being held back or not achieving….
>
> (Ms Peak, Teacher group interview)

Ms Peak thought that ICT "isn't taking over but provides a massive resource", "Yeah, it's a tool like a pencil" (Ms Peak, Teacher group interview). She estimated that pupils used ICT for around 30% of the time in her lessons. She thought that ICT could be used as both a carrot and a stick, and noted that they would confiscate a child's iPad if they consistently misbehaved (i.e. used the iPads inappropriately). She gave examples, in the past, of problems that had arisen with the iPads:

> we've had people emailing each other and things. We cracked down on it massively last year. I think when the iPads first went out there were children playing games up and down the corridors, because there was a massive excitement. They are now briefed so much that they really know the rules and what they should and shouldn't be doing. And so we've had people who've lost their iPads, because they've sent inappropriate emails or taking it home and emailing at three o'clock in the morning!
>
> (Ms Peak, Teacher group interview)

However, since then the school has blocked the downloading and deletion of apps, blocked access to social media, and implemented the Apple Classroom, which lets teachers look remotely at what children are doing on their iPads, and they can lock them down or project them onto the class display. This has "reasserted teacher control", the children are no longer

> playing games round the corridor and it was a nightmare and they were sitting in the lunch queue and stuff, hiding their iPads and playing them…
> You can see how much it's [locking down the iPads has] calmed the children and it's embedded into – they're not desperate to email each other round the toilets!

Ms Peak was sure that if the iPads were unlocked things would revert …

> **Ms Peak**: in a second they would be straight onto …
> **Researcher**: They'd be straight back onto it.
> **Ms Peak**: of course they would.
> **Ms Proctor**: Yeah and we have parents who say

> **Ms Peak**: It's like a habit, an addiction, isn't it? And not being able to download their own apps has just been a revelation, because I think from children…
> **Ms Proctor**: Then you don't have any control do you, as to what goes on?
> **Ms Peak**: Yeah and we had children who have their own iPad at home, but were still emailing from their school account. … But we have to protect them.
> (Teacher group interview)

Parental concerns had been one of the elements that had led to the iPads being locked down. Ms Peak said she had no evidence that taking their iPads home had any impact on parents' awareness of what their children did in school: "I don't think they record photos and show their parents, I don't know" (Ms Peak, teacher group interview). Communication with parents seemed to be more limited with the older children than it was in Key Stage 1. For example, some of the Key Stage 1 classes had class blogs, whilst the Key Stage 2 classes did not, which Ms Peak thought was because it would be harder for them to do

> because we subject teach rather than class teach, but it is something that I think we would like to do, but it would be a lot trickier to set up
> (Ms Peak, Teacher group interview)

Parents of older children were also less likely to bring them to school or collect them, so there were fewer opportunities to meet with teachers. This perhaps helped explain why Ms Peak said she had little knowledge of what the children did with ICT at home.

When asked to give examples of how she used ICT Ms Peak focussed on three applications that she said she used regularly: TT Rock stars, Kahoot! and Airdrop. She also noted using Reflector, to project children's work onto the touchscreen at the front of the class (Ms Peak questionnaire).

TT Rock stars allows children to practice their times tables without it being "times tables torture". They have their own account and get coins if they get the answers to questions correct; the more rapidly they get the correct answer the more coins they get. The coins can be used to enhance their avatar, for example buying a better guitar. Ms Peak enthused about how motivated the pupils were to use it: "It's fun. It's massively carrot and stick for the children. They're doing it at home" (Ms Peak, Teacher group interview) and

> some of them are doing a lot of hours at home practising it. One child [in Year 5] divulged that he came down in the middle of the night to turn it on and play.

Ms Peak thought that the competitive element was central to TT Rock Stars motivating the pupils. The program allows children to look at each other's performance, the amount of time spent using it, how many coins they had obtained, and how cool their avatar was.

> They can compete against each other and against other classes … an element of competition, especially for your high ability children, that's a way of them progressing and pushing each other further rather than just, yeah, I know all my tables, OK, how quickly do you know them compared to so-and-so?
>
> It's been a massive good investment into the school.
> (Ms Peak, Teacher group interview)

Similarly, Ms Peak thought that the quiz program Kahoot! was highly motivating for the children and gave an example of a boy in her Year 5 maths group who went home and created a Kahoot! quiz which he wanted the class to do. Here too Ms Peak thought that the competitive element of getting the answer right (more quickly than your peers) was important. When she first introduced Kahoot! there was a steep learning curve with some of the children pressing the wrong buttons – something that some of them still claimed they had done if they got the wrong answer.

Ms Peak thought that the iPads made a difference by enabling multiple choice questions

> because actually when children have the choice of answers they can look at an answer and work backwards as opposed to panicking going oh no, I have no idea what that question means.

So the iPads enabled her to use Kahoot!, instead of doing "normal mental agility questions" at the beginning of the lesson, or sometimes she used it at the end of the lesson as a plenary "just to check that they understood what we've done." She said that ""Pretty much you could get away with using it for every lesson as a plenary … if you were mega organised" (Ms Peak, teacher group interview). In the previous year Ms Peak used Kahoot! every Thursday, but now she uses it sporadically so the children don't come to expect it (and be disappointed if it's not used).

Whilst she recognised the motivating effect of the competitive element of answering Kahoot! questions fast, Ms Peak thought that this was sometimes problematic:

> … and actually they then, they build on the, the thick is quickest, we call it, like on Who Wants To Be A Millionaire where they just try and press any button and then they realise they've messed up and they haven't actually worked it out yet.
>
> (Ms Peak, Teacher group interview)

She felt that this was a particular issue for certain children [like Rory] and with more complex multi-step questions, because the children just guessed the answer rather than working it out. To counteract this she sometimes set a long timer delay before the Kahoot! showed the answer to a question, so that the children knew they had time to do workings.

Ms Peak mentioned the possibility of using data from Kahoot! to compare children's progress within and across groups:

> I do sometimes use the same one [Kahoot! quiz] actually. And also I don't always save my results, but if I do I sometimes look for my Year 5 results to see, so where each group is. Because then you can balance and go, you can download it onto an Excel and see how many children got it right, and then yes you can do it again. But also you can, so my year 5s have just done the fraction equivalent one, and so I could look at what the year 6s last year got, which is really good.

She went on to note that she wasn't worried about having a physical paper trail to evidence pupils' progress, because the data could be stored digitally and could be printed out if they needed it. However, she acknowledged that Key Stage 2 were not as advanced as the teachers of younger children in using Class Monitor (which had been introduced that year), although she seemed keen to find out more about it.

As well as this professional use of ICT to generate data to track children's progress, Ms Peak used ICT to support other aspects of her practice. For example, she used ICT to replace paper-based homework instructions and extension activities, by taking a photograph of the worksheet and Airdropping it to the children:

> I'm fed up of sheets and scrumpled sheets and sheets that are half finished, and sheets that clearly they haven't done any working out. Because if they got a whole load of wrong answers I just cross the whole load and I don't know why they're getting it wrong. So they've moved into having a maths book, and so trying not to use so much paper I'm Airdropping the homework to them now … the other thing is that at the end of every lesson I do, for children who are ready to, an application challenge. And they know to either come up to my desk and take a photo of it, or I Airdrop it to them.

She planned to use all three of these applications in a maths lesson that the researcher was going to observe. This was with 17 children, including Rory, in the top Year 6 maths group. "They are ridiculously competitive … they're higher ability and so it means that I can stretch

them" (Ms Peak, pre-observation interview). She planned that they would work individually throughout the session. She didn't expect there to be much off task behaviour with the iPads,

> I think because there's just too much to do, and it's a subject that you specifically tell them to go onto a specific app. I think in another subject where they're doing research they can quite happily jump onto something else
>
> (Ms Peak, Pre-observation interview)

Whilst the main objective of the lesson was to be able to interpret pie charts, the lesson was divided into four parts. It would start with mental agility, using Kahoot! to check the children's understanding of work they had been doing previously on area and perimeter. Then they would work through some pie chart questions in their text books. When they finished that they would have a fun activity, using TT Rock Stars to reinforce their times tables. At the end of the lesson she would set their homework (delivered via Airdrop). The intention behind using ICT for this lesson was "Consolidation of what they already know, and continued repetition of their times table practice." (Ms Peak pre-obs interview).

5.3.1 A Year 6 Maths lesson

The lesson started with Ms Peak stood at the front of the class and the children sat around large wooden tables, with two or three children per table. The first Kahoot! problem was showing on the large touchscreen at the front of the class. The children had their iPads out. For each question Ms Peak read it out. The children then had 60 seconds to answer, during which time Kahoot! played music with a rapid beat, and children talked quietly. Some children occasionally wrote something in their exercise books. Ms Peak prompted children, recapping elements of the question, and discouraging children from announcing the answer. When the correct answer was displayed quiet shouts of 'Yes!' and grumbling about getting it wrong could be heard. Ms Peak then asked specific individual children to talk through how they got the answer. This went on for about 15 minutes.

Ms Peak then introduced the main activity, a new topic about interpreting pie charts. This built on work they had done the previous year on fractions and percentages. Having had the task explained the children worked through the questions in their text books, writing answers in their exercise books. Some children shared a text book in pairs. Ms Peak circulated, providing support and ensuring the children remained on task.

About ten minutes before the lesson ended Ms Peak told the children that she was going to Airdrop their homework to them and asked them to turn on their iPads. She then proceeded to transfer the homework, which consisted of photographs of two worksheets, to each child. The children sat with their iPads, waiting for the homework to download, which it did for most of them in under a minute. Ms Peak asked two children to make sure their iPads were on as she had not been able to send the homework to them. They said their iPads were on, and Ms Peak tried again, this time successfully. Ms Peak then talked through each of the worksheets. For the first task she explained that they did not have to write anything, they just had to do the calculations and could either write the answers in their exercise books or could email them to her. She spent more time explaining the second task, which involved the children in listing the coordinates that would draw a picture of something related to Christmas. It was clear that many of the children did not really understand, so Ms Peak showed how to do this for a simple diagram on the touchscreen at the front of the class. She explained that in the next lesson the children would swap their coordinates and then try to draw each other's pictures. She said that they could write the coordinates on their iPad. Several children had their hands up. A girl asked if they could use Excel, to which Ms Peak said they could, or they could just use a large sheet of squared paper. This questioning continued for several minutes, until the lesson ended.

After the lesson Ms Peak commented that it had been too rushed, which meant she hadn't had time to fit in the TT Rock Stars activity. She thought that the Kahoot! activity had gone well as it had enabled her to include some questions for 'the higher ability children',

> … so things like the area of a parallelogram, there's a couple of children that I knew would go 'huh'. But actually, with multiple choice at least they can have a guess. And then having to get them to explain it, the children that I wanted to explain it, …"

Ms Peak felt that allowing 60 seconds between questions had worked well – "you could see [a girl] panicking, and then she noticed somebody else making notes …". She felt that this use of ICT had helped her stretch some children and talk through some of the questions.

When asked Ms Peak said that the children should not have been sharing text books, because they have one each. However, she seemed quite happy that the children had been talking quietly about the questions on this occasion:

> I mean that's what the lesson should be, that they can have that freedom if they need to scaffold each other … Yeah, sometimes not but actually it shouldn't matter so much unless it's something that I really want to see what they're doing. I mean that was the first time we've done pie charts so, but maybe on the next lesson when they're doing it they should be doing it on their own.

Overall she felt the children had all been engaged. Ms Peak did not think any of the children had done better or worse than she had anticipated "because I think I just know the children. I'd be very surprised if something came out that was a surprise".

6 What are the digital practices that pupils bring to their learning in school? (RQ1)

What are the digital practices of children in their home arena, what are the factors which shape these practices and what do children bring to their learning in school?

This section examines children's digital practices in each of their home arenas. It aims to provide an insight into the digital practices of a number of children aged from 3-11 who were involved in the study. The section identifies the key factors shaping these digital practices and outlines what children bring to their learning in school. As Twining, Heller, Nussbaum and Tsai (2017) point out, qualitative research, because of its underlying ontological and epistemological position, does not view a sample to be representative and thus does not aim to generalise from the study's findings. Thus this research does not aim to draw generalisable conclusions about the digital home practices of this age group in England and Scotland. Indeed, there are compelling reasons for this note of caution in relation to the children involved in this study. Firstly, due to the composition of the sample group of children and their carers. This issue was explicitly addressed when a researcher asked the assistant head in one school whether the parents and children to be interviewed were 'typical or atypical' of those in the school. The facilitator responded:

> **Mr Baker**: They are, they don't represent the full diversity we have in the school.
> **Researcher**: Yes.
> **Mr Baker**: There are forty two languages here, and some.
> **Researcher**: To get the full diversity.
> **Mr Baker**: They represent the parents that are passionate supporters of the school, I suppose. I saw the names that came back, I wasn't surprised at the people that had put their name forward. But having said that we have never done anything like this before, so whether they know what they're doing.
> **Researcher**: Still potential diversity of views within that group around particular issues.
> **Mr Baker**: Absolutely, and the children, there's a real mix in the children in terms of their ability, the way that they communicate and also we don't really know even with those children what they do at home
>
> (Mr Baker, Assistant head, Stepside Primary)

In this particular school the self-selected group of four carers who were subsequently involved in the research project included two of the school's own governors and a parent who taught ICT in a local school.

Secondly, because of the way in which data were collected (as explained in Section 3 – Methodology), the richness of data varied across the sample. The richest data were collected about the home arena from those children who logged their use of ICT outside school, were interviewed individually, and whose carer(s) were interviewed. Other children logged their use of data outside school and were interviewed individually, but there was no carer interview. Yet others were interviewed as part of a group, but did not log their use of ICT outside school.

The pattern of data collection meant that the research team were able to draw together some detailed data about the home digital practices of 44 children drawing on the children's perceptions and also those of their carers. The strength of this particular set of research data lies in its ability to provide insights into the day-to-day digital experiences of children at home within the setting of their families. The data for the remaining children in the study is less detailed and in some cases very sparse in terms of what the children did at home with respect to ICT and as such was not useful for analysis of the home arena. Whilst teachers were asked

about their pupils' digital practices at home the data from the teacher interviews is explored in more depth in subsequent sections of the report.

This section of the report focuses on the 44 children involved in the study for whom it was possible to collect a rich data set. It should be noted that the insights and comments of all the children involved in the study were valuable, and are referred to and considered throughout this report where appropriate.

The child vignette (see Section 5.1 of this Report) provided a useful starting point for analysing children's ICT practices within the home arena. It illustrates that the interplay between different facets of the home arena, people in action (settings), and identities of actors are critical to what is taken up by the child.

Four interrelated themes emerged as being important in defining the arena: the level of ICT provision; routines; rules; and the views of parents, which underpinned the other three.

People in action within the home is the second aspect of the children's home experiences that affect the affordances within the home.

The third aspect of the home setting, which is inter-related with the previous two, is how people who are significant to the child help shape the children's positioning of themselves.

6.1 Children's home-based digital activities

The children's use of ICT differed depending upon their degree of engagement and the purposes underpinning its use. Examining the data it was possible to identify six main purposes underpinning the children's use of ICT at home. In this section, home is understood to include anywhere outside school or school clubs, and incorporates children's outside school activities and clubs (eg. football, band) but does not include school-based Coding Clubs or use of ICT between lessons. Since this section is concerned with the children's self-initiated choices and personal preferences it does not explore children's use of ICT at home if used to complete homework tasks or for explicitly 'educational' activities or games with which parents have 'asked' children to engage. Figure 6.1.1 shows the spread of activities in relation to the six main purposes: playing games; finding information; using apps designed primarily for communication; creating and sharing visual images, videos and music; programming[1]; and other uses 'for fun'.

The outline of children's uses and activities does not present an accurate picture of children's digital home practices; it conceals the different patterns of access children had to digital devices in their homes, the diverse ways in which children and their families used and interacted with ICT, and also, very importantly, the reasons for these differences.

[1] Though technically not correct we are using programming to include coding

Figure 6.1.1 The spread of children's ICT activities at home

Playing games

Angry Birds
Arena (Euro soccer)
Big Heads Football
Bungee Jump
Call of Duty
Candy Crush
Car, football and bike games
Car simulator
CBeebies games
Civilisation
Colour Switch
Disney App
Dora the Explorer
Drone flight
DrumPads
Fifa
Flappy Birds
Frozen App
Games on Friv site
Games on GoGirls
Garage Band
Ghost Recon
Goat Simulator
Halo
'Horse games'
I want to groom my dog
Jelly Jump
Mario
Minecraft
Monument Valley
My Little Pony
'Make up and dressing up games'
Nail varnish games
Ninjago2
Penalty Shooter2
Pianofile
Pixel Monster (played within Minecraft)
Problem solving games
Quizzes on Seventeen.com
Robots
Rocket League
Score! Hero
Simple arcade games
Sims
Snake
Sports Resort
Steam (various games)
Subway Surf
Tappy Chicken
Temple Run 2
Unicorn Simulator
Virtual City
Wrestling
Xbox games
(various and unspecified)

Finding information

Internet searches (normally using Google)

Games
Amazon for things to buy
Searches for memes
How to make soap
How to make Christmas decorations
To 'look at different sites to try and find out a way that explains it to her better'
Flight paths

Youtube searches

Xbox games, Minecraft, Fifa, gamers, Stampy
videos for baby brother
films of children playing with cars, bikes etc.
Lego, My Little Pony and Littlest Pet Shop
Music videos
animals, cat videos, 'funny stuff', magic tricks
dance/gymnastic moves, mountain biking
famous people, teen lifestyle
'cool things people have made', Nerf gun mods
'bored what to do'.

Download games from Google Play

Communication

Uses snapchat
Instagram to share photos with and communicate with known and unknown followers
Facetime family
Skype
Facebook
Emails
Messaging friends (on phone)
WhatsApp friends

Creating/sharing images, videos & music

Photography – selfies
Photoshops own photos
Pic Collage
Video Star (make videos singing along to songs, with special effects)
DubSmash (video and sync with audio (similar to Video Star))
Take photos and films with tablet and edits them
iMovie/ Moviemaker - get photos and videos you've already taken and edit them – (learnt in school?)
Videos of self
Videos of pony and husky
Edits own videos -shares with friends not online
PlayTube
Own Youtube channel (uploads videos of stop start animations using lego and dance routines)
Own Youtube channel (post skits and has Q & A)
Own YouTube channel (playing Minecraft
Sound mixing app for laptop (unspecified)

Other uses for fun

Plays music on iPod and gets Bluetooth light speaker to flash in sync
Reads on Kindle
Created own watchlist on the Amazon Firestick,
Finds own favourite programmes on Sky planner
Smart TV – watch films, football, music videos, Netflix, Cartoon Network, Nickleodeon
Watches Pink Panther cartoons, Daffy Duck,Horrid Henry, Power Rangers, Harry Potter, Rio, Dolphin Tale., Fox Trolls, Minions, Paddington, Snow White, Pocohontas, Tinkerbelle , CBBC, ITV3
'Listen to music- a lot'
Downloads music
Streams music between computers

Programming

Coding (using Scratch)
Coding (Hopscotch)
Coding (unspecified programme)

6.2 Children's views about access to and purpose underpinning ICT use

The data suggested that children held diverse views about the role of ICT in their lives and also had different reasons for using it.

An eleven year old boy, when asked how he would feel if he had no access to ICT replied:

> Well I'd be OK as long as I still had the TV, but if I didn't have the TV I'd have a nervous breakdown
>
> (Alex)

This view stands in stark contrast to those expressed by others in the research sample with another eleven year old stating that she would 'feel lost' without ICT as she:

> …wouldn't be able to interact with my friends as much, because we do texting and messages as I said
>
> (Grace)

Another child commented that she would be "quite annoyed if told I couldn't use ICT" although being able to watch TV would somewhat soften the blow (Abigail). Rory stated that if his parents took away his ICT he would "feel so bored, and I wouldn't like them that much any more" (Rory).

A father noted that his ten year old son viewed ICT as "essential, almost as essential as oxygen" and added that if his son was prevented from using ICT he would "throw some strop, be very moody, stomp around the house" (Ashish's father). Another girl, when asked what she would do if she was not able to use ICT, replied: "I would cry for the rest of my life" (Latifah).

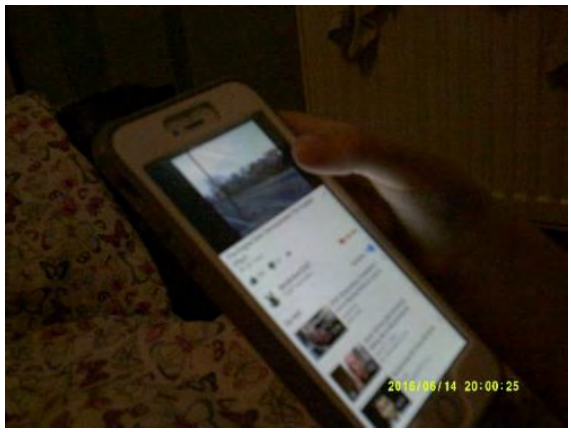
Latifah, who was 11, talked about why she had her own YouTube channel:

> I only do it for fun, I don't do it for money because if you do it for money and fame, then you won't get any subscribers and people will know that you're doing and it's not… you're just forcing yourself to do something you don't want to do. But I'm doing this for fun and it's something I like to do
>
> (Latifah)

ICT was also used deliberately by some children to pursue a specific interest they had in the physical world, such as football, animals, cooking, or as in the case of the following six year old, her general environment:

Claire: I'm watching videos in bed, I'm watching videos about the big bang, and about how when things go away they lose their pitch of sound
Researcher: Right why were you doing that?
Claire::At bed time
Researcher: Okay but why, what caught your interest?
Claire: Because I was reading a book about how the world works and the big bang just came up and I asked my Dad if I could have a video about it and he put on a video, because it had something about how when the big bang went away it had lost some pitch and my Dad told me about how the ambulances did that to and so I asked my Dad if he could show me that and that's a video of it

Figure 6.2.A Claire watching video



(Claire)

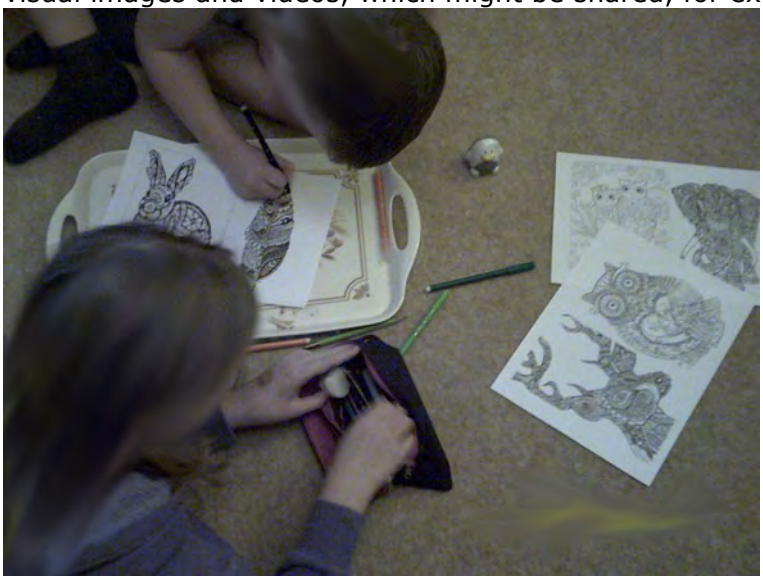
Whilst for another girl ICT, when she was with her friends, it was clearly something they would only turn to for amusement if there was nothing else to do:

> Sometimes when me and my friends are bored, I have friends over at my house or at their house and we just play on technology together if we're really bored.
>
> (Sky)

In order to begin to make sense of the wealth of data about children's home digital practices it was necessary to develop a framework which acknowledged children's varying levels of engagement with ICT, coupled with sophistication of ICT use, and the different purposes children had for using ICT.

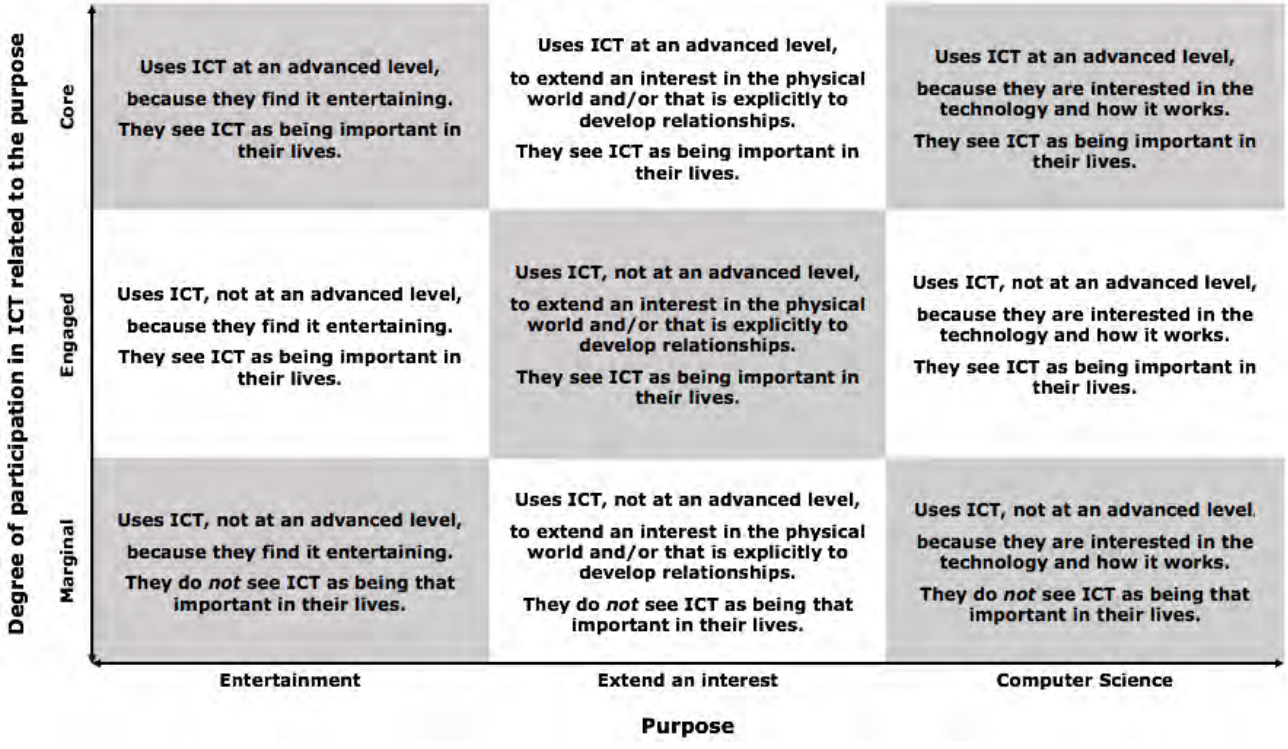
6.3 The Digital Practice Framework

The Digital Practice Framework (DPF) arose out of the data, as it became clear that children's participation in ICT practices varied along a continuum from marginal or peripheral through to engaged and, for a small number of children, participation in digital practices was not just integral but was core to their lives and their identities. In addition, children's purpose for engaging with ICT fell into three main categories. Firstly, entertainment (which included playing games, watching television and listening to music purely for entertainment, creating visual images and videos, which might be shared, for example by uploading to YouTube.



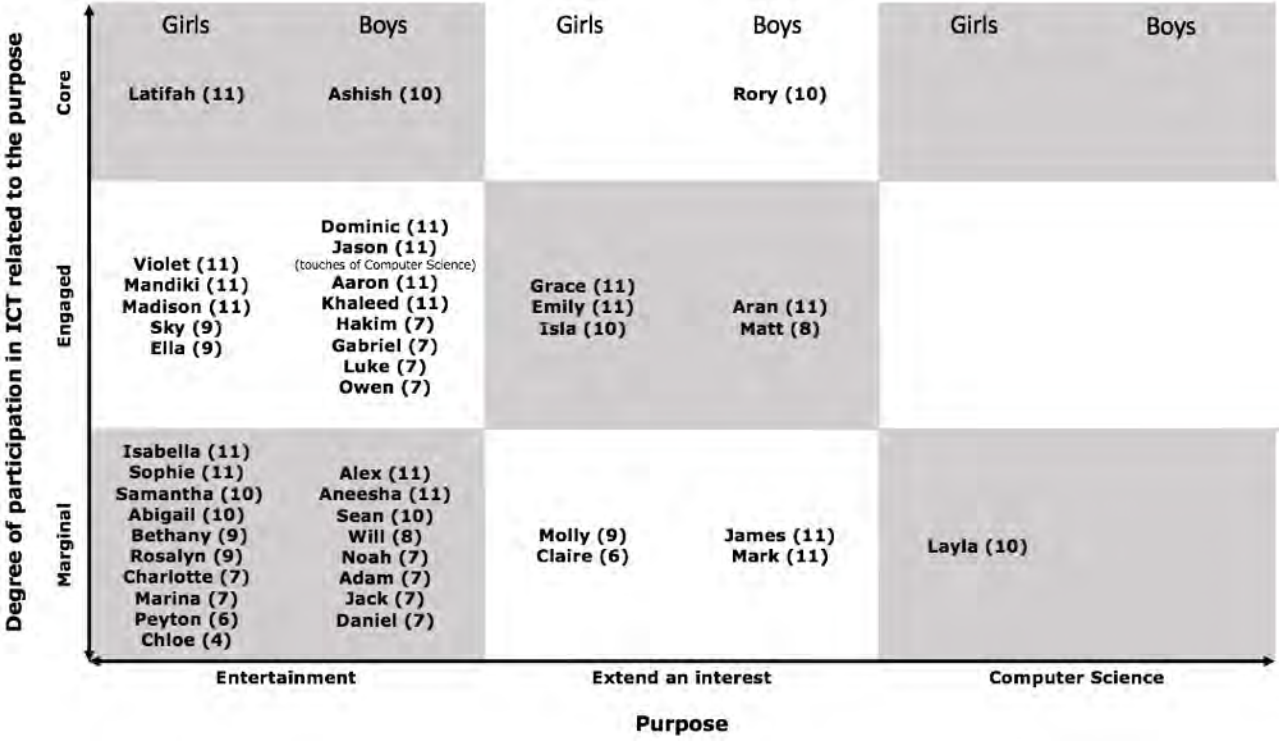
Secondly, extending an interest in the physical world, which included: searching for information related to specific interests that the child had in the physical world (e.g. gymnastics, or being a pilot); using ICT to extend on an interest in music, drama or sport; or using software that we primarily intended to enable them to communicate with others and develop their social relationships). Thirdly, activities related to an interest in computer science. The Computer Science category was incorporated as the wider data set (i.e. including those children for whom rich data was not available about their home arena), included a small number of children who were interested in controlling ICT and how computers work (e.g. programming, networking and servers, etc.). The Digital Practice Framework, which was introduced in Section 4 of the report, where the analysis of the data was explained and illustrated, is a useful tool for analysing children's digital practices at home using three criteria simultaneously: the children's purposes, and their degree of participation in relation to those purposes and level of sophistication of ICT use (Figure 6.3.1).

Figure 6.3.1 The Digital Practice Framework (DPF) replicated from Figure 4.3.1



The data for the 44 children being explored in this section of the report were scrutinised and each children's digital practices were assigned to a specific locations within the Digital Practice Framework, as indicated in Figure 6.3.2. It should be noted that whilst it was obvious where some children were located, with others it involved looking closely at what the child said they did, what the carer said about the child, and crucially, how the child positioned themselves and what they had to say about the importance of ICT in their lives.

Figure 6.3.2 Where children were positioned in the Digital Practice Framework



Having identified each child's primary purpose for involving themselves with iCT at home and gained a sense of the degree of participation and sophistication of their ICT use, as illustrated in Section 4, it was possible to begin to analyse how factors in the home arena, people in action and children's identities may have influenced a child's digital practices outside school.

6.4 The Home Arena

6.4.1 The level of ICT provision

Children's access to different types and numbers of digital devices varied between the families. All of the 44 children owned or had access to at least one tablet, laptop, or computer, and some owned a wide range of digital devices. All except one child in the sample either had access to a tablet or, more commonly, owned their own tablet. Relatively few children owned a desktop computer. Many children were able to share their siblings' devices and access the 'family laptop' whilst others were also permitted to use one or more their parent's devices, in particular their parents' smartphones. The range of device these 44 children had access to is illustrated in Figure 6.4.1.

Figure 6.4.1 ICT Devices within the home arena

<table>
<tr><th>'Owned' by children</th><th>'Owned' by siblings</th><th>Shared by family</th></tr>
<tr><td rowspan="3">iPad, iPad mini, Tablet (android)
Tablet (unspecified), Kindle (Fire)
Kindle Paper
Own Mac (in bedroom), Apple Macbook
Computer (sometimes connected to the TV)
Touch screen laptop
Games console (eg. Play Station, Xbox, Nintendo)
Smart TV, TV (not Smart)
Phone, SmartPhone, Smart watch (like Apple Watch but is phone in its own right)
iPhone without SIM card, Old phone with headphones (only for games), iPod
Remote to the TV
Model plane and First Person Goggles
Old but 'very good' camera
Headphones, portable DVD player, MP3 player</td><td>iPads (siblings)
ipad mini (brother)
an iPod with a Bluetooth speaker and strobe light (sister)
Games console</td><td rowspan="3">Smart TV
TV (not Smart)
Macbook Pro
Desk top computers with keyboard
Laptop
iPad
Tablet (unspecified)
iPhone
Games console
Wii
Printers
Bluetooth and wifi in family car
Amazon firestick
Amazon Prime
Freesat</td></tr>
<tr><td>Owned by parents</td></tr>
<tr><td>iPad- parents
Computer – parents
Laptop
Desk top (Dad) – he does not live with them
iphone – parents
Samsung Phone, internet connected
iPhone watch (Dad)
'Dad has access to every gadget and teaching aid'
Raspberry Pi
TV</td></tr>
</table>

Comparing ownership of digital devices with children's levels of engagement according to their placement within the Digital Practice Framework revealed, perhaps surprisingly, that there is no clear correlation between the number of digital devices to which a child has access and the child's position on the Participation dimension. Whilst some children who used ICT for 'Entertainment' and who were described as 'Marginal' rather than 'Engaged' owned only one digital device (usually an iPad or other form of tablet) there were others in this category who owned three or more devices and had access to other devices within the home. One child (Isabella), whose digital practices were deemed to fit into the Entertainment/Marginal category, had a TV in her bedroom and shared an iPad and a laptop with her five older brothers, whilst another child (Sean) had owned his iPod for five years, shared an iPad with his sister and was going to get his own for Christmas, had use of an Xbox, Smart TV and Wii, had an additional TV in the playroom and use of model planes and 'First Person' goggles.

This varied pattern of device ownership and access was replicated within the group of children judged to be 'Engaged'. The three children whose ICT practices were categorised as Core on the Participation dimension of the DPF had fewer digital devices than some of the children whose digital practices were categorised as Marginal (because it was not that important to them and they were not using it at an advanced level). One of the children (Latifah) owned her own iPad, laptop, and phone, and shared the family's Smart TV. The second child in the Entertainment/Core category (Ashish) reported that he owned a laptop, Xbox and Wii. Rory

owned a laptop, XBox 360, Wii Mini; an 'old iPhone', a small android table, an iPad keyboard (probably used in conjunction with his school–owned iPad) and an external microphone.

Clearly the number of digital devices to which a child has access is not the major or single factor influencing children's home ICT practices. In the interviews children and their parents frequently mentioned rules, and sometimes talked in some depth about the ones the family had about ICT use, and how ICT fitted into the family's routines.

6.4.2 Family routines

'Family time' and meal-times at home were frequently occassions when children could not use ICT. Parents talked about their children's use of ICT during these times:

> **Mother**: No, my husband and I don't agree with um…giving them kindles and iPads around in a dinner tables or things like that, I think like, that's because, I like to be sociable and talk about the day, or talk about what they are doing, or being involved in a conversation. But I am finding now with his Kindle he is taking himself off on his own and playing his game for a long time.
> **Researcher**: Oh I see.
> **Mother**: And he is, he is not losing his social skills but he is becoming very quiet. So, if we go out I don't have anything in the back of the car. They sit in the car and we talk in the car. If we are out for a meal, we talk around the table and, same with dinner, we do not eat dinner in front of the TV, we sit at a table and talk about our day.
> **Researcher**: I think it's a very good point because I have heard so many parents making some kind of
> **Mother**: Yeah, I just don't really agree with, I know that what it's like now, and when I go out for a meal and I turn around and I look around the tables and check around whether the children are sitting in the chair with phones and iPads and other forms of tablets, I just think it's a shame because they are losing ability to have conversation with their parents, so, but when he is at home and if he has done well at school or been out for swimming and he will come home then I will say him you can play, then he will play on his Kindle or play Minecraft or play Angry Birds, and games like that.
>
> (Luke's mother)

The situation in another family was very clear cut:

> … if you're coming shopping you're shopping, you're not going to be playing with your phone
>
> (Alison's mother)

In some families, ICT was used during those times in the day when parents were busy and could not spend time with their children or as a means of keeping children occupied:

> I've got three kids on my own at the minute, so there's just me and them. The older one is seven. Jackson's five and I've got an 11-month-old. With technology, I can't say it's childcare, but it fits in quite well when you need it
>
> (Jackson's mother)

The general timetable and pattern of family life impacted on children's access and use of ICT. One nine year old provided an insight into her day-to-day life and how ICT was slotted into available time:

> When I go home on a nice day I play in the garden and then I play with my pony figures, and as it gets towards the evening before dinner, I'll play on my Kindle, and then I'll have my dinner, and then I might watch some TV with my parents, and then I'll go to bed. If it was a rainy day, I'd go up into my bedroom and read some books on my Kindle, then I'd play with my ponies, and then I'd do the same thing basically
>
> (Sky)

This same child also did gymnastics and art on Saturdays and then the rest of the day was described as 'family time' when they would all watch TV or a film together.

Other children spoke about busy weekly routines involving after school clubs, such as attending Guides, Scouts, sailing over the weekend, gymnastics, dance and street dance classes, football practice, netball club, and/or learning instruments (e.g. guitar). These all limited the time available for engaging with ICT.

Whilst the children had to think about how best to use their available time parents too talked about the pressure of trying to accommodate ICT into daily family life:

> [I] feel I am forever trying to juggle your family time to make sure they've got a screen in front of them, to make sure homework is done and that's the part of it I don't like if I'm completely honest
>
> (Ella's mother)

Although family routines impacted on the available time for ICT they were not a major factor in influencing children's levels of engagement. Some children in the sample still found time to engage with ICT and become sophisticated users (e.g. Rory and Ashish whose digital practices were categorised as Extend an Interest/Core and Entertainment/Core respectively), whilst for others their digital practices fitted in the Marginal category on the Participation dimension, despite the lack of family routines or activities which impinged significantly on children's free time at home.

6.4.3 Rules: Time constraints

Despite many of the children's busy routines, parents talked about their concerns about how long their children spent using ICT. The majority of parents interviewed talked about imposing time constraints: one child mentioned that her mother "sets timing on all of our devices" (Grace), as was also the case with Daniel who explained:

> Well I have to ask my mum and I get a limited time a day, about 20 minutes… if I want to download a game I have to ask my mum and dad because they have the Apple ID and I don't know it….
>
> (Daniel)

Daniel's mother discussed why and how she monitored the time he spent on ICT, saying she had noticed how prolonged periods of ICT use impacted negatively on his general demeanour and concentration, and noted:

> ….particularly playing games, then his sort of mood and concentration things will just be a little bit off. Then he'll can be quite sulky afterwards, and he also then finds it difficult to do something else. But sometimes when he's put the timer on himself and he's done what he wants to do then he will you know, we'll then hear it go off and I will just see if he will bring it back and then sometimes like that's fine and that's enough
>
> (Daniel's mother)

For other children the time limits were longer and more flexible. One child commented that over the weekend he was allowed to use ICT and there were no set time limits, although if he played on it "for a long time, more than three hours", he was told to "get outside and help my dad on the farm" (Alex). His mother's perception was slightly different as she said that time limits were indeed established:

> … particularly in the holidays, because otherwise he would be on his iPad all day if you let him
>
> (Alex's mother)

One parent, who was a peripatetic music teacher at her daughter's school, talked about how her daughter's friends spoke to her personally and commented negatively on the time limits she set for her:

> She is allowed 10 minutes free play iPad in the morning and 10 minutes free play iPad in the evening, which according to all of her friends, and they tell me to my face, is incredibly, incredibly mean
>
> (Samantha's mother)

Time spent playing on the Xbox was limited to approximately three and a half hours a week for Evan, whose mother described herself as "a bit strict" saying that access was certainly "not a a free-for-all" and her children were expected to ask permission to play and to turn the Xbox off when told.

Time constraints appeared to be the norm, but it is interesting to note the different time limits imposed on the three children whose digital practices were categorised as Core on the Participation dimension. Latifah talked about being able to use ICT whenever she wanted, but was limited by the poor Wifi connection and being kept awake by the charging light flashing on her laptop, and perhaps by a feeling that she shouldn't be playing on her devices after bedtime:

> I put my iPad in my living room because like, I just want it in my living room. I keep my laptop in my living room sometimes to charge because you know there's like, in my laptop it keeps on flashing and I can't sleep with just the littlest light … Okay, basically, like when I'm tired, I just like to, I like to, I just fall asleep straight away, but when I'm not tired, you see the Wi-Fi box, okay, it does not work in our room, only if you bring it outside from my brother's room, 'cause my brother needs it for his PS4. So he bring, sometimes, like when I'm in my room with my friends, I bring it out and then sometimes like when he leaves it out, I like to play Candy Crush or Colour Switch and I watch like one video only. I only spend time on it for five minutes only…
>
> (Latifah)

Rory's time constraints were a result of his daily routine and also his mother's work schedule. Various minor chores, school, swimming and drama club occupied substantial proportions of his time. On a school day, provided his mother was not working, he was free to go into her room around 7am and use the iPad, but if he had swimming or his mother was going to work this time for ICT in the morning was curtailed. Most days he did not get home until 6.30pm. Rory felt that there were no rules regarding his ICT use saying that spending big chunks of time on ICT was fine "If I do my chores". His mother confirmed that there were few barriers to her son's ICT use at home (Rory's mother).

The picture for the third child in the Core category on the Participation dimension was somewhat different. He was only allowed to use ICT on Friday evenings after homework had been completed, and all morning and in the evening on Saturdays and Sundays. His father confirmed that:

> WiFi for personal YouTube gaming and everything else is off Monday to Thursdays, and is back on after they've completed their homework on a Friday for the weekend…
>
> addding that:
>
> …at the weekends he has pretty much free rein provided all his work is complete
>
> (Ashish's father)

Ashish explained how his father had limited his access to ICT by setting up a guest WiFi at home which the children could connect to, but:

> …my dad can turn it on and off, so say our time to be on our screen is over he will either just turn it off or he will tell us
>
> (Ashish)

Ashish dealt with the strict time constraints through careful planning:

> …because what I do is I plan everything out, so I plan what I'm going to do every day. So say I do one thing on one day, but the rest of it I need to do either that day or the next day. I'd probably do it on the next day rather than the first day.
>
> (Ashish)

However, not surpsringly, he found the guest WiFi system and his father's use of it to control his use of ICT a little difficult:

> … because it was all manual until my dad installed the thing where you can turn it on and off. And say I'm just in the middle of something, or I'm really close to doing this, when I turn over I don't recognise, I don't realise that I've been over my time, he just turns it off.
>
> (Ashish)

A very small number of children talked about imposing time limits on themselves 'as they don't have limits'. Sky used her Kindle for games and reading but tried to limit herself to an hour a day as she "likes playing with other things". This same child did say however, that she sometimes spent longer on her Kindle if she was reading saying, "I don't notice the time go" (Sky).

Analysing the numerous comments made about time constraints it became clear that they were not arbitrary and were instead a reflection of parents' views about childhood, learning, and the value and dangers of ICT. These issues are explored later in this section.

6.4.4 Rules: Access to the internet

Access to the internet was another aspect of ICT use which parents felt it was important to monitor and establish rules about. Very few children had free and unfettered access to the internet, despite some parents' claims. One mother of a nine-year-old girl for example, described their household as "A 24/7 WiFi access house" but then acknowledged that she had a parental lock on Amazon and had set up a "safe setting for Youtube" and "Google safe search" (Sky's mother).

The mother of a seven year old boy explained why she set a filter on the internet and how it helped control her son's access:

> **Mother**: Yeah, it's like I've put certain filters on it so he can't go on certain things.
> **Researcher**: So is that filters on the internet?
> **Mother**: Yeah, because there are things on there that isn't really screened from them and stuff like that.
> **Researcher**: Is there particular stuff that you're worried about?
> **Mother**: It's probably because I know they can search everything on YouTube and stuff like that. So I do have a limit on it. And he knows not even to attempt it. Because he has done before, which kids are curious, they're going to look at stuff.
> **Researcher**: Of course they are.
> **Mother**: And I'm like no don't.
> **Researcher**: And is that working, does he respect that?
> **Mother**: Yeah.
> **Researcher**: And so it sounds as though it's something you've really talked to him about.
> **Mother**: Yeah, he understands that he's got to be careful, and he can only go on things that, like I've got an app on it where whatever he tries to go on I get an email straightaway
>
> (Noah's mother)

Rory's mother, in contrast had no filters on the home WiFi and outlined the reasons for this:

> I'd rather have him discover something and then we talk about it, … and I find this better than putting restrictions on. They'll just get nosey and think there's something fantastic there that they are not meant to see
>
> (Rory's mother)

Other parents also did not limit their child's internet access in any way, and these children frequently talked about feeling trusted by their parents to make sensible decisions. The 11 year old girl who had her own YouTube channel also talked about being trusted on the internet and this trust seem to lead to her policing her older brother's use of the internet:

> **Latifah**: You can't watch anything that's inappropriate, obviously.
> **Researcher**: So what? So do they have filters or how do they stop you from doing that? Or would you just not?
> **Latifah**: You just don't, like they trust you. My brother's not trustable, they know that my brother might 'cause like I can tell my brother does. One time I caught my brother watching a video, a music video that's really bad, then I cancelled it for him.
> **Researcher**: So you don't watch music videos, or is it just certain music videos?
> **Latifah**: It depends. When it like, I watch all the music videos I like of the song, and if it gets too inappropriate, I just turn it off and I listen to the lyrics video. Or the audio.
>
> (Latifah)

Another child who enjoyed playing Fifa felt that his parents would not have a problem with him playing with, but not chatting to, strangers online. He said the advice they would give him would be the same as 'every' parent:

> They would say like, obviously every parent says don't talk to strangers, don't get into other people's conversations or other people's bits and fingers and stuff
>
> (Khaleed)

Issues around e-safety are implicit in the majority of the parents' comments and rules around internet access:

> I think it should be supervised, because there are things that look quite appealing to children and it could get them into a lot of trouble
>
> (Noah's mother)

It was apparent that parents were uncertain about their children's grasp of certain issues related to e-safety and many felt that strict rules around the use of the internet would help keep their children safe online. One mother of two girls aged 6 and 9 monitored her older daughter's use of Skype and insisted that her daughter did not add anyone to Skype without her parents' permission:

> … because we want her to be aware that there are nasty people and they might say that their name is and their age is a particular age but in actual fact their name is John and they're fifty four years old type of thing, which is why we've set those rules up for her to use the laptop
>
> (Ella's mother)

This concern related to child protection was echoed by another mother:

> … they are so much in technology, they can work anything out now. It can be quite dangerous, so I try to talk to them about safety, what not to watch - the bad things now. So things not to watch and not to talk to people on YouTube. Not to use their information on YouTube or anywhere else: if they say fill in a form, don't do it
>
> (Jackson's mother)

The mother's anxieties led, in the mother's own words, to her children being "stuck on just YouTube watching Power Rangers".

Obvious issues around child protection led to the use of filters and the imposition of rules as did parents' concerns around protecting their children from 'inappropriate' content, included limiting access to certain websites and/or banning playing games which were not age appropriate. One mother talked about how she monitered her son's online activity:

> "…he also knows that periodically we'll go in and check to see what's on, we'll just do a random spot check. He actually knows that we'll do that without, he could be asleep. … so to make sure he hasn't loaded anything up that we're not happy with." They had never found anything inappropriate "I think the fact that he knows that we might do that, I think that's a good deterrent"
>
> (Alex's mother)

Parents did find however that sometimes there was a conflict between protecting their child and enabling their child to access useful content. In one family YouTube was usually blocked but was unblocked on a temporary basis as one of the children (aged 11) was in a choir and used YouTube to look up song lyrics. Her mother was not totally comfortable with this:

> YouTube is a little bit of a grey area for me because there's an awful lot of things on there where there are swear words or, you know, a lot of music videos are not appropriate so, you know, I don't want to restrict her too much but also I don't want her to have free access
>
> (Violet's mother)

For other parents, although access to inappropriate material was a concern, they preferred to impose fewer rules and filters and chose other strategies, such as involving older siblings in helping their primary-aged children learn how to stay safe online. A parent of a ten-year noted that her son"ˆoccassionally" watched YouTube videos "with lots of swearing or blood and guts'' but she seemed to rely on his older siblings to control his viewing. This same mother also hoped that the digital leaders course he was about to embark on at his school would teach him about "that sort of stuff" (Ethan's mother). Latifah, who had set up her own YouTube channel, talked about how her older sister was concerned for her and discussed some of the negative aspects of being a YouTuber:

> My sister said that 'I don't think you're ready for YouTube' because there was this, this guy who is her favourite YouTuber and he got lots of hate comments 'cause he was annoying or something and then he committed suicide
>
> (Latifah)

In some families parents encouraged their children to talk to them about anything they were concerned about online or if they felt they had stumbled on something 'inappropriate'. One child described how he would talk to his parents and their response was usually "pretend you never saw that and forget about it, but don't go any further with it" (Alex).

Rory, being an only child, had no siblings to turn to for guidance, but he and his mother established a system which enabled her to monitor what he was doing on-line whilst also developing his ability to be critical and to develop his own judgments:

> …. we've agreed (is) that once a week he shows me what he's watching, and we talk about it and then see whether that is suitable or unsuitable. So far I haven't stumbled across anything else, and he's quite happy with that. I said I trust you, and show me and then we can find a solution together.
>
> Once when he was a bit younger he was actually watching an episode of Minecraft, and it was harmless but there were a bunch of guys and one, I think he had a bad experience with his girlfriend, he was quite derogatory about women in general. And I was hearing it in the morning as I was getting ready, and then I said Rory look, he's

> very negative about women in general, he's not very nice. It's not how you should be. I'd like you not to watch that group any more. And he was 'OK mum, that's fine'. So we haven't had any problems
>
> (Rory's mother)

The third aspect of internet safety parents worried about related to social media and children's 'digital footprint'. One mother said:

> ... as we know some of the photographs, some of the statements they make or texts to their friends will stay with them for the rest of their lives. And I don't think they are at the age where they fully understand the consequences
>
> (Grace's mother)

Her daughter, Grace, engaged with ICT primarily to interact with her friends using iMessage and FaceTime on her phone, and shared the fact that she would sometimes 'sneak' into her bedroom to text her friends. It is possible that the child's interest in communicating socially online was raising her mother's anxiety about her safety. Again, Rory's mother had a somewhat different viewpoint. Her son was the same age as Grace and attended the same school, but she felt that Rory had developed had a good understanding of issues surrounding social media and his digital footprint:

> I think he realises quite a lot what kind of damage that can do. **...** Because we talked about it. Our motto is a little bit if you haven't got anything good to say don't say it. And anything, what you sent, what you do, once it's on an electronic device it cannot be taken back, it is different, if you say face-to-face to somebody I don't like what you're doing, or you have behaved really nastily or you are nasty. But once you put it in writing on the cloud it stays on the cloud. You might not be able to see it but it's always there. And it will haunt you forever. And I think that's something that he very much understands
>
> (Rory's mother)

Where there were two or more children, parents had to consider how, and if, they were going to alter the rules regarding internet access depending on the child's age. In one family where the films the family watched took into account the age of the youngest child, a boy aged eight, the mother felt that internet access rules could be relaxed a little for his eleven year old sister, but restrictions needed to remain in place for the son:

> … almost sort of protecting him from himself almost because he doesn't always know that where's he's gone has been inappropriate
>
> (Violet's and Will's mother)

Most of the children in the sample mentioned having access to the internet, although children's use was frequently restricted by parents using internet filters, supervising children whilst on the internet, or limiting access to digital devices that had internet connectivity. As already noted, in some families parents also limited the time children were allowed to spend using the internet by controlling access to a WiFi signal.

All children who used ICT to extend an interest in the physical world (e.g. mountain biking, football, music, drama) or who used ICT primarily for social interaction unrelated to digital games had access to the internet. This constrasts with the group of children whose digital practices were categorised as Entertainment as a small proportion (4 out of 33) reported not being allowed to use the internet at home. No clear pattern emerged from the data regarding internet access and children's levels of engagement. A few children for whom ICT played a marginal role in their lives reported that they had free access to the internet whilst Ashish, one of the three children whose digital practices were categorised as Core, had his internet access controlled through filters and restrictions on access to a wifi connection. The second of these three children, Latifah, was only limited by the poor wifi signal in certain parts of her home and the third (Rory) had no apparent restrictions other than wanting to maintain his mother's trust.

6.4.5 Parent's Views

When examining the parentally imposed rules and routines the point was made that these rules are not arbitrary and instead were shaped by: parents' perceptions about ICT and its impact on children; and parents' views about childhood and learning, including how children 'should' be spending their free time.

Many parents acknowledged that ICT had not necessarily been an integral part of their own childhoods or family life when growing up, and some parents' voiced uncertainty about the value and importance of ICT. One father spoke about his perception of the function of digital devices and the role of ICT in the lives of children in the current day:

> **Ashish's father**: The use of digital devices are tools not a means to themselves. So a smartphone is there to provide access to email. So it's a tool so you use it to access email. I don't see these sort of devices being, or ICT being used for the sake of being used
> **Researcher**: And what about for your children: consider what it was a couple of years ago for them without the technology, how they are now, and what do you think their future is?
> **Ashish's father**: Yeah. they're at the cutting edge right now. So there's no real barriers for them, or real understanding of what the challenges are around ICT, and they spend far too much time I think on screen. And I think when I was growing up I didn't have nearly that much time on screen but then times change. Generations move on and people have different views, different aspirations, different ways of being. So maybe when my children are older they'll look back and think hey why I did screen all the time, my kids are doing something else that they don't feel appropriate
> (Ashish's father)

Parents, in particular those whose children were under the age of nine, spoke about their uncertainty about the value of ICT and whether it prevented children from playing in the physical world:

> … children in this age particular two or seven and I think and older, they don't want too much technology in terms of study, they want to play and they have fun and we have maths and English as subscribed for our website which is quite clever how they do maths and English and she was very excited in the beginning when it was new but then later she doesn't want to, she doesn't want to, she doesn't want to read the books now, she all but she wants, she would like to play or she wants to watch TV and so I have double feelings about technology in children personally
> (Claire's father)

A mother of two daughters aged six and nine was clear:

> I don't agree with children being sat in the front of laptops, computers and tellies I'd much rather them be outside playing, getting muddy and dirty kind of thing …

She added:

> …. it worries me with the way ICT is being, is the fact that its taking children away from playing and stops them from having, you know, and by playing in the sense of whether it's a game like a board game or whether or not it's going to the park or running around the garden and I don't know where that balance is
> (Ella's mother)

She went on to claim that her views were shared by her child's friends' parents as they too:

> kind of don't want them sat in front of the telly, they don't want them stuck in front of the laptop and things like that. They would much rather them be doing something, being kids kind of thing
> (Ella's mother)

A similar point was made by the mother of a four year old and a nine year old who said that although both girls had their own iPads and a games console, which was the most used piece of ICT kit, she emphasised that she preferred the children not to use their tablets because:

> they've got a playroom, that's filled with toys and crayons and paints and all that sort of stuff, so they've got quite a lot, of other activities, to keep them occupied
>
> (Chloe's mother)

A father of a six-year-old boy felt that watching Peppa Pig "was fine" and good for his son, and both he and his wife would play games, two-person games with him on his iPad, going on to say that they may play:

> every weekend, it will be time that we'll sit down and play with him, of the choice that he likes. Or, if he likes to go out and do something, then we go out, and you know, different things because sometimes being stuck in all the time is hard, it maybe we go round to his nan's, he'll take his iPad with him and we'll explore round there, and there'll be other children, family members that he'll play with, and he'll sit there with them, and they'll share the iPad and play together
>
> (Owen's father)

This seven year old's digital practices were categorised as Entertainment/Engaged and he had his own iPod, iPad, games console and TV, and also had access to the family's Smart TV. Despite this relaxed and apparently supportive approach towards his son's engagement with ICT, the father added:

> …I don't like letting him watch it too much, I want him to explore, I like him to play with his toys and things like that . I don't want it just technology all the time, because I don't think it's right for a child to have technology all the time. 'Cause I think they do need that bit of time away exploring different things around them
>
> (Owen's father)

This would suggest that this parents' misgivings about his child using ICT a lot was not necessarily reflected in decisions made about the ICT resources made available or the imposition of time constraints. The somewhat mixed views of this parent and sense of uncertainty about what is 'right' for the child was also evident in other parents' interviews:

> Well , being a boy I think he likes the physical sort of 'arrgh', you know, movement and stuff [playing the Wii] rather than just sitting 'tap, tap, tap' [on the keyboard]. I just don't think it's that useful or valuable for him when he enjoys doing other things for me to say 'oh yeah go on the computer'; cos he likes to just come home and chill out on his own and go to his bedroom, by choice, and play with his Lego rather than make a bee line for his computer. It's not that I'm really anti-computers or anything it's just that whilst they are still interested in doing other things there's no need to push it. I feel they do enough at school and at home to be able to be able to navigate and use computers but I'm just not going to push it
>
> (Jack's mother)

Although she appeared to have very clear ideas about the value of children's play in the physical world she went on to reveal an uncertainty when she acknowledged how the current landscape of childhood is very different to what her's had been:

> Obviously we're living in a digital age and I don't know if I'm doing him a disservice by not encouraging him. I don't know if he should be doing more. I just don't know. It's one of those things, I didn't grow up with it and I'm ok but I'm not brilliant with computers. So I don't know if I should be encouraging him more or less
>
> (Jack's mother)

Other parents made even more explicit comments on the possible impact of ICT on their child's learning, and their child's engagement with ICT was not always viewed in a negative terms. The following are a small selection from the numerous comments made by parents and are intended to provide a picture of the range of views:

> [ICT is valuable] for research and things that they're going to use their brain to learn something
>
> (Gabriel's mother)

> I don't particularly think [a games console] is that useful, so I will never buy it… I think he will probably use it for exercise…. Because we live in a flat, so running around is not an option… Somehow, he could benefit from it. But most of the games are not educational
>
> (Jackson's mother)

> In today's society they've got to be able to use it, there's no getting away from that and you know, things are only get better, more advanced and things like that but she has got to be able to do it
>
> (Ella's mother)

> … they get dizzy to be honest with you when they are spending a lot of time with technologies such as phones or TV or tablets. It affect them and you can see them they getting mentally lazy to play normal games, to read the books and I don't mind technologies personally because I'm a graphic designer
>
> (Charlotte's mother)

> **Noah's Mother**: So Noah's always been introduced to Xboxes and stuff like that. And I do think if Noah haven't have had that type of technology where you have to have an imagination to get into certain games and stuff, I don't think he'd have been how he was. Like at nursery they said we're playing a game and Noah's there trying to invent new ways to, if they have to make like a bridge or something to get across, Noah will be thinking of oh this is a better way and stuff, because he had that imagination.
> **Researcher**: And you think that comes from early exposure to the games?
> **Noah's Mother**: Yeah I really do. And he never played anything violent, it was always like army games and strategies and stuff like that. And I do think it has had a good impact.
>
> (Noah's mother)

> … he's just sort of zoning out for a bit really, just switching off to do something a bit different … his friends at school will talk about these sorts of games so he'll want to play them so he knows to be part of the conversation … I don't think they have sort of competitions where 'I reached this level' so it's more talking about characters
>
> (Jack's mother)

> So, he lost his concentration and his memory on other things which we want to teach him about education about knowing about other things, he is more remembering and repeating the words he heard on his game
>
> (Hakim's mother)

> I don't know what it's doing to her. I would like to know. It may be good things as they're really the first generation aren't they that have been utterly immersed in technology from birth
>
> (Sky's mother)

> she uses it to learn things that she wants to do, hobbies. Things like making different hair plaits, playing the different games. And she also can keep in touch with our family overseas
>
> (Grace's mother)

It is clear from these comments that whilst some parents were anxious about the potential negative impact of ICT in preventing children from playing in the physical world and developing the ability to concentrate and remember things, others held more positive views. Some parents valued chidren's engagement with ICT as they felt it contributed to their child's creativity and thinking skills, provided an opportunity for their children to learn new things, keep in touch with others and relax. Some parents also highlighted the role it played in helping them be prepared for the world of work, which many parents felt required a facility with ICT.

Two further issues were frequently mentioned by parents: firstly anxieties about their children becoming dependent upon or addicted to ICT and how children reacted badly when they were not allowed to use it, and secondly the parents' practice of using ICT as a reward or punishment.

One mother explained that she knew that her son "could be better" at ICT but nonetheless limited her son's use of it because:

> I don't want him at all to be attached to technology, otherwise it's going to be hard for me to, for him to stop it. He needs to focus more on studies and books than technology
>
> (Gabriel's mother)

Another mother, who had said that she thought ICT developed her son's creativity and was happy to play games with her son on his Playstation, nonetheless noted that playing games sometimes caused problems:

> If he gets games, this is the thing, if he's on it too long, and I interrupt him, and he loses, and then we have the whole game rage thing. And then it's confiscated from him
>
> (Noah's mother)

The issue of children's ICT use impacting negatively on children's moods was mentioned by another mother:

> What I do find though is that when they have been on it for a long time and I tell them to switch it off they're in a foul mood and it's not just because I've told them to turn it off, it's because they've gone into a bit of a zone. And they can't pull themselves out of it, that's partly why I don't encourage it. I don't, think it's fair of me to put them in that position when they then feel horrible when they come out of it
>
> (Jack's mother)

Whilst another set of parents felt that their son's 'habit' of playing with ICT was impacting on his willingness to engage in other activities:

> On weekends he don't want to go out, he just wants to stay at home and playing. We say we go somewhere with this friends or, 'no I don't want to', and he starts crying. He just wants to stay at home. I told him I didn't hear about child who doesn't want to go out and play. He just wants to sit at home and play with his iPad
>
> (Hakim's mother)

Interestingly, two of the four children whose parents felt they were addicted to ICT exhibited digital practices which were categorised as Marginal on the Participation dimension of the Digital Practice Framework. The other two children's digital practices were categorised as Engaged on the Participation dimension. In contrast, one of the parents with children whose digital practices were categrised as Core on the Participation dimension talked about him being quite happy "'if the weather's good" to "go outside either with the dog" or "we go to the beach, that sort of thing" (Rory's mother). It seems probable that parents' anxieties and the resultant constraints they placed on their children hindered the development of more advanced digital practices.

Withdrawing ICT or using ICT as a reward was a strategy used by a number of parents for children of different ages and whose digital practices spanned the dimensions of the Digital Practice Framework. One seven year old boy was able to 'earn' additional time using ICT by completing maths and English tasks online, but his mother also confiscated his ICT devices for two weeks when he and his sibling were having problems (Noah's mother). Using withdrawal of ICT as a behaviour management strategy suggests that some parents viewed their child's engagement with ICT as a privilege or as a form of play and not to be taken too seriously. There are no data about the children's views on this, but this would be interesting to explore further as it may yield some insights into children's perceptions of adults' attitudes towards ICT within the home arena and the possible impacts of this on children's developing views about the role, purpose and value of ICT.

There seem to be aspects of the home arena which impact in various ways on children's digital practices but the nature of the influence in any particular family dpends upon the interaction of these factors. People in action within the home is another feature of the home which may contribute to the pattern of children's digital practices.

6.5 People in Action (settings) and Children's Identities

This section draws on the data to gain a better understanding of the ways in which the digital practices and identities of children's parents and other family members influences how children positioned themselves as ICT users. Children's identities in relation to ICT will have an impact on how children then positon themselves in the school arena and experience the use of ICT in school.

The interviews with the parents gave rise to a wealth of data about how they view ICT in their lives and their identities as users of ICT. As in the previous section on parents' views about ICT in relation to children, there is only space in the this section of the report to provide an insight into the range of ways parents use ICT, their identities as users of ICT, how children view them and the possible impact of this on children's positioning.

One mother (Noah's mother) reported that she herself uses technology "all the time" and ''would be lost without it''. She uses her phone for emails, social media and games and when the Pokémon Go craze was at its peak she organised for a babysitter so that she and a friend could go searching for Pokémon. When she returned home her son was keen to know what they had found. In this family the grandfather was also influential and was described as being 'into his technology'. As result of the grandfather's interest Noah, who was seven years old when he took part in this study, had been introduced to games at a very young age. In his interview he noted currently playing Call of Duty, Ghost Recon, Mario and Skylander. He positioned himself as the best in the family at games as both his mother and grandfather asked him for help. He did not appear to have a full understanding of his mother's ICT skills as she noted that he thought he knew more than her and would not think that she knew how to monitor his use of the internet.

In another family, when asked about ICT expertise within the family the father said:

> **Father**: I'm a bit of a Luddite, yeah. I was probably in my second year of medical school before I was even able to like even save a word document. I didn't, I was late going to medical school, I used to work on building sites, so I never really got the whole IT thing. So, [my misses], you know, I'm not good with Excel, all these sort of things I need to use, she'll always set it up for me and I'll just do all the data input after that, but, yeah.
> **Researcher**: Okay, so why is your missus good at using technology?
> **Father**: Because she works for a leather wholesalers now, but she did a Business Degree, then she did a Speech and Language Therapist Degree, so she's always, even in her teens, she's always used computers for data input and stuff like that, she's always very au fait with the basic programs. Where I was on building sites since the age of five.
>
> (Claire's father)

As a result of this the mother was viewed by everyone within the family as the person to go to for help. The daughter talked a lot about time she spent with her dad looking at YouTube, particularly at bedtime. Her father also spoke about his attempt to encourage Claire's interest in games on his playstation:

> **Father**: I have a Playstation 3 which I bought with my first ever pay check as a doctor and I've hardly used it. {Ok} and Claire's gone on it to do things like Gran Turismo, the racing game, but she just can't get the hang of it. {Yeah} There are more sort of grown up games, I bought another thing, there was the classic games from the nineties and Mega Drive, even them, she's not into fighting games, she's not into Sonic the Hedgehog. I might try her again actually at six.
> **Researcher**: And she doesn't, you haven't got any games on your phones or your tablets, you know, like Candy Crush, or Angry Birds?
> **Father**: Not really, she didn't mind Angry Birds, she didn't mind Angry Birds, that is a great game actually, it is phenomenally simple, but she did like Angry Birds, but then again she would never ask me, 'Dad can we play a game?'

(Claire's father)

Whilst the mum may have been the expert it would appear that the father had the greatest impact on the child's developing ICT practices. However, Claire herself was not very forthcoming about her positioning as an ICT user so it is hard to know how the people around her were influencing her view of herself in relation to ICT.

A third parent (Joshua's mother) explained how ICT played a central role in her work and home life. At work she used a computer on a daily basis and at home she used her phone for "shopping, banking and communication". She was not certain that her son Joshua knew how important ICT was in her professional life:

> Well he doesn't see me at work, I'm a nurse, so it's a lot of database stuff. But he's never been to my work and he doesn't know. But I think if you ask him what I do, he wouldn't think it was anything to do with computers. He thinks I'm rubbish at them anyway.
>
> (Joshua's mother)

Despite her use of ICT at work and the fact that she also used it for what she described as the basics: shopping, Facebook, texting and talking, she described her expertise as "pretty poor" especially in relation to a 23 year old, but then felt that in comparison with her mother-in-law she was "pretty good". Her husband was the person the family would generally turn to if they needed help, although she recounted how her son, who had just learnt how to do the basics of Excel spreadhseets, stepped in to help his dad when he was having a problem and solved it with him. The whole family also attended a Raspberry Pi session in a local community centre which would suggest that the general approach to ICT within the family was encouraging and supportive.

Although the three families discussed differed in terms of the extent to which ICT was used at home and work, who the 'expert' in the family was, and the digital practices the children were being inducted into, the digital practices of two of the three children from each of these families was categorised as Marginal on the Participation dimension of the Digital Practice Framework (there was insufficient evidence to categorise the third child).

Ella's mother, whose daughter's digital practices had been categorised as Engaged on the Participation dimension, was asked whether she felt anyone within the family had influenced her daughter's view of ICT. She responded, saying:

> No, in the sense that when my older children were doing their GCSE's at college and things like that, Ella was too young to be aware of it. She just saw the computer as something, you know, she used to play her Peppa Pig game on. I don't, I think 'influenced her' is the wrong word because she's not with any other family member enough to kind of like, have that thing of like 'yes they have influenced her'. She's aware that one of her aunties has to use it for work, she's aware another auntie has to use things like the iPad because she works in a hospital so it's working out medicines, things like that but I wouldn't say it's enough to influence her because she doesn't see her auntie at work and you know, work is obviously never brought home from the hospital, so I think influence is the wrong word for it.

Furthermore the mother commented:

> For me, I don't class it very important for me personally, in a sense I don't use anything like computers or anything like that for the job that I currently do. But saying that I do think it's important because I've got four kids, alright two of them are you know, bigger than Ella's age kind of thing but I need to make sure and I want to make sure, that whenever she's on the computer, tablet, whatever, she's safe.
>
> (Ella's mother)

The mother 'only' used WhatsApp, Facetime and emails but Ella still turned to her if she had a problem with ICT.

It would seem that a parent's own expertise or engagement does not necessarily have that great an impact on a child's developing sense of how and why ICT is used or how they position themselves. However, looking in a little more depth at the three children whose digital practices were categorised as Core on the Participation dimension, it becomes clear that for these three children supportive parents and family members played an important role in inducting them into ways of engaging with ICT, and developing their skills and interests.

Latifah, who had her own Youtube channel, talked about how her mother had helped her, initially by allowing her to use her mother's account:

> When I was like nine, I made these horrible videos, and it was on my old, old, old channel and it was on my mum's account. Let me find it for you [laughs]. It was really bad videos, like…

This support continued even when Latifah set up her own account :

> … when I finish editing and import my videos, my mum tells me whether the video's good editing and good quality and if I should upload it or not
>
> (Latifah)

She also talked about the fact that her brother used to have his own very popular YouTube channel ("he's had over a million views") and that her older sister gives her advice. She described herself as a 'tech nerd' saying she had been a nerd since the age of four. She saw being a 'tech nerd' as explaining her interest in editing videos, though her passion was using YouTube. Intertestingly, although she was happy to search for solutions to specific ICT problems, such as how to reinstall an earlier version of Windows so that she could run the editing software that she preferred, she also asked her older sister for help:

> I'll do it myself, but like I'll go on the internet and I'll try and find it, like how to do it, and if it doesn't work, like usual because I can never do it properly, I ask my sister because my sister's a tech nerd too
>
> (Latifah)

Ashish, the second of the three children whose digital pracices were categorised as Core on the Participation dimension, talked about how important ICT was to both his parents, and he was provided with the necessary kit to enable him to pursue his interests in ICT. He positioned himself as a skilled gamer:

> R: So you've got quite far, what level do you think you'd say you're on?
> T: Well I also have the best Pokémon in the game, but then all that's going to be reset in January 1st because they're updating it. So I'd say I'd probably be at say about 50th or something.
> R: So how would you rate yourself as a player, pretty good?
> T: I'd say between, say I was bad, good and then amazing, I'd say between good and amazing.
>
> (Ashish)

He was also someone with wider ICT knowledge who was happy to help teachers in school sort out problems with ICT:

> They [the school] tell us that he's frequently called upon to help and fix things, or help other children.
>
> (Ashish's father)

Rory, the third child whose digital practices were categorised as Core, had a mother who was very supportive in a number of different ways. ICT was an important part of family life. He was

well resouced in that the laptop he shared with his mother was set up to be his 'complete studio' in his mother's office. His mother may have been instrumental in developing his interest in Minecraft and inducting him into it. She explains:

> I think in the beginning he watched more the Minecraft things. Then he asked, he started wanting to play the game. And my husband had no clue. I had no clue, so I bought some books. Because I thought he was, at that point he was, I don't know, seven or eight, and he didn't quite have enough ICT knowledge in general to be able to get kick started. So I bought a couple of books, read those books, went through the books with him on how to do it. And from then onwards he developed quite quickly, and he left me far behind quite quickly I have to say.
>
> (Rory's mother)

His parents also accepted that his iPad "is constantly somewhere" close to hand and they did not impose serious time constraints or restrictions on his internet access. Furthermore they viewed his time using ICT as his downtime in the midst of his busy schedule, saying:

> it's time that is to himself, and I find that important, we stay out of that a little bit as well, it gives him a bit of a freedom to do what he wants to do
>
> (Rory's mother)

Furthermore they were happy for Rory to use his ICT competence in a range of contexts and encouraged him to position himself as a sophisticated and confident ICT user and problem-solver:

> **Rory's Mother**: We went to a restaurant and there was a device on the table, or an iPad to order your meals.
> **Researcher**: Oh really?
> **Rory's Mother**: and ours didn't work, so Rory was very disappointed and was then a little bit bored. And then he cracked their password, hacked into their system, reset the whole thing and went da-da it works again, I've solved it for you. And I just sat there with an open mouth literally, it's like who are you?
> **Researcher**: Interesting yeah.
> **Rory's Mother**: And that made him feel really good.
>
> (Rory's mother)

6.5.1 Gender, identity and children's home digital practices

Unforunately the data relating to children's socio-economic backgrounds, their ethnicities and cultural backgrounds was not sufficiently comprehensive or robust enough to enable meaningful analysis. There was suffient data relating to gender that, on analysis, raised some interesting issues related to gender, identity and children's home digital practices. The following exmples are indicative of some of the gender-based practices and attitudes evident in the data.

Whilst there was not a clear connection between the number and type of digital device to which girls and boys had access there were gender-based differences in the children's uses and purposes. Minecraft, for example, was played and enjoyed by both girls and boys as were other games (eg. Goat Simulator). Engagement with other games showed a clear gender divide. Boys talked about and enjoyed playing the football-based games (eg. Fifa, Arena, Rocket League) and only one girl mentioned that she 'occassionally' played FIFA on her brother's Xbox. Girls talked about games such as Unicorn simulator, 'horse games', My Little Pony, 'makeup and dressing up' games, 'Nail varnish' games and 'I want to groom my dog'. Even when children were playing the same game the data suggest that children's purposes varied, frequently reflecting a child's gender. A mother decribed how her daughter, Chloe, played Minecraft with her older sister, aged nine:

> …she feels grown up she's playing something that her big sister plays. It's quite creative. She definitely likes the creative element of it. She doesn't like the baddies in Minecraft, we have to switch the baddies off, she just likes to create and build…they

> seem to let one of them control it and the other one sort of barks instructions and they say, 'Make me a bed! Make me a castle!' so then big sister diligently collects the bricks and … often Chloe will take over though and make something for herself, something wacky looking … they take turns
>
> (Chloe's mother)

An older girl, 11 year old Marina, played Minecraft with her three siblings; her mother described the children's play:

> …usually they play, four of them, they interact, three girls and a boy – her brother is usually playing hunter gatherer and blowing things up in his little aspect of it, you can do four screens, Marina usually stays at home [in the game] because she is scared of some of the characters that come. I don't really know, this is just what I'm getting, the older two are always amassing and gaining these beautiful big houses and Marina will pootle around and build things and sometimes she goes off horse riding with one of her sisters but she always comes home before nightfall which I think is quite sweet - they talk and fight with one another - 'look what I've build' or 'you're not looking!' - obviously they're all in their little square or box as I call it but they're all chatting and then whatever the evil presence might be they're all like 'quick, get in!' trying to make sure that none of them die - they have certain lives and they have to feed one another…
>
> (Marina's mother)

These descriptions of Minecraft play constrasted with those offered by boys and their parents. One 10 year old boy (Ashish) for example talked about playing Minecraft in Battle mode in which the player has five minutes to build something specific and how he worked with a team, communicating via Skype to help them refine their construction. He added that sometimes they get 'voted best, second or third'.

Boys were also more likely to search on YouTube for videos which would helped them impove at Minecraft, suggesting they would not neccesarily agree with Bethany who said she finds

> films of guinea pigs relaxing because there is no action in it, it's not exciting or anything, very calm…. I like playing minecraft because it's relaxing
>
> (Bethany)

Differences in children's use of Youtube were also apparent. One of the project researchers made the following field note:

> Searching for and watching videos on YouTube was common practice, however there appeared to be a greater gender difference in this group. When interviewed, the three boys indicated they primarily did it to watch to be inspired/get ideas for Minecraft constructions; or watch teams complete missions in first person shooter (Call of Duty). The purpose did not appear to be to learn how to complete the mission but to gain knowledge about the domain and be able to be part of the collective (e.g. to have deeper knowledge of the game universe and be able to converse with friends about it. Katie liked to watch gymnastic routines, teaching herself new moves to practice with friends. Katie indicated that she both filmed and edited her own videos (of her and her friends doing gymnastic routines). These were shared privately amongst the group and not published.
>
> (Researcher's field notes, Byrne Primary)

Whilst the data did not show a clear difference between children's access to and occasional use of social media there was a noticeable difference in the ways girls and boys talked about it. Boys mentioned using social media but preferred to talk about other uses of ICT. In contrast, a number of girls talked animatedly about their use of social media. One 11 year old girl, Madison, claimed to get "a thousand messages a week, a hundred per day" adding that there will be 50 messages for her when she wakes up in the morning and that her iPad "pings throughout the night". She also talked about replying to messages and sending messages

"when bored" although this was not after bedtime as her mother insisted that she leave the iPad in the lounge once she has gone to bed. Another girl, who used ICT for a range of purposes from playing games to watching YouTube videos to texting friends said that she would feel 'lost' without ICT, but only focused on how she would feel socially isolated:

> I would feel like I wouldn't be able to interact with my friends as much, because we do texting and messages as I said.
>
> (Grace)

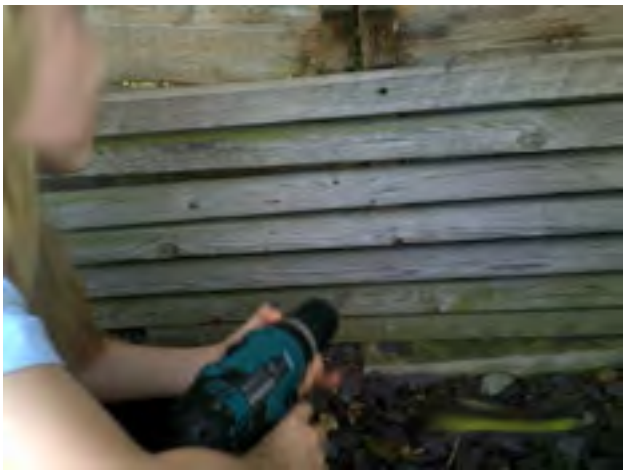
Parents seemed to foster their daughters' use of ICT for communication. Sky's mother, for example, talked about providing her daughter with an old phone so that she could WhatsApp the children who lived on her street as without this contact "she was missing out".

The data suggest parents seemed to view gender as a significant factor in children's engagement with ICT. Aran's mother explained how she had to keep her two children separate when using digital devices to prevent squabbles :

> …they want to do different things, one is a girl so into princesses and the other into airlines, they don't have common interests
>
> (Aran's mother)

Charlotte's mother commented confidently that she likes playing games on the phone and "she likes makeup games and dressing up games…like because she's a girl". Charlotte positioned herself somewhat differently, telling the reseacher that she was good at using the drill to fix fences with her Dad. Furthermore, she had games on the phone she said "I don't really want to play them that much".

Charlotte using a drill to help her dad



Children's game preferences were often commented upon by parents and Claire's father talked about his six year old daughters lack of interest in playstation games:

> It does seem to be that without it coming across as sexist, it seems to be certainly, definitely in the teenage years, it seems to be more of a male pursuit anyway, game play, but there are plenty of Little Big World and stuff like that the girls seem to be into as well. So yeah I might have to tackle her again, some of the nineties, Sonic the Hedgehog those platform games I think might be more up her street now, but I think she found it more difficult, the sort of co-ordination.
>
> (Claire's father)

This father and daughter interacted a lot through using ICT together. The father helped extend his daughter's interests by searching for relevant content on the internet and the bedtime routine included a time when they watched YouTube videos together. It was apparent that whilst some interests may be shared, on occasions the daughter's enthusiasm did not match the father's passion, particular around YouTube videos about Lego which she did not mention when interviewed, despite her father's interests:

> Sometimes I also say I saw a really good thing about saltwater crocodile recently, so let's watch that, so we'll watch that. But the Lego ones, I loved Lego as a kid, by far my favourite toy, and it was, I still play with it now as well, you know, it's just good fun. But she'll pick videos which is cute as well, its bedtime, and she's, 'no I don't want to watch that daddy'… So, yeah, so, they're her choices but I'm not going to let her wrap me around her little finger either. But, yeah, though, they're mainly her

> choices, it's her bedtime, so yeah, I'll let her have a look at that. But, yeah, it's to show her what you can do with Lego.
>
> (Claire's father)

Marina's mother sought to explain the levels of children's engagement and focus in terms of gender:

> I find TV is less intense so I worry about prising them off ,more focused than on TV. Girls can come out of it easier but having said that one of my daughters has trouble getting out, she has more of a male brain, interestingly. When they are focused they don't hear, it's not that they don't want to listen, they are so intent on what they are doing
>
> (Marina's mother)

Parents were often unaware of the level of their children's ICT skills but this did not appear to have any relation to the child's gender. One ten year old for example talked about how he erased his search history so that his parents would be unaware that he had accidentally accessed an inappropariate site on the interenet. Whilst a nine year old girl told the researcher that when her SnapChat account had been hacked and a pornographic image had been posted she herself alerted SnapChat and had her account shut down and deleted before her parent even became aware, saying:

> There's all kinda weirdos out there, I didn't want anyone thinking it was me! I don't wanna see that kind of stuff! Eughhh!
>
> (Emma)

There is insufficient data to comment on the extent to which parents' positioning of themselves with respect to ICT use and expertise and the children's views about their own expertise showed any gender bias. However, it is interesting to note that Latifah, who had her own YouTube channel and whose participation was categorised as Core, not only described herself as a 'tech nerd' but also felt her sister merited this title and had a supportive mother who provide critical feedback on her YouTube videos.

6.6 Summing up findings for RQ1

Analysis of children's home digital practices indicated a wide variation in levels of engagement: from children who used ICT for short periods of time through to children who engage for much longer periods and/or with higher levels of commitment. The sophistication of ICT use also varied with some children exploring or playing games in an unsophisticated manner through to children who were talking about adding mods to their games or using ICT to film and edit videos to be made public on children's own YouTube channels, and at least one who had sophisticated understandings of different YouTube genres and/or how to manage negative comments.

The data showed that children's purposes varied too. For some children ICT was used primarily as a source of entertainment and for many this involved playing games. Some of these children were passionate game-players who chose to watch YouTube videos to improve their game playing, which also reflected their participation in particular communities of game players. Other children also used ICT purposively to extend interests they had in the physical world (e.g.watching YouTube videos to find out how to make Christmas decorations which the child then made; watching gymnastics videos after attending gymnastics club and using them to help think up new routines). Although many of the children in the research sample were still very young and some parents expressed anxieties about communicating on-line, some children, usually with their parents' knowledge, were using various social media apps (e.g. WhatsApp, Facebook and Facetime) mainly for communication with friends and family. There was some evidence that a few children were showing signs of interest in programming.

Perhaps unsurprisingly, a major feature of children's home digital practices was the children's agentic use of ICT. Children, for example, would proacatively and independently search for information about things in which they were interested, or for games, and more than one child talked about using reviews posted on the internet to inform decisions about game purchases.

Children were also conscious of the different ways in which ICT was used by people in their families. Children were generally aware of their own levels of expertise relative to their family and friends, which also contributed to children's identities (e.g. "the best gamer in the family", "tech nerd"). There is also evidence that there were some differences between children's patterns of use, which appeared to be influenced by gender. This means that schools need to be alert to the fact that children will have very diverse experiences of ICT at home. The extent to which schools acknowledge children's home digital practices is explored in more depth in the following section, which looks at the alignment between schools' pedagogical practices and children's home digital practices.

7 Teachers' Practices and the influence of pupils' digital practices (RQ2)

Across subject domains what do teachers' intended and enacted pedagogic practices indicate about their awareness of and the value accorded to pupils' digital practices, and how do pupils' experience these pedagogic practices?

Given that the study schools were selected because they were identified as being likely to provide useful insights into NP3's research questions, it is hardly surprising that the majority of them saw ICT as integral to life outside school, and thus an important, if not essential, element of school provision. Table 7.1 provides a summary of the types of ICT related provision observed or reported to the researcher(s) in each school. In some cases, it may have been that particular uses of ICT, such as to look up words in a dictionary or thesaurus or programming, were so deeply embedded or taken as givens that participants didn't think to mention them. As such the data presents a partial picture, particularly in the case of the exploratory studies which only involved two days of data collection. It should also be remembered that the data were collected in the past and may not represent current practice.

In order to answer RQ2, the extent to which teachers' pedagogic practices (linked to ICT use) aligned with children's digital practices outside school needed to be established. Thus, instances of teachers' practices relating to ICT were analysed in relation to the Digital Practices Framework (first introduced in Figure 4.3.1, and reproduced here as Figure 7.1), focussing on those practices which were most prevalent in the study schools, before looking at some of the other practices that, at least at first glance, seemed likely to align with children's digital practices outside school.

Figure 7.1 The Digital Practices Framework

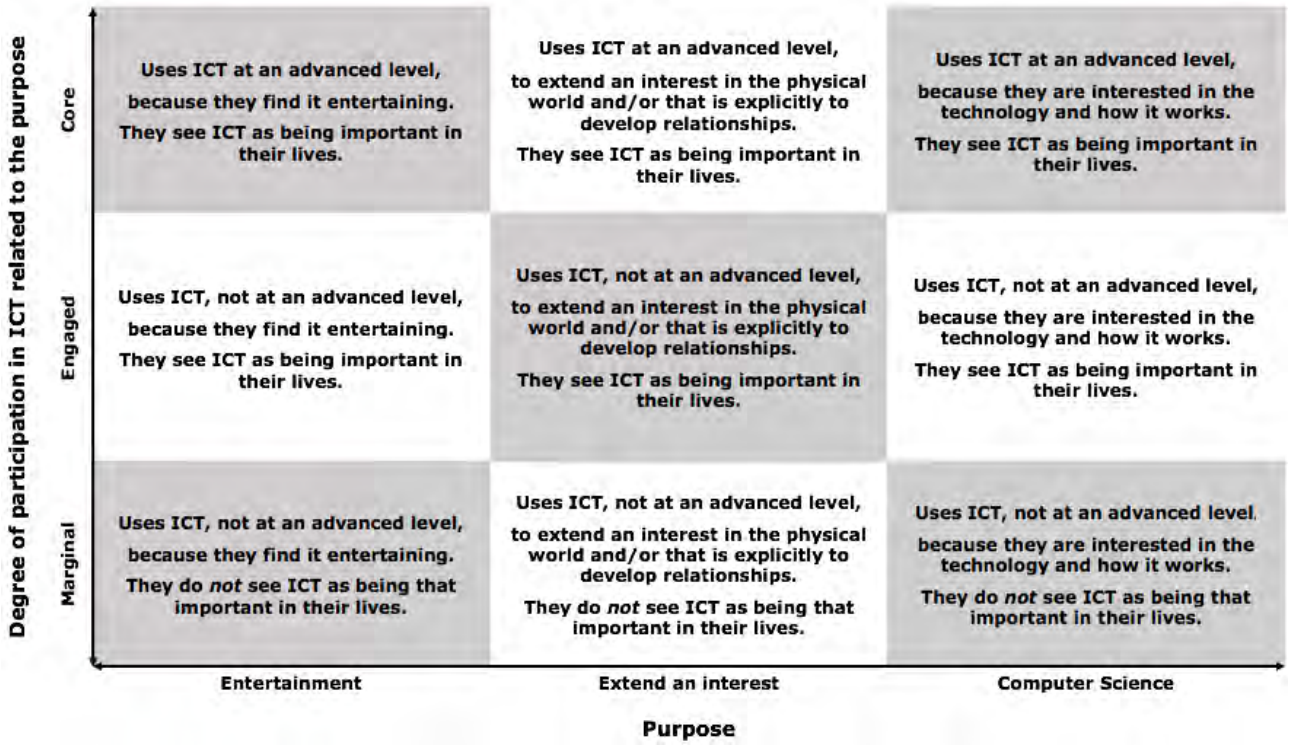


Table 7.1 indicates that all of the schools were engaged in the following activities:

- **using class displays**, including: interactive whiteboards (IWBs); large touchscreen devices; and data projectors or large monitors in conjunction with visualisers or mirroring software such as Airplay or Reflector
- **'playing' games**, seven schools only used 'educational games', three were only noted using 'real' games, and the remaining three used both types of games
- **finding information**, which ranged from reading information from a pre-selected source, guided searching, or free searching on the Web (though always with some level of filtering to prevent access to 'inappropriate material')
- **representing**, which surprisingly seldom included mention of word-processing (in the vast majority of instances pupils seemed to be required to write by hand, though some instances of copy typing were observed), with the focus being more on presentation software (e.g. PowerPoint, Keynote, Prezi), animation (e.g. Blabberize, stop motion animation), comic strips, or dedicated story book or poetry apps
- **taking photographs or making videos**, with varying levels of editing

Other practices that seemed likely to align with children's out-of-school digital practices, such as programming (within which we include coding), having Digital Leaders and/or a school radio station, using social media tools such as Skype, or allowing children to determine when they used mobile devices, were much less common.

Table 7.1 Summary of types of ICT use in each school

Use of …	Fairfield Lower	Byrne Primary	Glenville Juniors	Village Primary	City Primary	Coast Prep	Stepside Primary	Riverview Prep	Park Primary	Highden Primary	Norgate Primary	Holme Infants	Keyston Primary
Class displays	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Showbie, Airdrop, or similar		✓	✓			✓		✓	✓				✓
Apple Classroom or similar								✓					
Games	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
'Educational' games (e.g. MyMaths, Kahoot!)	✓	✓	✓	✓		✓		✓	✓		✓	✓	✓
Real (commercial) games (e.g. Minecraft, Wii Fit)			✓	✓	✓		✓			✓		✓	
VLE (inc. G Suite for Education) and/or 'Walled garden'	✓		✓	✓	✓	✓	✓	✓			✓		
Blog(s) or Twitter by pupils			✓								✓		
Video conferencing (e.g. Skype, Facetime, Google hangout)			✓		✓					✓			✓
Subject communities (e.g. NRICH)			✓					✓					
ICT to find information	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Software to represent 'information' (e.g. Word, Keynote)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Animation/Comic strips	✓	✓	✓		✓	✓		✓					✓
Explain Everything, ShowMe or similar			✓		✓	✓		✓	✓	✓			✓
Still or moving image capture / editing tools (e.g. iMovie)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Audio recording or music making tools (e.g. Garage Band)		✓	✓		✓	✓	✓			✓			
Other ICT tools (e.g. for data logging, Google Earth)	✓	✓	✓					✓					✓
ICT for programming (e.g. Scratch)	✓		✓		✓		✓	✓	✓	✓	✓		✓
Mobile devices at pupils' discretion (excluding using it as a dictionary or thesaurus)							✓						
Dictionary or thesaurus (app or online)			✓		✓		✓	✓					
Digital Leaders Programme (or similar)			✓			✓	✓	✓		✓			✓
Radio station			✓				✓			✓			
School app (to share information with pupils and parents)										✓			
Assistive technology			✓	✓			✓			✓			
Iris connect or similar with pupils			✓						✓				✓

7.1 Using class displays

As already noted, class displays were available in the classes in all of the study schools, and sometimes in other communal areas too, such as the school hall. Teachers reported using them frequently, and this was evidenced in all of the observations and school tours. Whilst most classes had one such device, in Stepside Primary at least some of the classrooms were equipped with up to three large touch screens, which could all display the same or different content.

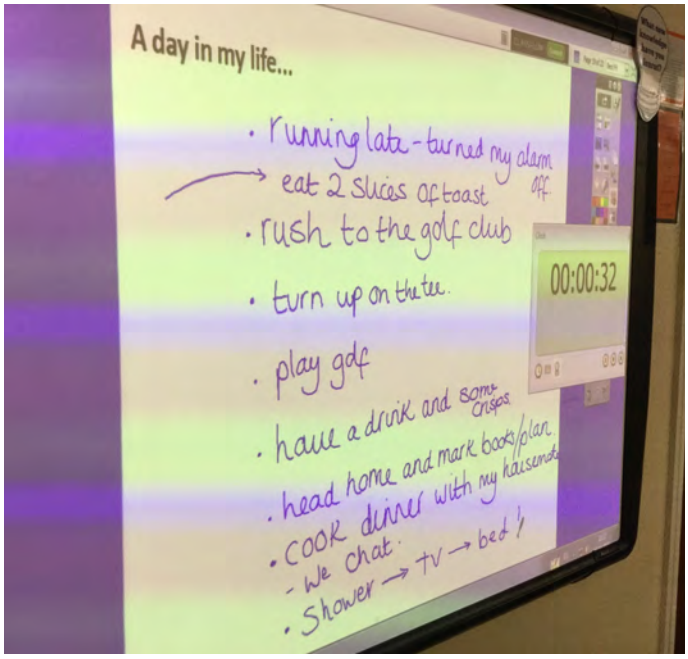
On some occasions, these large displays were used to share external events with a class or larger group. For example, in Keyston Primary they watched live broadcasts from Discovery on topical issues:

> I think there's been a number of events and I think Discovery are really good at picking up on things that are quite big and then they broadcast live to schools who have subscribed these, the like webcasts, so you just put it on in the classroom. Normally beforehand a couple of weeks, a couple of months beforehand they put out a competition and ask the children to enter something, it could be questions, it could be a letter, it could be a poem or something {Yeah} and then when it's, when it's broadcast live you can also tweet in, you can email in, you can do all sorts of stuff {Sure} but it's very interactive.
>
> (Ms Griffiths, Keyston Primary)

More typically, these interactive display devices were used at the beginning of lessons to introduce a new activity or remind the children what they had to do. Mr Ryan in Riverview Prep liked to have an activity ready on the screen when children came into the classroom, so they could start work straight away without having to ask him what they had to do.

Video was often used at the start of an activity, because teachers perceived this to be engaging for children:

> … sometimes a topic that they might not be so enthralled by, stick a video on and suddenly, even grammar, stick a video on about something to do with grammar and suddenly they're oh look, all engaged in it. It's quite scary really, how suddenly that can change the way that they access the lesson.
>
> (Mr James, Stepside Primary)



In Glenville Juniors, for example, the Year 6 teacher (Ms Evans) explained that the children were going to write a letter to an old person, in the local care home. The children had one minute, according to the timer on the IWB, to copy the learning objective off the IWB. Ms Evans then showed a video of a policeman visiting an old couple which she used as the stimulus for a lively class discussion about the sorts of things that old people would find interesting. After the whole class discussion, Ms Evans modelled writing at least seven bullet points about things that she did as part of her day on the IWB. Whilst she was doing this the children were also writing bullet points of their own in their exercise books. A countdown timer was simultaneously displayed on the IWB to show the children how long they had left to complete the activity.

Another common strategy was to use the interactive display device to support the explanation of the activity itself and/or to assess the children's understanding or recall. For example, at the start of a computing lesson in Holme Infants, Mr Murphy mirrored his computer screen on the class display and asked children to tell him what to do next as he modelled how to load and use the software that they were then going to use. In Fairfield Lower, Ms Smith modelled writing a poem, with input from the children before they went and wrote one individually in their exercise books. In Stepside Primary, Ms Allen asked her Year 2 children to remind her what the steps were that they had to work through in the activity, and revealed each step in turn on the IWB as a child explained it.

Once an activity had been introduced, in many cases the class display(s) continued to be used. In Stepside Primary, Ms Harrison used her three touch screens to display three differentiated tasks (one on each screen). Sometimes, as in an early years class in Highden Primary (School tour), the class display was used to show a carousel of images relevant to the task the children were working on, with an accompanying soundtrack.

Many teachers took the opportunity to refocus or share teaching points with children as they worked individually or in groups. Sometimes this involved mirroring a child's device on the class display:

> such as sharing good work, a Year 1 child's elephant drawing, makes her feel great and inspires the other girls
>
> (Ms King, Coast Prep)

or asking a child to come up and show something using the visualiser (a camera on a stand which enables whatever it is focussed on, such as a book, to be projected on the class display):

> we use the visualiser every lesson, showing work under it and stuff. And somebody to come up and write under it, showing how, like somebody who knows what to do, them showing everybody else what to do under the visualizer, so they learn through seeing somebody's work
>
> (Mr Kelly, Holme Infants)

As in the last example, children sometimes (but not very often in the observed lessons), interacted directly with the class display. Daniel (Stepside Primary) said they might use it to look up a word if they were reading a book. In Glenville Juniors, Ms Wilson sometimes asked children to come up and show how they had solved a maths problem on the interactive whiteboard (IWB). In Village Primary, during their regular 'Learn to learn' lessons, they had PowerPoint slides for the particular area they were focussing on in that lesson on the class display and

> I tell them that they can go and have a, they can move the PowerPoint to find out the information they want and we've got ebooks on there as well which I leave on the whiteboard so they can use the technology
>
> (Mr Hughes, Village Primary)

In a reception class in Village Primary a girl was standing on a step, in front of an IWB, which showed the outline of a flower that she was colouring in (Village Primary, School tour). One of the more dynamic ways in which the class displays were used involved the use of quiz software such as Kahoot!, which will be looked at more closely in Section 7.2 of this report.

Whilst most "Staff love them [IWBs]" (Ms Mitchell, Head teacher, Keyston Primary), this was not universally the case:

> certainly one of them [a colleague] I think isn't a fan of the SMART Board, and they would definitely rather not, they'd rather use a flipchart
>
> (Mr Silva, Keyston Primary)

Ms Martin set out a number of reasons why she [and other teachers] liked their class displays:

> Helps her give clearer instructions (with visual support)
>
> (Ms Martin, Questionnaire, Coast Prep)

> It's easy to correct on IWB and more readable. There is less limitation to resources to show. It can be led by the students (I can bring up hundreds of images and then we can focus on one they like) … I like the fact that the children are able to make more decisions about certain things than we were able to before. The balance of control of teacher/students is more equal, you can put more information up and speed up learning - more information with less explanation - they don't want to be listening they want to be looking and doing
>
> (Ms Martin, Coast Prep)

In contrast, in Riverview Prep, Mr Ryan liked the fact that it gave him more control over the introduction to a lesson than he would have had if the children were working on their individual iPads:

> I was tempted to save the video and let them all watch it individually on their iPads but I would like to lead that part and stop them at…
>
> (Mr Ryan, Pre-observation 2 interview, Riverview Prep)

Ms Harrison (Stepside Primary) thought that her class displays made it easier for all children to join in what she called 'silent debate' in which children submitted comments and ideas which were displayed on the class displays:

> … the digital technology was there so the children could all access the work at the same time. It was also there so the children could progress their point of view without having to verbalise their point of view. A lot of children find it quite difficult to share their opinions and their standpoints verbally in front of other people because they get a bit nervous a bit frightened. So doing it on the screen meant that the children could easily write without being known, because they can do it silently, however that also fosters discussion within their group because they write it up on the screen everyone can then see it. So everyone can see it and people can comment on it or they can have a verbal discussion dialogue about that.
>
> (Ms Harrison, Stepside Primary)

Few of the children explicitly shared their views about the use of the class displays, though it seemed clear from the observations that watching videos and interacting directly with them did engage the children. Indeed, in one early years class the teacher didn't always turn on the class display because

> there's some children that would just be on them the entire morning. So what we do is we leave it for them to kind of say 'Please can I go on or can you turn it on so that I can have a go'"
>
> (Ms Pryce, Norgate Primary)

When asked whether ICT was important in school one child focussed on the class display, saying:

> Well the lessons would go a lot slower, because the teacher would have to write everything down on the blackboard as opposed to having the interactive board. So that would be probably worse than using {Yeah} no ICT and then because we can reflect our iPads onto the board, so for that it's also useful for homework assignments
>
> (Alex, Riverview Prep)

Thus, it would appear that using a class display, particularly if showing videos or using it interactively with the children, did motivate them. However, none of the examples described above map well onto the Digital Practice Framework.

In relation to the Degree of Participation in the Digital Practice Framework, there is mismatch. The use of the class display is not about building relationships or children finding out who they are and where they belong in the world. It is not about identity formation, but about a dissociated, 'externally defined' and inauthentic task. Even in the case of Glenville Juniors, where the activity was framed as writing to an old person, who they would visit, it became clear that this was a facade for the actual task as illustrated at by this quite long extract from the class discussion:

Ms Evans: OK. You are, going to pretend, OK. That you, well not actually pretend, that's the wrong word, because I did a little research yesterday into [name of the local care home]

Pupil: What's that

Ms Evans: That's the um old people's home that [name of a child] mentioned across the road from [name of a local landmark]

Pupils: Ah, oh [etc]

Ms Evans: Ok. Um and, you guys are going to be writing, you guys are going to befriend [pause] a lonely person [pause] OK from [the local care home]. It's like bit like a penpal I suppose.

Pupil: Ahhow [sort of sympathetic noise]

Ms Evans: Ok. So you guys are let's first of all think about though so, whose ever had a penpal before?

Pupil: [Girl] I've had them [over several other children talking more quietly]

[Discussion of penpals the children have had]

Ms Evans: But the whole idea of a penpal is you forming a [pause] um [pause] a relationship with someone and you're sending [pause] you're communicating backwards and forwards. So [Boy] did you say you have a penpal with a friend?

[Further discussion of penpals and how the children communicated with them]

Ms Evans: Ok so its technology isn't it. So if we I think we've established [child calls out] Hands down. That you guys communicate or you would communicate with somebody who [child calls out] was a penpal, via technology only, our people we're going to befriend are, [Child says elderly] elderly and probably not so familiar with technology so I think we are going to have to take it back to the old pen and paper and I think we're probably just [background groans] going to have to write them an email, oh not write them an email write them a letter or a card or a postcard [several children speaking] So

Pupil: How are we going to know who we are actually like whose the person we're writing to? [Child in background says 'Hello Michael']

Ms Evans: What do you mean?

Pupil: Cos like we're going we can't just write to some like

Ms Evans: No you might write to Dear Mr Jones or Dear Bob

Pupil: [Different child] Whose Mr Jones? [Several children chipping in]

Ms Evans: Dear [children calling out, Santa, etc – loud hum of children chipping in]

Ms Evans: 3, 2, 1. [Still quite loud hum of children] We are, we're not, we can't obviously go down there today because we haven't got anything to give to them. [Aww and other comments] We can't just rock up and be like 'Hi'

[General buzz of children's voices]

Ms Evans: [indecipherable] we are going to do though is we are going to start to put together some information. [Yeah – one child whispering] to be able to put in our letter [couple of children mumbling – unenthusiastically]. Ok so you told me that you if you were that policeman you might write things about your childhood, you might write about your family, you might write about, some good memories that you've had. We're going to write, today, I think, which ties in quite nicely with some of the bits and pieces that you said, we're going to write a day in the life of a ten year old [Pause]

...

Ms Evans: Ok so I'm going to give you [some chatter in the background] [Pause] 7 minutes, our lucky number. In that 7 minutes, I would like you to jot down on your, in your learning book, writing book [Pause] Ok, a day in the life of a seven year old, er seven year old [lots of chat] 3, 2, 1, [Pause, still lots of chatter] So I'm going to ask you to jot down a day in the life of you. So, what do you normally do? So it could be [pause, some quite chatter] it could be [pause, class gets quieter] that you choose to do a weekday so it could be you choose to do a day when you come to school. It could be that you choose [pause – a couple of children responding] it could be that you choose to do a weekend. Ok, Saturday or Sunday. Ok, it could be [Pause] it could be that you piece together bits from the week, a weekday, bits from a weekend, so your morning routine during the week might be slightly different to your morning routine at the weekend. Ok so you've got to think about your, Girl1 put that on your wrist please or I'll be taking it off you, Ok you need to be thinking about the audience OK. What is the purpose of us writing this?

Pupil: To old people

Ms Evans: To persuade, to inform or to entertain?

Pupils: [Two or three children together] To entertain

Ms Evans: Ok we're entertaining them aren't we, we're trying to put on a smile on their face. We want to make them laugh. [Buzz of chatter] 3, 2 [Teacher says a child's name] [Pause] 1 [low buzz of chatter] So I'm going to put a 7 minute timer on the board. I'm going to do exactly the same thing as you and after 7 minutes [Boy1's name] we're going to compare. OK

Pupils: [A couple of children say OK]

Ms Evans: Off you go!

[At this point Ms Evans started to model writing bullet points about a day in her life on the IWB – throughout the remainder of the observation she referred the children back to the timer on the IWB and her example bullet points]

(Observation of Ms Evans's Year 6 Literacy Lesson, Glenville Juniors)

Across the examples of class display use described and observed in the study schools, there was also a mismatch in relation to the Purpose dimension of the Digital Practice Framwork. It seemed clear that the purposes underpinning the use of class displays were more to do with instilling an interest in children, motivating them to engage, and facilitating the pragmatics of teaching than to do with an interest in 'Computer Science', extending an interest that the child already had (Extend an interest), or 'Entertainment'. Whilst the use of the class display does seek to engage the children, entertaining them is not its purpose, but a technique to get them to engage with the task the teacher has set.

Thus, there is a mismatch both on the Purpose dimension and the Participation dimension.

Given that children do freely choose to play games outside school, perhaps the use of games in schools may align better with the Digital Practice Framework and hence with children's digital practices outside school.

7.2 Games

All of the schools in this study used digital games as part of their pedagogical practice. These split between 'educational games' and 'real games'. 'Real games' are ones which have been designed purely for entertainment purposes; they have no explicit or implicit learning intentions; though that is not to say that people playing them won't learn anything from engaging with them. 'Educational games', as their name suggests, were designed specifically to support particular learning and often to provide teachers with data about children's performance:

> They are designed by a teacher. So it gives the kids what they want and the teachers what they want. And what I want [referring to TT Rock Stars] is an average time per answer. So something in the region of two seconds tells you you know your times tables. Anything beyond that, you're working them out or you're guessing them. So it gives good data. And the more we use it, the more data comes in. We can compare between classes within a school. You get league tables nationally. It's very good. It's a really good thing
>
> (Mr Phillips, Riverview Prep)

Quizzes have been included within 'educational games' as they contain the element of competition, which many of the participants perceived as important:

> It creates that competitive, using that creative competitive, a friction of excitement, and that to some of them who are slightly more reluctant learners – they're not, they're not massively reluctant, but it gives them, it piques their interest I think
>
> (Mr Ryan, Post-observation 1 interview, Riverview Prep)

> I'm sure they like competing against each other especially the boys there's a real element of competition
>
> (Ms Griffiths, Keyston Primary)

> [Kahoot!] makes your brain think a lot quicker than usual. And it's just a lot more fun just being very competitive to hear all the buttons
>
> (Rory, Post observation C interview, Riverview Prep)

and is an intrinsic element of games:

> When you see something as a game or you make it competitive I think you're always going to do better...it generally brings out the best in you when you see it as a competition … you're independently going 'oh I want to do this'. I want to win myself. So like it's not against the class. If you're playing a game on the computer it's against the computer. And it just gives this competitive edge. And it's the same with me and that draughts game, I'm playing the highest level and I keep wanting to beat this girl called Jennifer who's a computer. But nobody wants to lose really, so you're aware you're going to do your best and without knowing it you're learning
>
> (Mr Murphy, Holme Infants)

'Educational games' were most frequently mentioned as being used to support mathematics, including ' learning your tables' and practicing solving problems (Fairfield Lower, Byrne Primary, Glenville Juniors, Village Primary, Coast Prep, Stepside Primary, Riverview Prep, Holme Infants, Keyston Primary), often as a homework activity. Maths games explicitly mentioned by participants included: MyMaths; Mathletics; Maths Whizz; Top Marks; TT Rock Stars; and simple counting, shapes, sorting, and matching games within Espresso.

'Educational games' were also used, though mentioned less frequently, in English (Glenville Juniors, Stepside Primary, Norgate Primary, Holme Infants) for example to practice spelling and phonics:

> I think it's very helpful. I think it takes, I'd say the games, I don't know if you've seen the games that they were doing during the letters and sounds after that, they were low ability children but for them to hear the sound and then they can click the sound. That sort of stuff is very good
>
> (Mr Kelly, Holme Infants)

Whilst an important rationale for using 'educational games' was for children to learn or practice specific topics, they were also used as a holding activity that allowed the teacher to concentrate on another task:

> you can set up so many different things going on at the same time, so you could have a group of children who are completely engaged in a bit of arithmetic work on a, on the tablets and because they feel like they're just playing games, they are learning their times tables and they're getting quicker and they're getting faster which frees you up then because that table is able to work independently with high engagement levels … it's more likely to keep the attention sustained for longer
>
> (Ms Griffiths, Keyston Primary)

Quizzes, often using Kahoot!, were mentioned by Ms Martin (Coast Prep), three teachers in Glenville Juniors, and observed being used in one lesson in Glenville Juniors and in several lessons in Riverview Prep. They were noted being used in a range of subjects, including maths, science, and humanities. Teachers generally used them as an alternative to a test, to assess the children's 'knowledge' either at the start or end of a lesson or topic:

> … helps with AFL, quick quizzes at end of lesson to find out who knows what and what else I need to teach them. That format suits them rather than sitting down doing a test. You don't have to mark it, I can just see straight away what is going on
>
> (Ms Martin, Coast Prep)

In one or two instances children were involved in designing quizzes, sometimes without being asked to by the teacher (see the Teacher Vignette, Section 5.3), or as a deliberate pedagogic strategy:

> The quizzes are fast, interactive, fun, and I use it as a treat every other week. The students now also make up the quizzes, on all topics … brings a new dimension to it
>
> (Mr Lee, Coast Prep)

The children clearly preferred using 'educational games' to more traditional forms of practice and testing. For example, when asked what was one of his favourite lessons using ICT, where he thought 'wow that was so much fun' Alex responded:

> It is probably a half an hour lesson of maths when we get to do TT Rock Stars
>
> (Alex, Riverview Prep)

Several children also commented that using ICT enhanced their learning:

> I think maths on the laptop helps me do I forgot what things, helps me, maths sums
>
> (Charlotte, Stepside Primary)

> … and that, that if we write it on paper, it won't be as fun, and it wouldn't stick in my head. But if we did it [practice times tables] on an iPad it would be much more fun, and we can remember it quickly…
>
> (Joshua, Group A Post observation interview, Keyston Primary)

However, it was also clear that 'educational games' were perceived to be inferior to real games:

> It would be nice to have like some more things put on the iPads because like the iPads are really good but they are more like educational games, so say if we have them out

> in golden time, there's only a few games that we can, that we would go on like for just pleasure
>
> (Jacob, Norgate Primary)

> Educational games, so that can get boring, so sometimes you want to read a book instead
>
> (Rory, Riverview Prep)

It seems clear that 'educational games' do not align well with the Digital Practice Framework. On the Purpose dimension, they would fit most closely into the Entertainment category. However, as noted in the examples above, they are not games that children would generally choose to play in their free time if 'real games' were available.

When asked if they thought that 'real games' should be allowed in school several of the children in Riverview Prep found it hard to imagine that being permitted, for example Isabella thought bringing games consoles into school would cause problems because everyone would want a turn which wouldn't be possible, and Zoe said:

> I wouldn't really play on it [the SIMS] ... because I'd be doing lessons. I don't know, I'd probably secretly do it. I don't know, no I wouldn't, I don't know. It would be cool if we were allowed! … If I was allowed to do that [play on a Wii in school] I wouldn't tell anybody {Why not?} because they might just barge in and I'm like this fast, and then they explain to the teachers we'll have this, they'll tell me off and then it'll go on and on and on
>
> (Zoe, Riverview Prep)

Even if it were going to be allowed they seemed to assume that this would only be as a reward once they had finished their school work:

> [Including Minecraft in school would be] good as obviously if you play at home and like I'm an only child, so I don't really have any brothers or sisters that I could play on it with, so like if you come to school and like we have, we get some free time because we've all like done a certain thing really well, then if we have the iPads out and your friend has one then you can both go on and you can play together and do different things
>
> (Jacob, Norgate Primary)

Six of the study schools (Glenville Juniors, Village Primary, City Primary, Stepside Primary, Highden Primary and Holme Infants) were using 'real games'. In the majority of cases this was outside normal lessons. In Village Primary and City Primary children were allowed to use Minecraft to complete their topic homework:

> Ms Green (Village Primary) reported that children were allowed to do their homework using ICT, and use programmes such as Minecraft if the task was to design something. She gave an example of how one child had designed an impressive Roman forum using Minecraft. On another occasion a child had used Minecraft to make a digital model of Stonehenge for homework. Printouts of their work was put on display alongside the models and drawings other children had made in order for them to "celebrate, look at and be inspired".
>
> City Primary Children's homework was displayed in Class A on the topic of the Trojan Horse and children had created their versions using a range of media: Minecraft, papier maché, drawing and handwriting (Observation A, City Primary).

In two schools, they used a Wii [games console] to help improve the health and fitness of children. In Holme Infants the ICT coordinator regularly took one or two children during lunchtimes or out of classes once they had finished their work so that they could play Wii Fit in the canteen or gym. In Stepside Primary the use of the Wii also seemed to be an initiative that the ICT coordinator (who was also the assistant head) was responsible for:

> The biggest thing was the Wii Fit, so we, we took children in Year 5 and 6 and we tested every single child's balance and posture... And then we chose the one that had no balance and posture or really bad balance and posture and had never joined a sports club in the school before.... and we got them to, I think it was twelve kids we ended up with and we got them to do, again, every single day some Wii Fit exercises and their balance and posturing improved by the end of the term but what was really exciting was all of them joined a club the following term
>
> (Mr Baker, Assistant head teacher, Stepside Primary).

Mr Baker said he also ran a Minecraft club at lunchtimes:

> … when we have our Minecraft club, it's amazing because you get children collaborating within the worlds together... So it absolutely can be social
>
> (Mr Baker, Assistant head teacher, Stepside Primary)

Latifah (a digital leader in Stepside Primary) said that the Minecraft club, which had been for Year 5 pupils, had only run for one term three years previously. However, the researcher noted two or three children in the assistant head teacher's office one lunchtime who appeared to be playing Minecraft on an iPad.

Mr Baker (Stepside Primary) also described how he had used Minecraft once for exploring shape and volume:

> We did a really interesting session with volume of shape using Minecraft with the Year 6s and first of all we were exploring, first of all whether they could see an image, we gave them an image, could they build it within Minecraft and then could they work out the volume. And then could they work out the volume of the building that would need to go around it if they were all like Henry Moore type sculptures. So, we had fascinating conversations about Henry Moore, Barbara Hepworth, conversations about volume
>
> (Mr Baker, Assistant head teacher, Stepside Primary)

Within normal lesson times the only identified uses of 'real games' were in literacy. One child in Stepside Primary mentioned using a game called Boggle, which involves finding words in adjacent letters in a grid:

> I quite like doing a spelling tests... I like doing Boggle when they're doing phonics... on Friday we do Boggle... So Friday is probably my best day at school
>
> (Daniel, Stepside Primary)

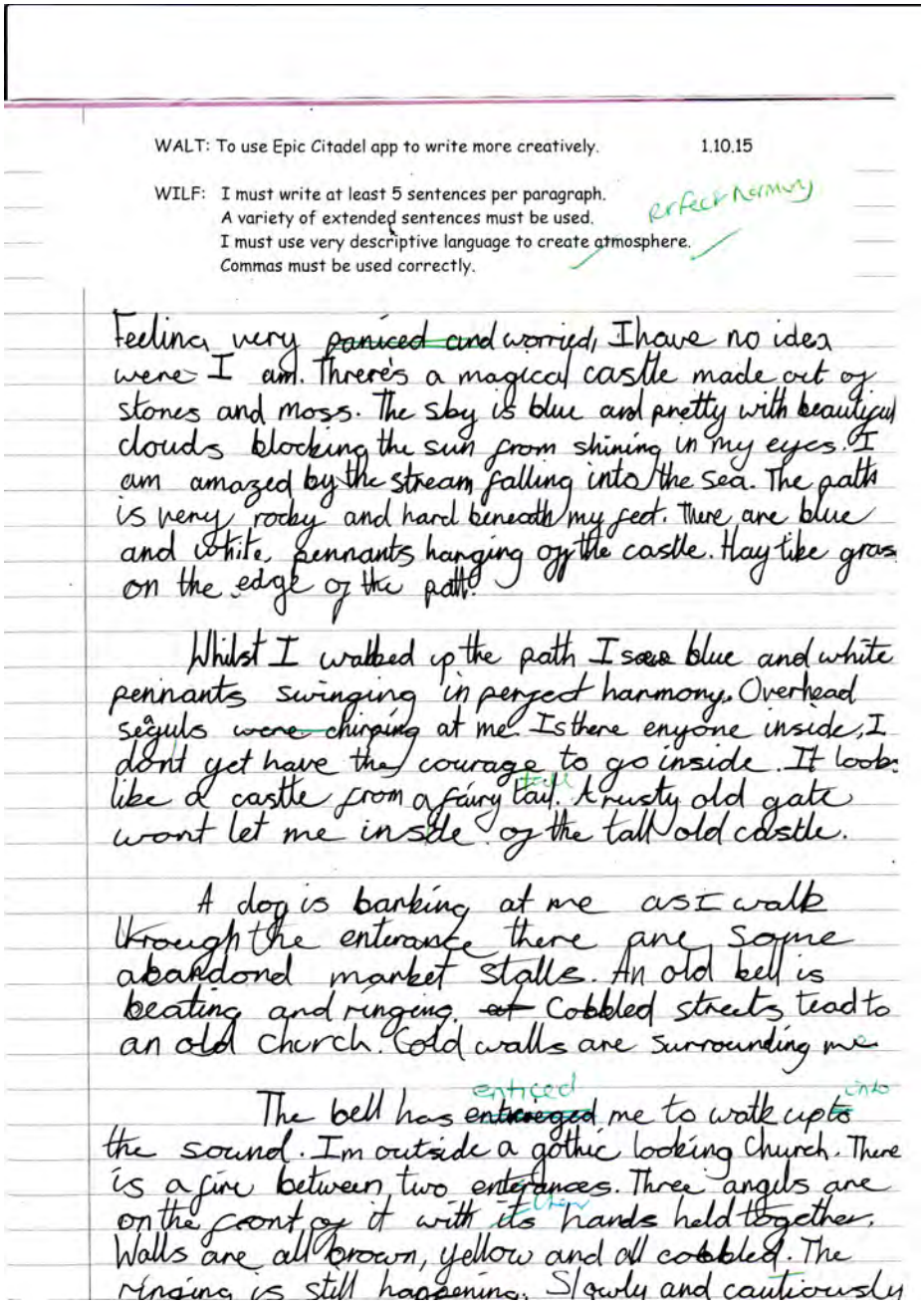
Stepside Primary had used Temple Run as a stimulus for writing, which was the main way in which Highden Primary used 'real games'.

Ms Young (Highden Primary) reported using Bike Baron [a motorcycle stunt/jumping game] as a writing stimulus. Over a three-day period the children played the game, then took screen shot images of the start, middle and end of a level they had played. They discussed these and developed a commentary of the jump. The three images were then made into a comic strip, with short commentary text. This then led into a piece of extended writing that was written up into their literacy books. This latter piece of writing could

either be typed up in the ICT suite, printed out and stuck into the literacy book, or written into the literacy book (i.e. copied out neatly, with the correction of mistakes). Ms Young noted that having played the game they "want to write" (Ms Young questionnaire, Highden Primary).

Other 'real games' used by Highden Primary as a stimulus for writing included Myst [a graphic adventure game] (Ms Wood, Observation, Highden Primary) and Epic Citadel, which was also used in Glenville Juniors. The ICT coordinator in Highden Primary described how he had used Epic Citadel:

> So this is one of the apps Epic Citadel, which I've used for a couple of years [shows app to researcher] … and what it is, it's a medieval world, and there are people in there, and its limited what you can do, but there's sounds, and so all we do is virtually explore it and describe it. You know you can describe the turrets, there's a bell there, ringing away. That rotates around so that… [Showing app to researcher] and what we do as we go on we actually start outside… so what it does it actually brings you to this place to start off with. So we can talk about mood and how we feel and how things change. I think, I'm sure the music is Peter Gabriel, so they had a say in this from the gaming world. {It's very atmospheric} Yes, and that's what it is, we always say 'oh what can we see, what can we feel, what can we hear, what can we taste', and that's everything off. So you know, the children end up opening their eyes, and what I tend to do is I tend to have a PowerPoint of this and then some music on, put some music in the background, and then I superimpose the two, and suddenly they're in the real world, and they're moving around, and they can describe everything, and that's what we do. We spend a week on this, but I'll show you some examples of it and… I would say probably the thing I like about this, the first, certainly in Year 6, this is the first one to get their hooks into for the moods and it's all about settings. And then what they do they go up to the citadel or the church as they say, they describe that and we finish off in here, and they actually in time, they've come up with the… they've changed the mood they talk about Gregorian chant music. You've gotta remember these are all Year 6s, so, so… It's just two doors either side, and then they go into the main chamber… and it blows their mind sometimes, some



WALT: To use Epic Citadel app to write more creatively. 1.10.15

WILF: I must write at least 5 sentences per paragraph.
A variety of extended sentences must be used.
I must use very descriptive language to create atmosphere.
Commas must be used correctly.

perfect harmony

Feeling very panicked and worried, I have no idea were I am. There's a magical castle made out of stones and moss. The sky is blue and pretty with beautiful clouds blocking the sun from shining in my eyes. I am amazed by the stream falling into the sea. The path is very rocky and hard beneath my feet. There are blue and white, pennants hanging off the castle. Hay like grass on the edge of the path.

Whilst I walked up the path I saw blue and white pennants swinging in perfect harmony. Overhead seguls were chirping at me. Is there anyone inside, I dont yet have the courage to go inside. It looks like a castle from a fairy tail. A rusty old gate wont let me inside of the tall old castle.

A dog is barking at me as I walk through the enterance there are some abandond market stalls. An old bell is beating and ringing. Cobbled streets lead to an old church. Cold walls are surrounding me

enticed into

The bell has entriced me to walk up to the sound. Im outside a gothic looking church. There is a fire between two enterances. Three angels are on the front of it with its hands held together. Walls are all brown, yellow and all cobbled. The ringing is still happening. Slowly and cautiously

> of them get a little bit frightened actually, but err, I think this, I think they call him the pilgrim, so they've got to come up with an idea where he came from. You can see, and I can give them the iPad, and they can create the journey as they go along so it's that interaction as they go along so it's all part of, they own it basically they own the story, but they could write for weeks. You know, you'll start with this and they could write for a day, and that's the good thing about it.
>
> (Mr Mercer, ICT coordinator interview, Highden Primary)

The assistant head teacher at Stepside Primary had some reservations about using real games in school:

> And also, not feeling under pressure, particularly in a school environment, from somebody who's overseeing and somebody you're supposed to be working for in some way. {Yeah} In that traditional sense of I'm doing this piece of work for the teacher. Whereas now you get a lot more situations where you're doing the work for yourself, or for your group of peers or for your own enjoyment. And the result is what might be assessed but in the gaming world particularly isn't, is not the ultimate aim, is it? The ultimate aim is the way they're doing it now. It's to survive. That's the ultimate aim, and everything else that comes about. We did a really interesting session with volume of shape using Minecraft with the year 6s … and at the end of the session we asked one question and we said how was it doing your maths in Minecraft and using Minecraft? And two of the boys said "I'd rather have just played Minecraft". So, there is that element. It's a really fine line between taking away what they have personally {Yes} in that fine enjoyment and us using it as an educational tool. Well in that whole danger, I get really uncomfortable about the kind of formal, informal conversations people have about schools should take more advantage of the informal and actually what they do is they formalise it. {Yeah and they completely undermine the entire} because they wrap it up in learning intentions and success criteria rather than just letting the children explore learning in a different way. And the elements of thing, yeah we were playing Temple Run and we were doing some amazing stuff in terms of writing, but we've taken, in some ways, the fun out of Temple Run.
>
> (Mr Baker, Assistant head teacher, Stepside Primary)

Thus, even the use of 'real games' seems not to align well with the Digital Practices Framework. The purpose underpinning their use in schools is, as Mr Baker noted, different to the purposes that underpin their use outside schools. In relation to the Participation dimension the relatively short timeframes over which the games are played and the focus on individual outputs (e.g. pieces of writing) further undermines the alignment with children's digital practices outside school (in relation to the Participation dimension of the Digital Practice Framework).

7.3 Finding information

All of the schools in this project involved children in using ICT to find information. This too was an activity that children frequently engaged in outside school and thus might have the potential to demonstrate alignment between teachers' pedagogic practices and children's digital practices outside school.

Finding information spanned the full range of reading material provided (on screen) by the teacher, through to relatively unconstrained searching on the Web, though in all cases the schools had some level of filtering in place to reduce the risk of children accessing what the school (or some other external gatekeeper) deemed to be 'inappropriate material'. This was often a source of frustration, as in the Riverview Prep Group Interview, where Rory and the other Year 6 pupils commented on the severe constraints on what they could do on the school iPads because most websites were blocked including YouTube and Answers.com:

> It's really hard to use the Internet because most of the websites are blocked …
> It's all blocked.
> You can do nothing on the internet though, you can go on apps.
> It's really hard to research.
>
> (Riverview Prep pupil group interview)

Finding information was often a homework activity, often undertaken over several weeks or a whole term. Subjects spanned literacy, science, history, geography, social studies/RE, PSHE, 'topic work' and Learn to Learn (in Village Primary).

A common use of tablets in school was to look up words, using a dictionary or thesaurus app or website. Mr Roberts (Glenville Juniors) said that was "because we only have a couple of thesauruses". Several participants noted that this was one time when pupils did not necessarily have to ask permission to use their iPad in two of the schools.

Mr Phillips (Riverview Prep) and Ms Griffiths (Keyston Primary) said that using ICT to look up information was much easier than going to the library. Ms Green (Village Primary) reported that the role of ICT was to an extent to replace having to buy new books to teach new curriculum content (e.g. Stone to Bronze Age). However, she aimed for children to use ICT alongside books so that they were competent in using both types of media. Several teachers expressed a concerned about ICT distracting pupils from learning to use physical books for research or emphasised the need to balance using ICT with other sources of information, for example:

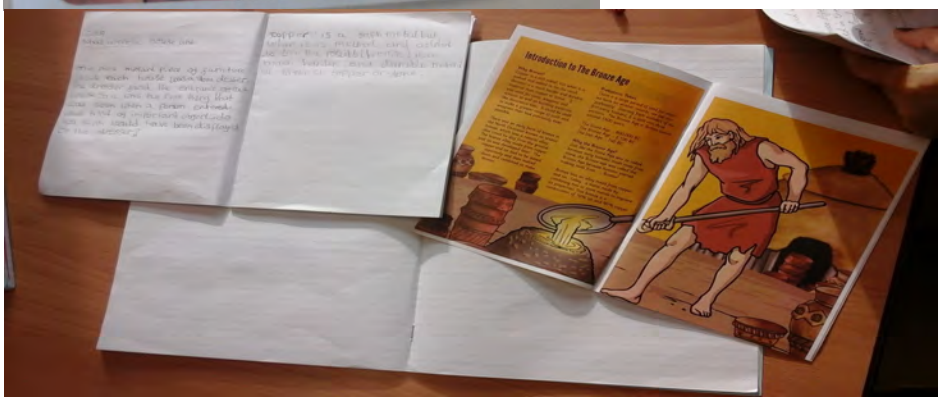
> I certainly think that they are more engaged by it [ICT], which I don't especially like, there's still a place for, they still need to be researching using books and I don't always let them. They always ask, if they're doing some research I might sometimes say right here are some books you've got to find out from the book
>
> (Mr James, Stepside Primary)

> So I'm also trying to encourage them to use the old fashioned, the books as well
>
> (Mr Hughes, Village Primary)

Mr Phillips thought that because children never used an encyclopaedia they hadn't learnt how to do a 'proper Google search':

> I see it from, I see it, I mean, these, these guys, some of them spend I suspect about ten hours a weekend on, on, on their computers and their iPads, but you ask them to do a, a, but they don't know how to do a proper Google search. They don't know how to, and I think this is, this, you know, what it probably stems to is the fact these chaps will never ever use an encyclopaedia. They never have to go to the back and, and think about, think about key word searches, they don't know how to search for key words.
>
> (Mr Phillips, Riverview Prep)

In a lesson in Village Primary there were a range of resources in the room that children could use to find the information they needed to complete their tasks, including: iPads; laptops; laminated signs in different parts of the classroom with facts about the Bronze Age; an e-book on the IWB; some printed pamphlets with the same information as in the e-book; and some worksheets from which children could cut out pictures (Holme Infants Observation B). The children were only allowed to use certain 'safe' websites and were discouraged from exploring topics not directly related to the question which they were seeking answers to. This reflected concerns that several teachers expressed, which included the ease with which they could copy information without having analysed or understood it (e.g. Ms Martin, Coast Prep) through to anxiety that they might come across 'inappropriate material'.



A number of key strategies were used to mitigate these issues. In his previous school Mr Ryan had restricted children to using the online Encyclopaedia Britannica which he thought was better than using the web as it was safer and there was no danger of plagiarism. Mr Ryan (Riverview Prep) now sometimes used QR codes to direct children to specific websites that he had pre-selected.

Ms Green (Village Primary) tended to provide her pupils with a list of websites she had found,

> but they can search websites on their own. Uhm we have kids', uhm, children's search engine, so on the ICT, they can just type in stone age and it comes up with all the information that they need, so it does give them more autonomy that way ... We do have lots of dialogue about the fact that, you know, sometimes, information on websites isn't always accurate. So they need to understand they can't trust all the sources, they should get 2 or 3. They have got that but I'm not sure they always follow that up
>
> (Ms Green, Village Primary)

Ms Allen (Stepside Primary) tended to use what she called 'supported searching via Fronter' with her Year 2 class because:

> I want them to find out certain things because we are researching something in particular and yes they could do a wider search. Erm and when we're doing E-safety I might let them go off on that tangent and we'll talk about, maybe the lesson would be try to find a good website that tells me about Sir Francis Drake, erm how you gonna search for that, what terms you gonna use. So we will. That to me is more of an ICT thing and I'm not saying you can't do that within the other lessons but actually because I'm trying to get them to answer questions, erm, it can take an awful lot of time for them to find a source that will help them answer those questions. I will need to have found the questions from what they're gonna be looking at really, like you would with a book…
>
> (Ms Allen, Stepside Primary)

Similarly, in Coast Prep Observation B, the teacher provided the girls with a specified website to use to help them create a family tree for the Greek Gods and Goddesses. One girl found 'a better website' with a family tree of the Greek gods already on it and told the teacher, who reiterated that they were not meant to be searching, but then looked at the website the girl had found and discussed some of its shortcomings (it was missing some of the information that was on the teacher specified website).

It seemed quite common for children to 'go beyond' the sources that their teachers had specified, for example in Keyston Primary children described what they had done in a history lesson:

> **Emily**: We used iPads and tablets for research
> **Joshua**: Me and [Girl's name] were using an iPad...To go on Espresso. I was using the tablet, and I was meant to be going onto
> **Emily**: Britannica
> **Joshua**: Yeah, Britannica... But there was this password, and I, I did do, and I knew the password for it, but it just didn't work... So I, I just moved onto Espresso... and I went onto a different thing to them
> **Ethan**: But it didn't find very much for this, so I went over to Google
>
> (Keyston Primary, Group A post-observation interview)

An alternative approach to addressing concerns about 'lazy' use of the web, or finding 'inappropriate material' was to educate the children how to find information safely and effectively on the web:

> there's also a thing about Google searches what comes up and we do discuss, we do talk about the fact that there are things in the Internet that are unsuitable for children, they should be blocked through a school. But they're not always because, we definitely talk about all of that
>
> (Mr James, Year 2, Stepside Primary)

> obviously one of the main important things is, and the school does it really well, is telling them about e-safety, and if there's something that you see or find stop straightaway, tell your teacher. But so far I haven't found anything like that, so it's been lucky enough
>
> (Mr Murphy, Holme Infants)

Developing effective research skills was noted to take time:

> We've done quite a lot of research on the internet and at the start it was just a bit of a disaster, just reams of information trawling through it; whereas now they're much better at pulling out key info and notetaking as well
>
> (Mr Ryan, Pre-observation 2 interview, Riverview Prep)

In Norgate Primary developing research skills was seen as important, and something that they believed could start even with their youngest children:

> we do try and keep a lot of our ICT sort of open ended… it's the research skills really that I want them to do
> …
> No, no definitely we start down here, we start down here [in Reception]. Did some observations last year it's very difficult because in one year the children change so much but at the end of Reception I did some observation last year of a little boy and he wanted to find out about sharks, so he was sat at the computer and you know we talked about Google and how he can find out his own information. So he clicked it on and then it came up with the all the images and he was clicking, it was lovely to see because he wanted to do something and he did it using the computer I was just there to go 'okay how can we do this' and 'how we can that' and 'what might you need to do'. But I think without me being there he might not have had the confidence to do

that, because especially at this age they struggle to spell. So I can't remember but he knew this shark name, I can't remember what it was but it was a really long name and we had to break it down phonetically so that he could type on the keyboard.

(Ms Harris, Norgate Primary)

As before, children were generally positive about using ICT to find information in school, notwithstanding their frustrations about websites being blocked. Pupils in Riverview Prep, for example, when asked why they liked lessons involving ICT responded:

Isabella: because we get to like research stuff and it's really good.
Researcher: So how is that different to listening to the teacher tell you about the facts and you researching, what's the difference?
Isabella: Because you can find out yourself, and then the teachers just tell you. And it's better to find out yourself because it's like more fun

(Isabella, Riverview Prep)

Ashish: Probably my favourite lesson would be SMSC.
Researcher**:** Why?
Ashish: Because every single lesson, or almost every single lesson we're looking up some information about say the Salvation Army or Jewish culture or Christian culture or different stuff like that, because SMSC is kind of like religious studies in senior school
Researcher: And you enjoy that.
Ashish: I enjoy using ICT in it but I'm not quite sure I enjoy the subject.

(Ashish, Riverview Prep)

However, some children seemed to find research in schools less engaging than other activities:

Researcher: Why do you think some children do other things on their iPads when they're meant to be doing research?
Abigail: I think it's because they think it's quite boring just to research, and they want to do something else and be more like fun at school

(Riverview Prep, post-observation pupil interview)

As with all the previous pedagogical uses of ICT in the study schools, there appears to be a mismatch between teachers' pedagogical practices and children's digital practices outside school, as encapsulated in the Digital Practice Framework. As before there is a misalignment of the purposes underpinning the in-school practices and the Purposes dimension of the Digital Practice Framework. Pupils generally have little or no say in what they are finding information about, which is seldom linked to a genuine interest of the child. They are severely constrained in how they find information from within school, with sites that they would normally gravitate to, such as YouTube, being blocked in most schools, even when the teacher allows them to carry out a 'free search'. As before, the atomisation of information, the short timeframes over which they engage with particular topics areas, and the focus on individual outputs in most schools mitigate against alignment with the Participation dimension. Byrne Primary, which engaged in topics that spanned up to two weeks and made extensive use of collaboration, and Highden Primary which used extended whole school topics, were notable exceptions, though here too the topics were not chosen by the children.

From the exploration of the extent to which the ways in which class displays and games were used, and finding information was implemented in the study schools it seems clear that there is almost no alignment between the purposes underpinning teachers' pedagogical practices and children's digital practices outside school. Similarly, there is a lack of alignment between the ways in which pupils are taught in schools, based on the examination of these three aspects of teachers' pedagogical practices, and the Participation dimension of the Digital Practice Framework. Participation in schools amounts to taking part in what in the majority of schools are discrete activities, though sometimes there is an attempt to make coherent links across school subject boundaries by having topics. There is little, if any, focus on inducting children into enduring relationships with people who have a shared interest (i.e. participation as

understood within the Digital Practice Framework). Teachers sometimes seem aware of the importance of building relationships and making what children do in school as authentic and relevant to them as possible, though often, as in the example of writing to an old person in Glenville Juniors the children see through the veneer of authenticity.

As will become clear in Section 9 (which addresses RQ3) this reflects the arenas within which teachers work. These arenas appear to impose constraints which apply equally to the other ways in which ICT is used across all the schools (e.g. representing information, and taking photographs and making videos). Thus, they too are unlikely to align with pupils' digital practices outside school.

There are however a number of areas, which were only evident in a subset of the study schools, which might align better with the Digital Practice Framework, for reasons that will be explained below. These include: programming (whilst technically incorrect we are using the terms programming and coding interchangeably), digital leaders programmes, running a school radio station, the use of social media, and allowing pupils to decide when to use ICT. The extent to which each of these within the study schools aligned with the Digital Practice Framework, and thus potentially with children's digital practices outside school, are looked at more closely below.

7.4 Programming

Programming was mentioned to or noted by the researchers in most of the study schools, and it clearly has the potential to align with the purposes underpinning out of school digital practices for a minority of children ('Computer Science' on the Purpose dimension of the Digital Practice Framework). The key question is how teaching of programming is implemented in schools, and whether that pedagogical practice aligns with the Participation dimension within the Digital Practice Framework.

Three of the schools (Glenville Juniors, City Primary and Highden Primary) mentioned Code Club, for example:

> Code Club come into school at the moment - they come in with a set of activities - it's a bit painting by numbers
>
> (Mr Hall, City Primary)

One of the pupils in City Primary elaborated on this:

> **Aran**: … we do coding club {Ok} so in that we have to do um we they give they give us shapes like make a star, that's not for us that's for Year 2 {Ok} make a star so we do ah face north go 8 steps up and then make this star {Ok} but we get stuff like make a capital L and stuff but that sounds easy but it's pretty hard {Ok} cos the thing starts in the middle but to make an L you need it to start at the bottom {Ok} so it's really quite hard
> **Researcher**: Right Ok and how often do you do that?
> **Aran**: ah we do that once every Thursday
> **Researcher**: every Thursday, that's in your coding club? {Yeah} Yeah ok and do you do you work with other children or do you work on your own?
> **Aran**: we work in pairs
> **Researcher**: Ok, so what do you do with your partner?
> **Aran**: Um well we just decide which code would go best for to make the shape {Ok} and then well sometimes, my partner he just tells me he just does it all the time cos he {Ok} knows what to do and I usually get mixed up in the numbers {Ok} and turn left and right and forward and backwards becomes really confusing {Ok, ok and anything else that you do between the two of you} um we can also change the colour of the thing and we can make noises like once I did jingle bells but I got into trouble {Oh right} because we're not meant to do sounds {Ok} and it was really loud so yeah
>
> (Aran, City Primary)

This contrasted with his experience of coding at home:

> **Aran**: on the computer, at school we're not allowed to do any games or anything unless we're meant to do them like coding {Yeah} so at home, if I've got this coding website and then if I if I go on it at school I have to do what my teacher tells me to {OK} but if I do it at home I can do anything I like I can make anything so and so
> **Researcher**: What kind of thing do you do at home then?
> **Aran**: I just make random codes and see what happens …
>
> (Aran)

Two of the children in City Primary Group A had programmed at home, including making games in Scratch that they had uploaded to the Internet. Teachers also reported that the coding that the children did in school was often less sophisticated than what they did at home. For example:

> he brought a book in, I think it was parents evening he had one with him and I asked to have a look at it and flicked through it. It's not a book for children, it's a normal book that adults would use and I had a flick through it and it was lost on me. So actually what we're doing at the moment is probably, he's way ahead of that …
>
> (Mr James, Stepside Primary)

Year 6 children in Norgate Primary reported that "We don't really use anything to do with coding we like to keep it simple" (Norgate Primary, Year 6 Group interview). This seemed to confirm that the programming that children encountered in school was less complex than a minority of them engaged with outside school.

The ways in which programming were taught in lessons seemed more varied and often less prescriptive than described in the coding clubs. In Norgate Primary they used Bee Bots with the younger children, often linked to 'acting out' a story:

> we've got the big mats where we can tell a story, so we've made them different stories so we've made them for like Handa's Surprise, and like Jack and the Beanstalk, so they retell the story with their Bee Bot moving it in order, or sometimes we'll say let's change the story and now he's not going to go there, where can he go now…
>
> (Ms Pryce, Norgate Primary)

In Glenville Juniors the Year 2 children were seen using Scratch to try to make an LED change colour (Glenville Juniors, School tour). In Highden Primary the Year 6 children had to plan and design a short scratch programme using sequencing, linked to their topic of the Vikings (Ms Young, Questionnaire, Highden Primary). In Park Primary, Ms Price liked to let the children in her Year 3 class experiment:

> **Ms Price**: whenever I'm teaching a computer lesson or anything like that I'd rather they just, I don't like teaching them how to use it, because I don't think they learn that way. I'd rather they just explored it themselves. And then yeah, they do show me different things that they can do and that kind of thing. But nothing yet they've taught me really I don't think. Actually that's a lie. Last year we were looking at Scratch, and they changed the background and figured out how to change the background before I'd figured out how to change the background. {Oh really?} Yeah, so they taught me how to do that when we were programming.
> **Researcher**: And what do you think that was down to? Was that their familiarity with Scratch or do you think that's about their speed at picking things up?
> **Ms Price**: Just picking things up I think, because they hadn't been on it before but they were able to change all the backgrounds, change all the characters and things like that. Which I'd managed to do, it just took me a bit longer. But yeah, they were really good at it.
>
> (Ms Price, Park Primary)

In Keyston Primary they made a game:

> **Ms Griffiths**: we talked about the games that they liked playing outside of school, the Xboxes, PSPs, like the Playstations, any games, any apps that they had on their phones {Ok} and then we began to explore and play some apps and games {Ok} and then we talked about developing our own games and we talked about what the importance of that was {Ok} and the children were able to come up with 'I like this game because' and 'I like that game because' and all the children in the class were able to talk about Minecraft to the nth degree and so that was, that kind of really built upon their strengths {Ok} and I knew that was something that they would like {Yes} and then they went on and they actually developed their own games and their own designs {Ok} and then they marketed them as well and they were really good.
> **Researcher**: Oh great, okay and so did they actually market them?
> **Ms Griffiths**: They, they did a very good job at attempting to and then when it came down to it, they, yeah, they did, they made some little PowerPoints that were trying to be persuasive {Ok} saying come and buy this game, buy that game but we didn't actually sell the games {No, ok} so just made them … that was probably, that was a one off
>
> (Ms Griffiths, Keyston Primary)

In Glenville Juniors, in the previous year, the Year 5 children had entered a competition run by Apps for Good (which was intended for Year 6 children). The prize was to work with a software company to commercially develop the winning entry.

In several of the schools children who were already competent at coding were either allowed to work on extension activities:

> near enough when I was first starting Scratch in Year 5 {Yeah} when I was doing Code Club {Yeah} when I was doing Scratch so I made a game in Code Club {Yup} and in school we started Scratch {Yeah} doing in class and then I brought in my game and showed people {Ok} um when we were doing that so whilst everyone else was making games mine was already finished and I was improving it {yeah yeah yeah} so it ended up the best because I had more time on it
>
> (Jason, Glenville Juniors)

or to support other children in the class:

> ... So we've had a discussion about how can you use your knowledge to help others and because explaining and being able to explain things to others is a really valuable way of making sure that you understand something yourself
>
> (Mr James, Stepside Primary)

For a small number of children who were interested in 'Computer Science' outside school, programming in schools (including in school coding clubs) where they were allowed to work on developing games in a child led manner, did seem to provide alignment between those children's interests and the teachers' pedagogical practices. However, the purposes were different in as much as the children who coded outside school were generally doing so because they enjoyed it and/or wanted to engage in coding activity with a family member or friends, whereas in school the purpose was often to teach them quite specific aspects of coding. As with the previously examined ways in which ICT was used in school, the amount of time spent focussing on programming was very limited. Again therefore, there was a misalignment between the teaching of programming in school and children's digital practices outside school (on the Participation dimension of the Digital Practice Framework).

For a child such as Jason (Glenville Juniors), who was interested in Computer Science (even if that was not their predominant Purpose within the Digital Practice Framework) it seemed possible that being a digital leader might align better with their out of school digital practices.

7.5 Digital leaders

Six of the study school mentioned digital leaders programmes, though they sometimes described them quite differently, and their role varied considerably.

Coast Prep was only just starting their digital leaders programme, and City Primary were in the early stages of setting theirs up. Riverview Prep had a digital ambassadors programme, but insufficient data were gathered about it to be able to enable a judgement to be made about the degree of alignment between the way in which that programme was implemented and children's digital practices outside school.

In Glenville Juniors there were ten digital leaders, all of whom were in Year 6. They were selected at the end of Year 5 based on a written application. Pupils from Glenville Juniors Focus Group A explained the digital leaders' role: each morning two of the digital leaders, on a rota, came in to school early and ensured that the ICT was all set up and working in each classroom – they turned on the IWBs and made sure the radio show was playing, unlocked the iPad trolleys, and ensured that the iPads and laptops were charged. After school they plugged in the iPads and laptops.

Jason, clearly saw himself as being very ICT competent ("I do some complicated stuff and it works again without turning it off") and seemed genuinely interested in programming (although this was not his overriding interest in ICT outside school). For him being a digital leader had the potential to align with his interests and extend his participation in the community of people interested in 'Computer Science'. However, he was disappointed by the school's expectations of the role which so far had involved charging iPads, setting up IWBs, putting on the radio programme and not much else – "they don't really recognise they haven't really recognised us yet …" (Jason, Glenville Juniors). He clearly hoped that the role would change as the year progressed. Thus, in practice, the digital leaders programme in Glenville Juniors did not align well with the Digital Practice Framework, because it trivialised the children's expertise and failed to extend pupils' levels of participation in a community of people interested in 'Computer Science'.

Mr Baker explained that the Stepside Primary digital leaders each had a specialism, such as filming school assemblies and other events, operating the radio station every Monday, choosing films for the after-school film club, operating the sound system in the hall, etc.. They also ensured all the class displays were turned on each morning, handed out iPads in class, helped update the school website, ran a 'web-lab' once a year, ran weekly drop in sessions for staff (e.g. getting to grips with iMovie), made presentations to visitors to the school, and a range of other activities. Digital leaders were selected based on responses to questions on a laptop, with one of the selection criteria (which was not necessarily evident to the children) being that they could afford to miss up to 10 days in their classroom, and others related to their digital competence. Mr Baker explained that where necessary they would train up pupils to 'fill any gaps'. Here too there seemed to be a mismatch between the Digital Leaders' out of school expertise and their in-school role:

> we have like these assemblies where the teacher or like or [the head teacher], would give either like certificates or or like some assemblies I just play the music while the classes are coming in
>
> (Mandiki, Stepside Primary)

Latifah described herself as being 'a tech nerd' since she was aged four, and was clearly proud to be a digital leader. Initially, she seemed positive about her digital leader role in school:

> every Monday, we do radio station. We record people, like they make their stories, they come into the office … we record them, we edit them, we put them in the story, and we put them live
>
> (Latifah, Stepside Primary)

However, at one point during her initial interview when the subject of YouTube came up Latifah became very hesitant and it was clear that she was uncomfortable talking about YouTube because she was worried that the conversation might be overheard and/or the researcher might tell the school what she had said. Adhering to the project's research ethics and child protection protocols, the researcher reassured her that so long as her parents knew what she was doing and nobody was in immediate danger then what she said would be treated as confidential and only reported having been anonymised. Latifah and the researcher then moved into a separate room where there was no danger of the interview being overheard. Latifah then enthusiastically explained that she had a YouTube channel:

> I do stuff to do with pretending to be mums and really annoying teenagers and cute kids. I make vlogs of what I do… I only have two, one at the funfair at one at the… one for Eid, which was yesterday
>
> (Latifah)

There were 14 videos on her YouTube channel, and it was clear that her mum and older siblings helped her with it:

> Yeah, they [my older brother and sister] help me edit sometimes. No, my mum and… when I finish editing and import my videos, my mum tells me whether the video's good editing and good quality and if I should upload it or not.
>
> (Latifah)

She had clearly been creating and uploading videos to YouTube for two years:

> When I was like nine, I made these horrible videos, and it was on my old, old, old channel and it was on my mum's account. Let me find it for you [laughs]. It was really bad videos, like…
>
> (Latifah)

The problem she had was that the school had a rule that pupils were not allowed to show their faces online:

> Because you get in trouble, like for showing your face online, you're not allowed to do that. I don't know. {It's not about child safety, child protection?} Kind of. I mean [Mr Baker] is a technology guy and if he finds out, I'm going to get kicked out of being a digital leader 'cause a guy, he had Facebook, he got kicked out of being a digital leader.
>
> (Latifah, Stepside Primary)

This latter point was independently confirmed by one of the other digital leaders (Mandiki, Stepside Primary). Latifah went on to name several of her friends who had YouTube channels and said that lots of boys in Year 6 had them. She thought that most of the Year 6 children were involved in making YouTube videos, even those who didn't have their own channel. For example, Mandiki helped Latifah make videos for her channel. Thus, it appeared that Latifah, and presumably most of the other children who were defying the school rule about using Facebook and other social media sites and uploading images of themselves to the Internet, were occupying two separate worlds: a school world in which you could not be seen to be using social media sites such as Facebook or Musically (one of Latifah's friends had got in trouble for that) or uploading images of yourself to the Internet, and an outside school world in which they engaged extensively with social media and frequently uploaded still and moving images of themselves and their friends. This seemed to suggest a clear mismatch between the school's pedagogic practices and the children's digital practices outside school, including in relation to being a digital leader.

In Highden Primary they had an ambassadors programme, which at first sight seemed to be unrelated to ICT use in the school:

> So the ambassadors are old fashioned prefects really, but they get to wear a different coloured jumper, and that's a big thing, and it says on the back [school initials] Ambassador
>
> (Ms Foster, Head teacher, Highden Primary)

However, the ambassadors oversaw and provided leadership for mini-mentors:

> so we have two mini-mentors in each class and the mini-mentors' role in class is e-safety and friendship, so they're out on the playground helping children you know develop friendship skills or they're in the computer suite talking about e-safety, and they've got t-shirts to wear as well
>
> (Ms Foster, Head teacher, Highden Primary)

Whilst the selection criteria for becoming an ambassador or mini-mentor were unclear, the development of a group of children who had a shared role over a prolonged period, which was explicitly focussed on helping other children develop relationships merged with awareness of the potential pitfalls of online interaction seems to align well with the Participation and the 'Extend an interest' (specifically using ICT that was designed to support the development of relationships) aspect of the Purpose dimension. So this seems to be one pedagogical practice that may be aligned with the Digital Practice Framework. More details about how the ambassadors and mini-mentors schemes were actually transacted would be needed before a firm conclusion could be drawn about whether there is actually alignment in this instance.

Overall, with the exception of Highden Primary, there seemed to be little alignment between the ways in which digital leaders programmes were implemented and the Digital Practice Framework. This was primarily related to the failure to build upon and thus extend Participation, either through trivialisation of children's expertise (giving them menial tasks to perform), as in Glenville Juniors, and/or requiring them to conceal their out of school practices because these would be in breach of school rules, as in Stepside Primary.

7.6 School radio

Three of the study schools had radio stations, which were used slightly differently in each school, though with a common theme of providing a real audience for children and their work.

In Stepside Primary, it appeared that the radio station had been out of action for quite some time, though a technician came to mend it on one of the later days of data collection. The assistant head explained how it was (intended to be) used:

> It is generally used to be able to capture the learning and to broadcast straight out, so it's broadcasting right now, broadcast out on a tuning radio network and broadcast out live on a website and effectively it allows us to capture children's work, so if they've done a great bit of poetry or a story or if there's a class they're working on a particular topic
>
> (Mr Baker, Assistant head teacher, Stepside Primary)

In Highden Primary the school radio system had become part of the everyday life of the school, according to the ICT Coordinator, with radio shows at playtimes and being used to support drama, literacy and other learning across the school. During the school tour the head teacher explained in more detail how it worked:

> anybody who wants to run it, they can come and run it. They get taught by the ones who know, and so they line up all the music in these carts at the bottom here, and then they go mic live and they introduce it, and it plays out into the playground. {I see, so is it on the internet or just} We can streamlive from the internet but we buy a special licence to do that, and do particular weeks, so [name of teacher] did a world war two week. But usually people who come to visit, when our MP came we interviewed him, and then we'd work on sort of jingles for anti-bullying week and things like that, and they can intermingle all the junior, this is a sort of playlist. So they've put in some songs and then there's some of our plays that are on here, NPL rocking radio jingle, err something that the mini-mentors did, our choir did you know, and build up a playlist. {What a lovely use of technology} Yes yes it is, it's great and you know, they feel very, a great self-esteem of being able to do this
>
> (Ms Foster, Head teacher, Highden Primary)

Glenville Juniors appeared to have a more structured approach to the use of their school radio station, which broadcast into the playground, and/or to all the teaching spaces in the school, and/or over the Internet. Year 6 pupils were appointed as radio leaders, having applied in writing towards the end of Year 5. The radio station had replaced parent assemblies; each class developed a radio programme that was broadcast each term, which parents could listen to (as a podcast that they could download from the school website) without having to come in to school. Each day two of the radio leaders, on a weekly rota, came in early to school and ran the morning show – they were the DJs and played music, which other children could request via a request board on the wall outside the radio room. When it was time for children to come in to school from the playground the radio leaders switched to the 'Coming in music'. Shortly after the start of school, the radio leaders then did announcements – on the first day of the researcher's visit this included: telling everyone that there was a researcher in school and what he was researching; wishing one of the TAs a happy birthday, and various other practical announcements about things that the children and teachers needed to be aware of that day. At break and lunch times radio leaders again became DJs and played music onto the playground. At the end of the break they played three chimes to tell everyone to line up, ready to come back into their classrooms. Ms Edwards described how different children took on quite different DJ persona, developing their own patter, adlibbing and adapting to their audience's requests. Whenever a visitor came into school one or two of the radio leaders would interview them in the radio room – the researcher was interviewed about this research by a Year 6 child without a teacher being present, but supported by the ICT Technician who managed the technical aspects of capturing the interview.

For at least some of the pupils who became radio leaders in Glenville Juniors the school radio station did appear to give them an opportunity to become, not just to role play, being a DJ. If this were aligned with a child's interest in music and/or the broadcast media, then this would align with the 'Extend an interest' category on the Purpose dimension of the Digital Practice Framework. Given that radio leaders in Glenville Juniors were appointed for a year, and had opportunities to engage over a prolonged period with their fellow DJs as well as with visitors and the ICT technician around running a radio show, this also seemed to align with the Participation dimension of the Digital Practice Framework. Thus, enabling children to take on the role of a DJ and supporting them in running a radio station, as occurred in Glenville Juniors does seem to align with the Digital Practice Framework. This suggests that schools using social media might also align with children's digital practices outside school.

7.7 Social media

Study schools used a range of different tools, including email, Skype, Twitter, blogs, and enclosed social media systems ('walled gardens').

The head teacher of Glenville Juniors recounted ways in which they had used a range of tools to support their teaching. On one occasion, they used Skype to get old pupils, who they maintained contact with through secondary school and into their adult lives, to tell children about their careers. On another occasion a Year 6 teacher was having problems motivating her class to write so they got all the children to contact friends and relatives around the world and asked them to share (via email, Skype or any other method) something that had happened near where they lived in the week beginning the 27th January. They then pinpointed on a map where all the people were that they had contacted. Lots of stories came in, from trivial things that happened in the village where the school was located to a murder in Mexico. The children then turned these into news stories and created a news show which was broadcast via the school radio station and stored as a podcast, so that all their friends and family who had contributed stories could listen to it (as could anyone else who wanted to).

In Highden Primary they had used video conferencing with Years 5 and 6 to link them up with experts in museums. Mr Mercer (ICT coordinator, Highden Primary) said they had just had an archaeologist dressed as a Viking in their school via video conferencing for an hour – "… it was captivating".

Keyston Primary, at some time in a previous year, used Skype to bring in an external expert to talk about historical artefacts:

> I think one of, one of probably the most exciting things that we did when we were in Year 3, was we got to watch on the national archives, somebody was opening up one of the historical archives and pulling out artefacts that the children could see and we couldn't get up there and they couldn't bring it here
>
> (Ms Griffiths, Keyston Primary)

Mr Silva (Keyston Primary) talked at length about Mystery Skypes, which were something that Keyston Primary had been doing at least once a term in previous years. These involved linking up with a class somewhere else in the world via Skype. Each class took it in turns to ask the other class questions which might help them work out where in the world they were – 'a bit like twenty questions'. Each child in each class had a role, such as presenter, questioner, note taker, or researcher. The children learnt about "language, and manners, like the early etiquette of talking to other people, and thinking about how they come across, and teamwork" (Mr Silva) and used lots of geographical language and information from asking and answering questions like 'Are you in the northern hemisphere?'.

Glenville Juniors had a school twitter account and children were involved in composing tweets which were then sent out by the school librarian. This was framed as a way of providing a real audience for children, which seemed to be used overtly, at least some of the time, as a mechanism to encourage them to produce their best work:

> Guys this is going out, this this is actually being publicised as it were [yup] you know we don't really want to embarrass ourselves

(Ms Evans, Observation A, Glenville Juniors)

In the instances where this was noted in Glenville Juniors by the researcher, one tweet was sent from each class that was involved. Often this included all the classes in a year group – such as a tweet they sent out related to the John Lewis 'Man on the Moon' advert - or all the classes in the school, based on what they called 'Meet and Tweet'. 'Meet and Tweet' was coordinated by the assistant head, who selected a small number of children each week to work in groups of three to produce a provocation video on an 'agreed topic'. The assistant head specified the topic, which the children then had a couple of days to research (partly in school time). They then choose two or three key facts and prepared to record the video. Each video had the same format: the children introduced the issue, shared two or three key facts related to the issue, shared their views on the issue, and then ask 'What do you think?'. The video was made in front of a green screen, so they could then put a relevant photo in the background with the three children stood in front of it. Once per week a video was shown to classes of children throughout the school, who then had a class reflection - a managed debate - in which they thought about 'What does it mean to me, to our class, to our school, to the world'. They then came up with a tweet, using a tweet template to ensure that they didn't have too many characters in their messages. The best tweet was then posted by the school librarian.

In Keyston Primary, Mr Silva mentioned teaching 'a unit' on blogging in Year 5. Several schools mentioned having class blogs. In Norgate Primary these seemed to be used across the year groups: the head teacher mentioned it being used by four and five year olds, and the deputy head talked about its use in Year 6 where they published their own work. The head teacher explained their rationale:

> … with the blog, because we try and publicise what we're doing so, and also trying to get the parents to respond to that, and communicate by it, and that's happening, but not as much as we'd like
>
> (Ms Clarke, Head teacher, Norgate Primary)

Glenville Juniors had piloted blogs in Year 4 the previous year and were in the process of setting up class blogs across the school because they had had such an impact on the children's writing. The intention being that every class would have their own publicly accessible blog, managed by the class teacher. Children would be allowed to publish directly to it, but posts would be pre-moderated by the teacher. People would be able to leave comments on the posts, but these too would be pre-moderated. In the pilot, they had found that they were filtering out lots of the comments …

> … not because they are inappropriate but because they are spelt badly or the grammar doesn't make sense and we think we don't really want that on there
>
> (Ms Thomas, Staff interview, Glenville Juniors)

Several of the study schools mentioned what we have labelled 'walled gardens' – systems that enabled two-way communication but where access was limited in some way to 'known individuals'. In a lesson observed in City Primary, Mr Lewis introduced Google Hangouts so that children could use it to chat with a pair of children they had been partnered with on the other side of the room and with whom they were meant to be creating one shared slideshow using Google Slides. Children chatted loudly and freely as they went about their work, although the teacher reminded them not to talk across the room and to use Google Hangouts instead. The teacher joined in using Google Hangouts. One pair of children's MacBook screen was displayed on the large classroom monitor; it displayed their slideshow and Google Hangouts chat window. At one point the teacher announced to the class that the chat stream was displayed on the monitor to remind them that such chat is not private and that everyone in the classroom could see it on their own Google accounts (City Primary, Mr Lewis, Observation B). After the lesson two of the boys talked about how the Google Apps (including Google Hangouts) could be used to collaborate with people around the world, but that this "can be dangerous because there could be bad people" (City Primary Pupil Group B). Mr Lewis noted that part of the reason he had used Google hangouts in the lesson was to reduce the noise level in the class.

The previous year in Village Primary, when she was in Years 3 and 4, Ms Green had used an online digital platform called Starz Plus, which the children used to blog about healthy eating, and to which teachers uploaded information, including songs that the children could access from home. She noted that they had also used the chat facility: "there were some children that were chatting every now and then" (Ms Green, Village Primary).

The assistant head in Stepside Primary described the system they had used:

> We had our own social network which we haven't done for a couple of years now, it was built within Fronter… and we made them [the children] all make their own profile page and then we told them what was wrong with it because they put date of birth or address, or each of them on holiday and all that kind of thing and we put fake kids into our, into our Fronter system so these, these children would just pop up as members of the group and ask if they could see, you know… and some of the children respond directly to that child and some would respond to the teacher to say this has happened and some are just blocked and it was great
>
> (Mr Baker, Assistant head teacher, Stepside Primary)

Norgate Primary used a system called Learn Anywhere which Ms Grayson said was meant to counter pupils' use of Facebook. Children described it as:

> **Ethan**: It's basically like mini like child friendly Facebook.
> **Ava**: Like child's WhatsApp.
> **Ethan**: Like say if you went on Facebook there's random people, you can only find your friends on it.
> **Ava**: And you can't get any other school's people on it, it's only your school and it's safe
>
> (Norgate Primary Year 6 Group interview)

The children were aware that the ICT coordinator monitored the system:

> she can see everything ... someone has not sent you a very nice picture or email it flags it straight up to [the ICT coordinator] and it sends her an email and she finds out what's going on. Even if you don't flag it up, or an inappropriate word in it then it automatically it flags straight up to [the ICT coordinator]
>
> (Norgate Primary Year 6 Group interview)

The children in the Norgate Primary Year 6 Group interview noted the differences between the school system and the ICT they used outside school. They commented that the school system was "pretty good as well", though it appeared not to be their social media of choice outside school.

Social media in the study schools seemed to be used for a number of pedagogical purposes, including: to broaden their horizons; to provide pupils with access to information and expertise that would support the school curriculum; to share examples of children's work (primarily with parents); to provide an audience for children's work, which was seen as an incentive to raise its quality; to educate children about social media; and/or to provide a 'safe alternative' to mainstream social media sites such as Facebook. Table 5.3.B summarises the degree of alignment with the Digital Practice Framework.

Table 7.7.1 Summary of alignment of uses of social media with the Digital Practice Framework

	Purpose		Participation	
Children's purposes for using social media outside school	To developing and sustain relationships (Extend an interest)	✓	Sustained interaction over a long timeframe using tools that their friends and family and peer group (outside school) use	✓
Skype – news item	Aim to stimulate/motivate pupils (i.e. to instil an interest in them) and/or provide access to content to support the curriculum	x	The news item with radio show might help sustain relationships with friends and family, but was not sustained	✓ x
Skype / video conferencing to bringing in experts	To broaden horizons and/or bring in information and/or motivate the children	✓ x	One off events	x
Mystery skype	To develop 'soft skills', geographical language and knowledge, and potentially cross cultural understanding	x	One off event with the other class. Might be repeated with new classes but does not enable sustained engagement.	x
Twitter	To motivate children to write	x	One off events orchestrated by teacher	x
Meet & Tweet	To develop their values and beliefs (about topics chosen by the teacher)	✓ x	The use of pupil developed video provocations repeated weekly over the year does provide a sustained opportunity for clarifying their position in the world. Depends in part how the discussions are managed	?
Blogs	Incentive to increase quality of work (mainly writing)	x	May have supported the children in becoming a community of writers, but insufficient evidence	?
'Walled gardens'	To teach about social media	x	Potentially sustained, though in practice short lived interaction	x

7.8 Allowing pupils to choose when to use ICT

One of the most striking features of ICT use in the study schools, particularly where there was a high level of provision of mobile devices, was the degree to which teachers maintained control over ICT use. Indeed, there were no instances where children were free to decide to use ICT in lessons without checking with the teacher first, except, as discussed above, in a small number of schools where they were allowed to use their device as a dictionary or thesaurus. In Byrne Primary, the intention was that children would be allowed to make this choice for themselves, and during the observations they were free to choose whether or not to use a Chromebook. The key limitation appearing to be that there were not sufficient devices for every child to have one, though as they often worked in groups at least during the observed lessons this was not a problem. The head teacher explained that the problem was to do with negotiations with the network management company which resulted in insufficient Chromebooks being available when planned. This had meant that personalisation of devices by children, including taking devices home with them, had not been possible and children didn't feel personal ownership of their devices:

> That's a huge compromise. Huge. Fundamental. The point is that they should be able to have them wherever they are and reach for them when necessary – not just when they're not being used by another class, or when the WiFi can cope with it. It's not supposed to be 'let's use ICT now' it should be there like a pencil case and you open it up when you need something from it
>
> (Mr Brown, Head teacher, Byrne Primary)

In Stepside Primary there was one Year 6 class in which it seemed that the teacher was genuinely open to the children asking if they could use a device, though they would have been expected to justify the need:

> if they feel that it's appropriate I'm quite up for understanding why they feel it's appropriate … So there's a lot of times when the kids 'can I just grab an IPad to do this?' {Right} and I'll go 'sure you can' {For sure} or I'll say 'Do you really need to ask?'
>
> (MS Harrison, Stepside Primary)

In contrast, Ms Allen, said:

> because of having to borrow from elsewhere and only having 2 of the IPads, it has to kind of be planned in advance really usually. I mean you can send someone and ask but no one wants to be constantly interrupted with 'can I borrow your iPad'
>
> (Ms Allen, Stepside Primary)

The high degree of teacher control over mobile device use seemed at odds with the rationale that some teachers gave for having them in the first place, particularly in schools that had invested heavily in tablets and/or instigated a Bring Your Own iPad strategy (such as Glenville Juniors, Coast Prep and Riverview Prep):

> Well we mainly use iPads, um cos they are really easily accessible and they're child friendly. You switch them on and they're ready to do straight away
>
> (MS Johnson, Glenville Juniors)

Though, as Ms Cooper noted:

> Any given chance they will use them - whether they are meant to be using them in lessons is a bit different
>
> (Ms Cooper, Coast Prep)

Strategies for controlling iPad use included requiring them to be put in lockers at the start of the day and only taken out when the teacher instructed (e.g. Ms Evans, Glenville Juniors).

Where the teacher had said that devices could be used, their use was often still controlled by ensuring that tablets were put screen downwards on the table when the teacher was talking or in the case of laptops:

> It's really important boys and girls, when I'm talking laptops are turned around [so the teacher can see the screen] and you leave them alone because there is a lot of temptation to touch them.
>
> (Mr Hall, Observation, City Primary)

In other schools (e.g. Riverview Prep) device management software had been purchased that allowed the teacher to observe what a particular child was doing without them being aware when this was happening and/or lock children's device if s/he so wished. This was something that pupils clearly found frustrating and were finding ways to circumvent:

> … because if you're halfway in the middle they just stop you, and then you forget what the question is
>
> (Zoe, Riverview Prep)

> **Ashish**: If we have Bluetooth on then they can watch our screen and they can also lock our screens so we can't do anything.
> **Researcher**: So Ashish, so are you turning Bluetooth off so that they can't do that?
> **Ashish**: No, I want to but then [teacher's name] tells us to put it on.
> **Pupils**: Everybody has …
> **Girl**: Everybody has turned Bluetooth off because it saves battery.
>
> (Riverview Prep, Year 6 group interview)

In Glenville Juniors, which had a BYO iPad policy and had previously run a scheme to help parents buy iPads (and get them insured), it was clear that many of the children who had an iPad at home didn't bother to bring it in to school. This was confirmed by Ms Evans and Jason. Children in Glenville Juniors Group B explained that there was no disadvantage not having your own iPad because if you needed to use one you could use one of the school ones. This also seemed from the data to reflect a generally low level of use of the iPads in most classes in Glenville Juniors, with the possible exception of one teacher who used Showbie to manage children's work, though the children in this class were seen to be writing in their exercise books even though the task was delivered to them via the iPads (Glenville Juniors School tour).

In Byrne Primary there did seem to be a much greater degree of alignment between the pedagogical practices and the Digital Practice Framework, at least in the observed lessons, though even here the purposes were set by the teacher. The low degree of child control over ICT use in most classes did not align with the digital practise of children outside school, which involved a considerable degree of agency much of the time about the use of ICT. Whilst it has to be acknowledged that parents did also put restrictions on children's ICT use outside school, as we have seen in Section 6, the more this occurred the less likely it seemed that children's practices had developed – they tended to remain in the Marginal category on the Participation dimension.

7.9 Summing up findings for RQ2

Analysis of the ways in which ICT was used in schools against the Digital Practice Framework indicated that there was little evidence of teachers' pedagogical practices aligning with children's digital practices outside school. This reflected the view of most of the pupils in Riverview Prep Year 6 group interview that teachers didn't need to know what they did with ICT outside school as it didn't help them with their ICT in school, it wasn't useful in school (with the exception of for homework). It also seemed to reflect the response Stepside Primary's head teacher gave when asked 'To what extent do children's home experiences with ICT impinge on school and learning?':

> I think for me, I think probably I don't know the answer to that question actually in most ways, certainly in terms of learning … we have to accept what they are experiencing outside school. Are we competing with it?
>
> (Ms Almasi, Head teacher, Stepside Primary)

This lack of alignment between teachers' pedagogical practices and children's digital practices outside school seems at least in part to be related to constraints that teachers have to work within, which will be explored in the next section. However, this lack of alignment does not mean that there were no examples of effective practice using ICT (See Section 8) or of innovative pedagogy involving ICT (See Section 11).

There were some pedagogic practices that seemed to offer the possibility of alignment with children's digital practices outside school, including: programming (for a minority of children); digital leaders programmes; the use of school radio stations; some uses of social media; and giving children control over when and how to use ICT in school. However, in almost all instances, the ways in which these had been implemented, or the lack of their implementation is some schools, meant that they did not align with the Digital Practice Framework.

In the case of programming, this was due to the ways in which coding was taught (particularly in out of school clubs), and the failure to extend the expertise of children who had already exceeded the level that was expected to be taught in their lessons. It also reflected the short timeframe over which children experienced programming within lessons.

In the case of digital leaders programmes, the misalignment with children's digital practices outside school seemed to be due to the often routine and trivial nature of the tasks that the digital leaders were asked to undertake, which in no way reflected their view of their expertise. Alternatively, it reflected constraints that schools imposed on what they considered to be acceptable practices, such as uploading images of themselves to the Internet or having accounts on Facebook or other social media platforms (which often had age restrictions specified within their terms and conditions).

School radio stations did seem to offer the possibility of alignment with some children's interests outside school, where the pupils were enabled to become radio presenters. Noticeably, this was something that seemed to happened outside class time (before school and in breaks between lessons), and was again restricted to a small minority of pupils.

The use of social media again offered the possibility of alignment with children's out of school practices, but in all the observed cases was implemented in ways that undermined this, resulting in a lack of alignment.

Similarly, giving pupils control over when and how they use ICT would seem to offer great potential for enhancing alignment with their out of school practices, but was only claimed in one class (Ms Harrison's Year 6 class in Stepside Primary) and intended but not fully achieved in Byrne Primary due to lack of devices and much to the frustration of the head teacher.

Thus, with the very small number of exceptions noted above, there was no evidence of alignment between teachers' pedagogical practices and children's digital practices outside school. However, there were many examples of interesting and effective use of ICT in the study schools. These are explored in the next section.

8 ICT use in schools

The analysis of the data in the last section looked at the extent to which ICT use in schools aligned with children's digital practices outside school, using the Digital Practice Framework DPF). This indicated that there was very little evidence that pedagogy in the study schools aligned with children's digital practices outsides school. However, the data did provide many interesting examples of ICT use in schools, which varied in terms of their effectiveness and potential impact. To explore this further, the ICT Innovation Framework (ICTIF) was used, as described in Section 4.5.

8.1 Quantity of use

The amount of ICT use is one important determinant of the degree to which ICT use impacts on practice. In all the study schools teachers made extensive use of their classroom display technology. As the ICTIF defines the Quantity of use as the proportion of the available school time that pupils are using ICT, teachers' use of an IWB (or similar) is not included, unless the children were engaged in controlling the device.

Table 8.1.1 (on the next page) provides a summary of the Quantity of ICT use in each of the classes in the study schools where there was sufficient data to be able to make a reasonable estimate of the time that pupils spent using ICT. Section 4.5.2 provides an illustration of how the Quantity was estimated for one teacher. In the case of City Primary, the data on the amount of time that pupils used ICT was thin, so an estimate was made based on the level of ICT resourcing and the claims teachers made about the level of ICT use. In the case of Ms Harrison (Stepside Primary) it was very difficult to gauge an accurate figure as the children seemed to have a high degree of freedom to choose when to use ICT; however, all the evidence suggested that they used it extensively so a figure of <50% was deemed reasonable.

The study schools were specifically told that this research was focussed on the cross curricula use of ICT, and the researchers did NOT want to observe or collect data about the teaching of Computing (the subject). Thus, the focus here is on the 132 instances of ICT use that were noted by the researchers that were categorised as PICT (Pedagogical use of ICT) on the Focus dimension of the ICTIF. As will become clear, not all of these examples of ICT use were observed by the researchers, and in many cases it was impossible to corroborate the claims made by teachers and/or confidently determine how a particular use of ICT had been implemented, and therefore what impact it had had on what and/or how the children were taught.

It might seem reasonable to assume that the higher the level of use of ICT to support learning across the curriculum the more likely it is to impact on the curriculum and/or how children are taught. However, the data indicate that even in schools where the quantity of ICT use was low there were examples of it being used in ways which had the potential to change what and/or how children were taught in ways that would not be possible without ICT (i.e. Transform on the Mode dimension of the ICTIF). For example, Mr Silva, whose children made limited use of ICT, described how his Year 5 class engaged in a Mystery Skype (Keyston Primary, see Section 7.7). This clearly falls into the Transform category, as it would be impossible to set up that sort of international interaction between children without ICT. However, that appeared to be a one-off or infrequent activity. Similarly, other uses of ICT that Mr Silva described had the potential to change what and/or how the children were taught in ways that could not realistically have been achieved without ICT, though in practice were not. For example, he talked about using an augmented reality app about the moon landing, which could fit within the Transform category. However, he used it in 'free time' and commented, "I guess they're kind of learning, but it wasn't sort of a specific lesson" (Mr Silva, Keyston Primary), which seemed to undermine its potential impact. In two observed lessons, some of his children used Explain Everything to produce instructions. However, the teacher acknowledged that they were not that familiar with the software, and the children in a post-observation interview said that it wasn't the best software to use because if you made a mistake you had to start again from scratch. Thus, overall, they spent more time getting to grips with operating the software than reflecting upon

their instructions. Furthermore, in one of these instance, they appeared to be transferring (and refining) their presentation of instructions that someone else had originally written, which they had found on the Internet using a search guided by the teacher; this undermined the potential of both Explain Everything as a metacognitive tool and of the Internet had they been able to choose their own search. Children's lack of familiarity with school software is a potential barrier to using ICT to enhance learning across the curriculum, as the focus then shifts from PICT (using ICT to enhance learning across the curriculum) to Computing (learning how to operate the software).

Table 8.1.1 The Quantity of ICT use (based on the ICTIF)

School	Teacher	M/F	Year	'Subject'	Quantity % of teaching time
Fairfield Lower	Ms Smith	F	3	Class teacher	<10%
Fairfield Lower	Mr Jones	M	3	Class teacher	<10%
Byrne Primary	Ms Campbell	F	4 (P5)	Class teacher	>50%
Byrne Primary	Ms Webb	F	5 (P6)	Class teacher	>50%
Byrne Primary	Ms Roper	F	6 (P7)	Class teacher	>40%
Holme Infants	Mr Davies	M	1	Class teacher	>20%
Holme Infants	Mr Tobin	M	2	Class teacher	>20%
Holme Infants	Mr Murphy	M	2	Class teacher	>20%
Holme Infants	Mr Kelly	M	1	Class teacher	>20%
Greenvil Juniors	Ms Evans	F	6	Class teacher	<10%
Greenvil Juniors	Ms Wilson	F	6	Class teacher	<20%
Village Primary	Mr Hughes	M	5/6	Class teacher	<10%
Village Primary	Ms Green	F	3/4	Class teacher	<10%
City Primary	Mr Hall	M	5	Class teacher	<20%
City Primary	Mr Lewis	M	4	Class teacher	<20%
Nortgate Primary	Ms Pryce	F	EY	Class teacher	<40%
Nortgate Primary	Ms Harris	F	EY	ICT coordinator	<40%
Nortgate Primary	Ms Travis	F	EY	Class teacher	<20%
Nortgate Primary	Ms Hunt	F	1	Class teacher	<20%
Nortgate Primary	Ms Carter	F	2	Class teacher	<30%
Nortgate Primary	Ms Archer	F	5/6	Class teacher	<40%
Nortgate Primary	Ms Rush	F	6	Class teacher	<20%
Hilview Primary	Ms Wood	F	4	Class teacher	20%
Hilview Primary	Ms Young	M	6	ICT coordinator	20%
Coast Prep	Ms Bright	F	5	Art	<20%
Coast Prep	Ms Cooper	F	5	Form tutor	<20%
Coast Prep	Ms Turner	F	6	RE & PSHE	>50%
Coast Prep	Ms King	F	5	Music	>25%
Stepside Primary	Ms Harrison	F	6	Class teacher	<50%
Stepside Primary	Ms Allen	F	2	Class teacher	<10%
Stepside Primary	Mr James		2	Class teacher	<10%
Riverview Prep	Mr Ryan	M	5/6	Maths/English	<40%
Riverview Prep	Mr Phillips	M	5	Science	<10%
Riverview Prep	Ms Peak	F	5/6	Maths/English	<20%
Park Primary	Ms Parker	F	4	Class teacher	<20%
Park Primary	Ms Price	F	3	Class teacher	<20%
Keyston Primary	Ms Griffiths	F	6	Class teacher	<25%
Keyston Primary	Mr Silva	M	5	Class teacher	<10%

Both the study teachers in Fairfield Lower made little use ICT (other than their IWBs). Ms Smith (Fairfield Lower) said that her children had done some research using iPads to create a fact file about extinct animals, but she had directed them to one specific website. Thus, the Internet could have been replaced with a book or handout selected by the teacher and was

neither changing what they children were learning about or how they were learning in any substantive way (i.e. Support on the Mode dimension of the ICTIF). Mr Jones (Fairfield Lower) said that children came up to the IWB to "write on it and move things" but there was no evidence of this in the observed lesson or pupil focus group interview.

Mr Jones (Fairfield Lower) also mentioned that they had used the iPads to video role play in drama, which would provide the potential to enable the children to reflect upon and enhance their performances (and thus could have been Transform on the Mode dimension of the ICTIF). However, this appeared to have been some time in the past, and there was no evidence to indicate that this or the few other uses of ICT that the teachers in Fairfield Lower mentioned changed the pedagogy or curriculum in any substantive way.

In Village Primary children were working in groups to produce a video as part of a 'learning to learn' lesson. ICT per se did not change the curriculum (though having a Learn to Learn curriculum is innovative in its own right). Creating a video had the potential to change how the children were learning, by enabling them to reflect upon and revise their performances. However, based on the group that the researcher observed during the lesson (who went out into the school grounds to film) they spent most of their time arguing about who was going to be in charge and what they were going to do, and no time reviewing and revising their video. Thus, at best the use of the video fell into the Extend category (working in groups could have been achieved without ICT, as could performing without being filmed) and at worst it hindered their learning (which would place it in the Other category on Focus dimension of the ICTIF).

Thus, whilst a very low level of ICT use (<10%) might not prevent it being used in ways that change what and/or how children are taught, there were no instances within our data of very low levels of ICT use involving ICT being used in ways that substantively changed what or how children were taught.

Amongst the classes where pupils used ICT for more than 10% of their school time, there were examples of uses that changed what and/or how children were taught. However, it is important to note that it was very clear from the data that using ICT for a high proportion of the time did not necessarily mean it was being used in ways that changed what and/or how children were taught.

There were 159 observed or noted instances of ICT use by children. 139 of these of these were categorised as pedagogic use of ICT across the curriculum (PICT on the Focus dimension of the ICTIF). Of these 87 were from classes where the Quantity of ICT use could confidently be estimated to be more than 10% of the teaching time. Only 11 (13%) of these 87 were categorised as changing what and/or how children were taught in ways that couldn't practically have been achieved without ICT (i.e. Transform on the Mode dimension of the ICTIF). There were 36 additional instances of ICT use that had the potential to be categorised as Transform, but either they were implemented in a way that prevented this from being the case, or there was insufficient evidence to be confident whether or how they had been transacted. In addition, a number of instances of ICT being used were noted by members of school senior management teams, or by teachers in classes where we had little evidence about the quantity of ICT use. Of these 27 were, or seemed likely to be categorised as Transform on the mode dimension of the ICTIF and so are also briefly exemplified in Section 8.2.

8.2 Examples of ICT use that were categorised as Transform

The children in the three classes whose lessons were observed in Byrne Primary all used ICT more than 40% of the time. All three observations involved extensive use of ICT. In two of the lessons it seemed clear that the ICT was used in ways that changed what the children were learning and/or how they were learning it in ways that couldn't have been achieved without ICT (i.e. were categorised as Transform on the Mode dimension of the ICTIF). The researcher was only able to see part of the third lesson so was unable to be confident about whether or not it should be categorised as Transform, though it clearly had the potential to be. Vignette 8.2.1 provides an illustration of how ICT was being used in these classrooms in Byrne Primary. It should be noted that Ms Campbell (Byrne Primary) felt that her use of ICT in numeracy was "formulaic" and limited to sites such as Mathletics, and thus not all the lessons in these three classrooms involved using ICT in ways that substantively changed what and/or how the children were taught.

Vignette 8.2.1 – Byrne Primary P6 (Yr5) - Aspects of the life of Robert Burns

12 girls and 10 boys were seated in mixed ability and gender groups of four or five. The mobile Chromebook charging station was in the room on the pupil's arrival. Two boys began to handout the Chromebooks (without explicit direction) as soon as they entered. Meanwhile, the teacher asked students to select their lunch option on the IWB (this was usually done at the start of the day, but the pupils were swimming that morning). As the Chromebooks were handed out, the pupils started logging on. One pupil discovered her profile had been deleted by another user (apparently, this was quite a common occurrence – the P6 pupils deleted the accounts from what they saw as 'their' devices). She sought help from one of the boys handing out the devices and then approached the teacher as she'd forgotten her school email address.

[An initial activity has been omitted as it did not relate to the main focus of the lesson]

This was the fifth lesson in a series examining the life and work of Robert Burns in the run up to Burns night, and the second lesson on this specific task. In setting the task in the previous lesson, Ms Campbell had asked pupils to produce a piece of work covering selected aspects of the poet's life or work, with pupils free to choose: whether to work individually or in pairs; the tools or equipment they used; and the output medium (e.g. video, presentation, etc.). Pupils knew they would be asked to present their work at the end of the task. The teacher had provided access to Chromebooks, handheld cameras, craft materials and the library.

Most pupils were working in pairs; 3 pupils were working alone. Four pairs seemed to be working closely in two groups (but with separate outputs for each pair). Liam worked in a pair with another boy, Emma and Isla were working in separate pairs in one of the loose groups, and Sophie worked with another girl.

Emma and Isla were both making videos. The group had chosen to work in an upstairs communal area, away from the classroom. Emma was directing activities, filming her partner playing the role of Burns and Isla was playing his mother. Emma clearly enjoyed being in control, and assumed the position when the second group were ready to film their version of the scene. Emma relinquished control easily when asked, but stated jokingly that "I'm the expert at this stuff, I can do it sleeping".

Liam was working in a communal area outside the classroom, a spot deliberately chosen as "the WiFi was better". They had elected to use Blabberize to make a talking picture (an animated mouth super-imposed over still images). They were recording dialogue they had written previously, but were reluctant to perform it in front of the researcher.

Sophie had elected not to use ICT, and was making a poster of the poet's life with her partner.

The teacher moved around the groups in and immediately outside the classroom (but did not visit the group on the upper floor). When speaking to Liam, she asked why they had chosen to

focus on a particular poem (Tam o'Shanter). Liam indicated it was because it was the one he found most funny.

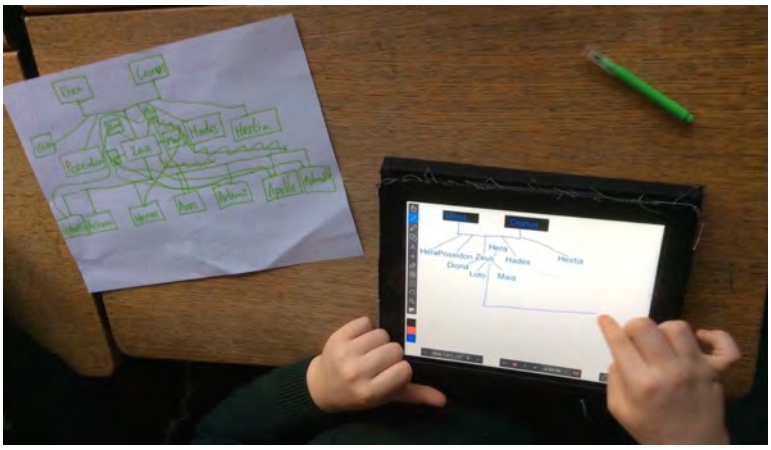
Towards the end of the lesson, Ms Campbell gathered the pupils back together and asked a selection of pairs (4) for a 30 second summary of their projects so far and to share one thing they knew about Burns. She indicated that they had two more lessons in which to complete the task. She reminded pupils to save their work (to download and save to their GC folder). In the last few minutes she read an extract from a Burns' poem.

At the end of the lesson, 2 girls asked to remain to work on a tartan design project on the Chromebooks. The other pupils plugged the other Chromebooks into the charging station on their way out of the room.

In Riverview Prep, two teachers talked about how they had used video and Explain Everything to record the results of science experiments that their Year 1 children were conducting. They then used the class display to watch the experiments again and discuss their findings. They provided photographs to substantiate their claims. Using the class display with mirroring software such as Reflector or using a visualiser was common in several of the schools. In another Riverview Prep class, the Year 6 Geography teacher mirrored her own iPad onto the class display to share Google Earth and photographs of population from an atlas at the start of the lesson. During the lesson she mirrored individual children's work so that the class could discuss it in order to enhance their learning. In many other instances where children's work was mirrored on the class display the researchers did not consider it to change what or how the children were being taught because of the way in which it was implemented. On many occasions, such sharing of work was very much teacher directed, rather than participative, and on some occasions, this invited criticism of individual children's efforts. For this strategy to be supportive of learning and to recast 'learning' as participative rather than individualised, there was a requirement for high levels of sensitivity on the teacher's part and a sophisticated understanding of the role of critical reflection on the children's part.

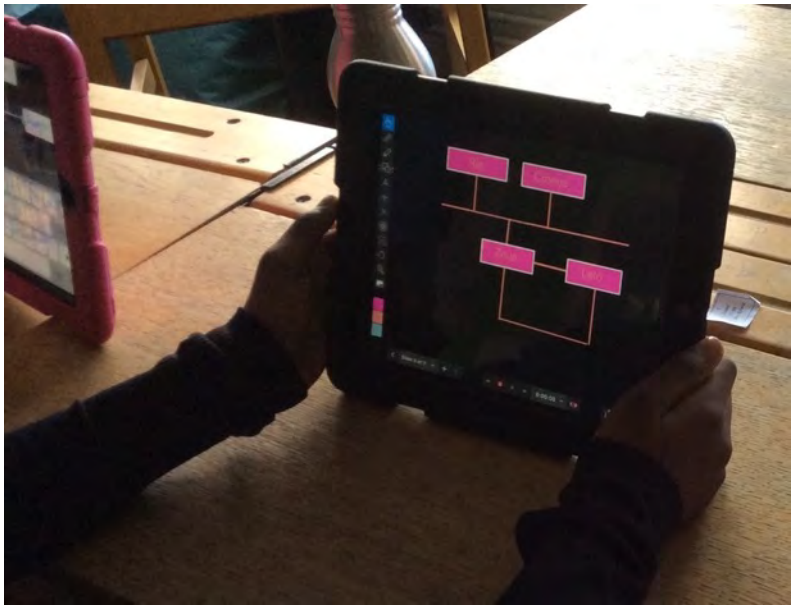
Four of the instances where the use of ICT was categorised as Transform on the Mode dimension of the ICTIF involved children finding information. The first was in Nortgate Primary, a school that appeared to be keen to empower children to search effectively and safely for information on the Internet. This particular example of finding information, which was described in Section 7.3, involved a boy in the Early Years who wanted to find information about sharks. Supported by a teacher he was able to enter a search term, and was then able to access the information about sharks that was returned relatively independently because it was visual, and therefore didn't require a high level of reading competence. The second example involved a Year 2 child in Holme Infants who was able to search independently for images of islands using the voice search feature in Google. The third example, which involved Year 5 children in Coast Prep, is illustrated in Vignette 8.2.2. This instance of ICT use could very easily have ended up being categorised as Support, if the teacher had reacted differently when faced with a child who had not followed her instructions. In practice, the child took a degree of ownership of her learning, which could have been viewed as challenging the authority of the teacher and/or trying to circumvent the task by searching for alternative websites that would provide her with a ready-made final product. The teacher did not appear to feel challenged, and whilst pointing out that the girl had not done what she had been told, accepted this and engaged in discussion with her, to explore the strengths and weaknesses of the alternative website that she had found. The fourth example was in Glenville Juniors, as part of the Meet and Tweet process referred to in Section 7.7 during which the children used the Internet to search for information to include in their videos. This occurred partly during school time and partly at home. Whilst the topic was chosen by the teacher, the children were free to search the Internet and thus had access to a vast range of information in a wide variety of formats, which was not controlled or limited by the teacher (except by the filters on the school or home Internet connections).

Vignette 8.2.2 – Coast Prep Yr5 - Creating a family tree for the Greek Gods



This was a history lesson on Greek Gods and Goddesses, as part of an overarching topic on Ancient Greece. As the girls came into the classroom, Ms Cooper told them that they would need their iPads. Some of the children said that their batteries were low and were told to get chargers. Ms Cooper then introduced the activity, using her iPad connected wirelessly to the Interactive Whiteboard (IWB) at the front of the class – it showed the Ancient Greek Gods page on History for Kids (http://www.historyforkids.net/ancient-greek-gods.html). Ms Cooper explained that they were going to create a family tree for the Greek Gods. As the Internet was not responding she switched from the website to a blank family tree and made sure that the girls understood how relationships should be shown on it. She explained that they were going to use their iPads to research information on the relationships between the Greek Gods and then create a family tree in Explain Everything. The Internet came back up as Ms Cooper finished explaining the task.

Girls worked individually reading information from the History for Kids website and designing their family trees. Ms Cooper circulated, talking with individual children about their work and helping to sort out problems with iPads that had flat batteries. After about ten minutes she started to draw a family tree with a marker on a whiteboard, asking pupils to tell her what to fill in. Some children created their family trees on paper initially and then transferred them onto their iPads. Others worked exclusively on their iPads. Several girls had problems drawing the family tree in Explain Everything, and other girls helped them to resolve this.



One of the pupils told Ms Cooper that she had found a better website, which had a family tree for the Greek Gods on it. Ms Cooper pointed out that they were not asked to search for a family tree, but then went on and discussed the family tree that the girl had found. Through their discussion it became clear that this 'ready-made' family tree was missing information about some of the relationships between the gods.

Most of the girls were part-way through creating their family trees when the lesson ended, so the activity was to be continued in the next session.

Another example from Coast Prep involved Ms King, the music teacher. She described with enthusiasm how she used ICT with her girls, and provided examples to evidence the quality of their work. This is described in Vignette 8.2.3.

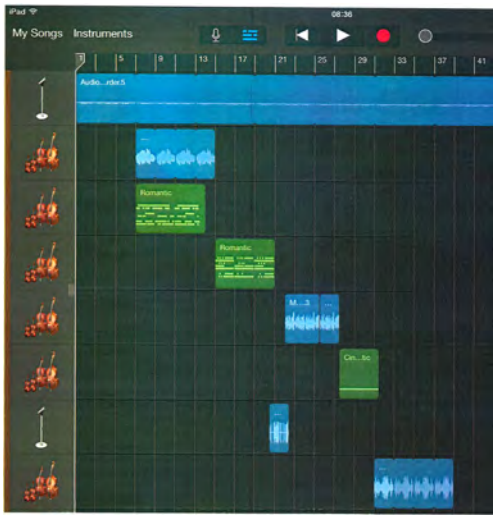
Vignette 8.2.3 – Coast Prep Yr5 – Music composition

This activity spanned a six-week period and was linked to the overarching topic on Ancient Greece. Their task was to compose a piece of music which portrayed the atmosphere of the journey Theseus made on his return to Athens. The task brief stated that their composition should include: audio samples, and smart instruments (which are a feature of Garage Band). They were not allowed to use drumbeats and were clearly told to focus on the structure of the music, and were required to use Apple loops to help them do this (another feature of Garage Band which allows you to repeat sections of music very easily). Initially the girls, who worked individually on their iPads, researched classical music with a sea theme. They then created audio samples using physical instruments in the music room – this took two weeks. Next they used Garage band on their iPads, importing their sound samples and using the composition tools within the app. Once the music was completed it was exported into iMovie and images sourced from the Internet were added. The final movies were then uploaded to YouTube.

Ms King explained that she used Garage Band because it:

- provides scope for a variety of sounds otherwise not available in the classroom
- displays the structure of the music clearly and visually
- can be edited and refined very easily
- enables every child to produce a professional sounding piece of music even if they cannot play a musical instrument or read music

She felt that adding the finished products to YouTube increased the girls' feeling of accomplishment, by sharing their work with a global audience (yet without them being recognisable).



In this example (Vignette 8.2.3) aspects of both how and what the children learnt were altered substantively and in ways that could not have been achieved without ICT. The software helped extend the children's agency by allowing them to visualise as well as hear the music. Thus it increased their sense of being a learner of music. Furthermore, the way in which the teacher treated the children as composers legitimised their participation and sense of competence. However, it is important to note that the 'professional sounding' piece of music was not only because of the children being able to use readymade audio loops and the other features of Garage Band. It was also related to children having been inducted into the community of musicians and composers through developing their familiarity with similar genres of music; it was listening to classical music with a sea theme that helped children gain an understanding (albeit rudimentary) of the structure of a piece of music and other conventions of music which was then utilised as they moved on to using Garage Band. There is a danger that one overemphasises the role of software such as Garage Band in inducting children into the community of composers and musicians and fails to recognise the importance of the first stage of the activity, which involved listening to music.

The previous example included sharing the children's music compositions via YouTube, and sharing children's work and communicating over the internet with people, particularly experts or famous personalities, accounted for another four of the 13 uses of ICT that were categorised as Transform on the ICTIF. The Year 6 children in Stepside Primary created 'a 360-degree video' of one of Michael Rosen's books and then tweeted it to Michael Rosen – "and he responds, that's amazing!" (Ms Harrison). This could not have been achieved without ICT.

In Keyston Primary, Ms Griffiths felt that it was imperative to give her children access to a wide range of experiences:

> **Ms Griffiths**: I think that, for a child to be like a well-rounded child, they do need to have experiences of different cultures and backgrounds and histories and, and music genres and story genres and just they need more experiences {Yeah} and I think particularly children around this area, live in quite a deprived area, lots of needs, lots of pupil premium children and I don't think they necessarily get all of that from home {Ok} so {Ok} so
> **Researcher**: Okay so it's about kind of developing, sort of enriching, enriching
> **Ms Griffiths**: Yeah definitely
> **Researcher**: their knowledge {Yeah} and experiences {Yeah} Okay and do, do you think there's a role for ICT in that?
> **Ms Griffiths**: Yeah I do, I think one of, one of probably the most exciting things that we did when we were in Year 3, was we got to watch on the National Archives, somebody was opening up one of the historical archives and pulling out artefacts that the children could see and we couldn't get up there and they couldn't bring it here
>
> (Ms Griffiths, Keyston Primary)

She went on to explain that this was in interactive video conference type event, though she wasn't sure what software had been used as it had been set up by the History coordinator. Again, this sort of interaction with experts would not be possible without ICT, as Ms Griffiths herself said. Here too however, this appeared to be a one-off activity which had happened in the previous school year. Similarly, in Highden Primary the ICT coordinator described how they used video conferencing to link up with experts in museums, though this seemed to be a more regular occurrence for them:

> We've done it [video conferencing] for five or six years now within the school. You know, we've just done a Viking {Right} so, and the Viking's through, another way we work with this particular company that each museum has got an expert that talks about, so for an hour there was a a somebody who was a, I think he was an archaeologist actually {Yes} but he was dressed as a Viking and talked about and showed everything and after after ten minutes my board was full you know , there's nothing I could fit it on {Yes} and he was talking about the Viking, everything locally as well, things that happened, and and obviously I had to the children's questions {Yes} and that was another thing, it was captivating … they were bouncing questions, it was complete interaction {Yes} … [Explaining what he meant by 'my board was full] I write things down on my whiteboard whilst he is talking, so they can mind map at the end
>
> (Mr Mercer, ICT coordinator, Highden Primary)

Glenville Juniors also used video conferencing software (Skype) along with other communication tools to collect information from people all over the world (as already mentioned in Section 7.7). This clearly fitted into the Transform category as it would not have been possible to collect such a diverse array of stories from so many locations globally without ICT. Glenville Juniors used their school radio to broadcast the resulting news show. As already indicated in Section 7.6, some of the ways in which Glenville Juniors used their school radio, particularly when that use was handed over to the children, resulted in changes to what they were learning and/or how they were learning it and could not have been achieved without ICT (i.e. Transform on the Mode dimension of the ICTIF).

Two other examples of use that were categorised as Transform on the Mode dimension also involved video, though in quite different ways (see Vignette 8.2.4 and Vignette 8.2.5).

Vignette 8.2.4 – Stepside Primary Yr6 – Filming the learning journey

> There's a lot of freedom in technology so I like to do, I do what I call learning journey's, where if I've done a topic with the children for example Vikings. I'll tie in art and theatre, dance, music, literacy a whole host, design and technology and I invite the parents in to school for like an hour. The children recreate a journey a physical journey through the school which will usually start in the hall and finish in our classroom and it might start with a performance or a piece of poetry and the children will be in character for example as Viking warriors, and march them up the corridor and all these things are filmed and for me that's an awesome way of us using technology because it keeps the work that the children have done. Because I believe a lot of the time you can't always see in a book, because we don't all learn the same, you can't see what a child has learnt always. It's not evident in a book because a child might, the learning intention might be to have an empathetic view point for a Viking warrior leaving his home, and say I have a child who can't write, a child whose spelling is atrocious, a child who doesn't like writing. But they can film me that learning intention, but they can't show me in that one way that I, so the schools really supportive of, 'Is it evidenced someway in some form?', 'Yes', 'Brilliant that will do'.
>
> (Ms Harrison, Stepside Primary)

Vignette 8.2.5 – Park Primary Yr3 – Live streaming group teaching on the class display

The school used a 'matched learning approached' which meant that children's level of competence was very regularly assessed and children were then grouped according to their current level of competence in relation to the current learning objective.

This was a maths lesson focussed on division. Ms Price, the class teacher, worked at a table with one group of children. A child, who was stood beside the teacher but a little way back from the table, used an iPad to film what the teacher and children were doing and saying. This was live streamed onto the class display so that all of the children could see and hear what was going on. This seemed to provide a way of both teaching a small group and allowing the rest of the class to 'be there', participating in the group whilst actually sat at tables around the classroom.

In addition, Ms Price provided pre-prepared videos showing more complex division techniques, which she provided to children via Showbie. The intention being that this would allow them to work relatively autonomously.

The final examples of ICT were both reported by Mr Baker, the assistant head at Stepside Primary. One, which was referred to in Section 7.2 involved the use of Minecraft to support the children's understanding of volume. The others, each appeared to be past projects using augmented reality (See Vignettes 8.2.6 to 8.2.8). There was not sufficient evidence to enable these reported uses of ICT to be categorised on the ICTIF, however, they certainly had the potential to fit within the Transform category on the Mode dimension. In the case of the Imaginarium (Vignette 8.2.7) Mr Baker went on to explain that despite the potential of the resource to have "massive impact" there were logistical issues (e.g. the room was too small to accommodate a whole classes) and pressure on space within the school for additional areas to accommodate the needs of the high number of children with special educational needs, which meant the Imaginarium space was increasingly being used for occupational therapy, physiotherapy, speech and language work and for quiet work. As a result "those big moments were happening less and less" and Mr Baker felt that technology used within the classroom had the "bigger impact".

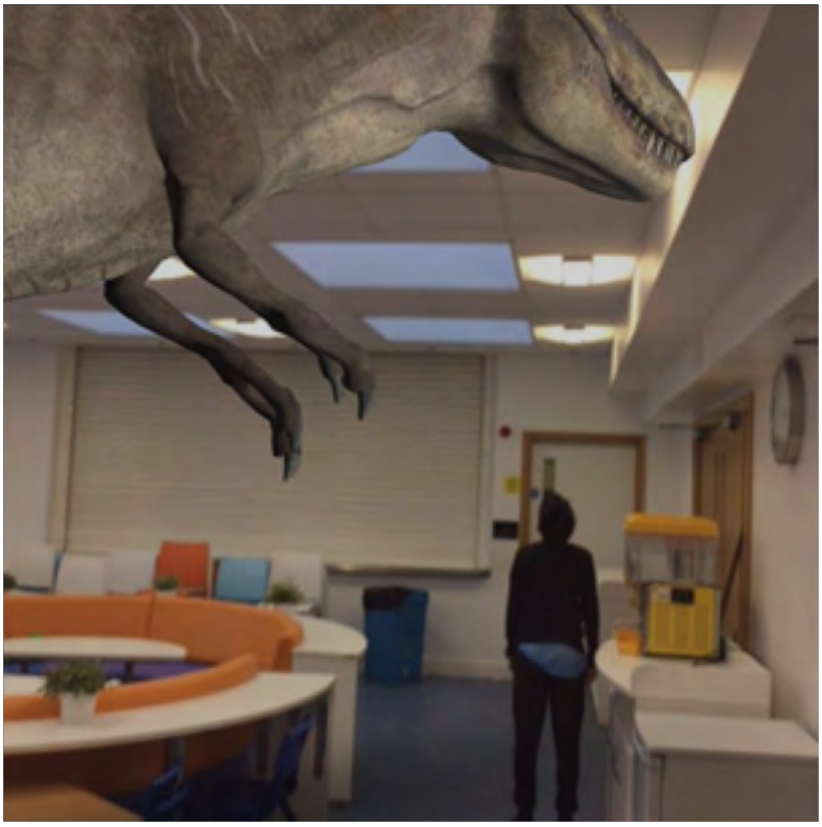
Vignette 8.2.6 – Stepside Primary Yrs 5/6 - Augmented reality London

> We've done augmented reality for a few years. Two thousand and ten we turned the whole of London into an augmented reality experience. So we took all of the children in Years 5 and 6 and split them into their four classes, and then split their four classes in half, and then gave each of the groups different monuments around London, and then through rigorous planning and TfL mapping, got the children in four consecutive weeks to go down to those places and make notes and speak to people and find out why they were there, draw the building, and then come back and research, and research what they could find out about that building, that place, that monument, and then again, we went back down and recorded on location the video that they wanted to showcase, and then came back again and mapped the artwork to the video via augmented reality. So you could pretty much hover over any of the London monuments, and you'd get their video report of that particular place, and it was amazing, and it showed us really just how little the children knew about the city they lived in
>
> (Mr Baker, Assistant head, Stepside Primary)

Vignette 8.2.7 – Stepside Primary - The imaginarium and Fantastic Flying Books

> …. when it [the imaginarium] was fully functioning was the idea that you would be able to take children anywhere. So it has a floor projection, a wall projection, scent, you know, it has an air conditioning unit, UV light, wind machine and so if you wanted to create the Arctic you could create the Arctic and take children to the snow. We had it done as an air-raid shelter, so you would be able to bring a class in, have projections of the wall, a sound of the air-raid siren, you'd be able to get them inspired to write. We could take them under the water, so we'd bring nursery reception in here with flippers on and snorkels and projections on the floor.
> …
> So if I think about the Fantastic Flying Books of Dr Morris Lessmore, which is a brilliant book about this guy who reads, and reads all the time and then one day this big storm comes along and it wipes off everything including all the letters off of his page and he ends up going to this amazing book room and it's full of books and the books are talking to him and it's great. It's a great book. It's even better as an augmented reality experience where you're inside the storm and you know, getting children to generate that kind of writing is just phenomenal because all of a sudden they're in it and they're experiencing it and they're talking about their experiences. So there are elements where yeah, in some ways it's a motivator but actually, it's the stimulus now. ...
>
> (Mr Baker, Assistant head, Stepside Primary)

Vignette 8.2.8 – Stepside Primary Yr6 - Augmented reality maths



We did a little fantastic maths activity with the Year 6s where we used augmented reality dinosaurs to do estimating. So you get the dinosaur on the table, tiny little thing, you click him and he goes life size. You then get a child to stand underneath and then you estimate how many children it would take to reach the dinosaur's head. It's a different way of doing it. Ordinarily, what are we estimating ordinarily? How many cubes there are in 30cm. it's dull [laughter]. What we're able to do now is yes, it's a motivator but yes, it's the way to teach it.

(Mr Baker, Assistant head, Stepside Primary)

8.3 Summing up findings about the use of ICT in schools

Whilst in Section 7 little evidence was found of teachers' pedagogy aligning with children's digital practices outside school, there were a large number of instances of ICT being used in school. The most common use involved teachers using the class display. However, there were also many instances of children using ICT. Of these 139 were categorised as cross curricula use (i.e. PICT on the Focus dimension of the ICTIF) across all the schools. Just over 60% of those had the potential to change what and/or how children were taught in ways that could not have been achieved without ICT (i.e. Transform on the Mode dimension of the ICTIF). However, fewer than 20% were categorised as Transform, either because of the way in which they were implemented, which undermined their transformative potential, or because there was insufficient evidence that they had in practice resulted in changes in what and/or how the children were taught.

There did seem to be a minimum threshold level of use that was needed in order for ICT use to do anything other than Support existing curriculum and pedagogy. This may have been because below this level of use children were not sufficiently familiar with the school software and/or because some of the more transformative uses of ICT required sustained use over time rather than discrete use in individual lessons.

It was noticeable that there were very different levels of use between teachers within individual schools, as well as between schools. Reasons for this are explored in the next section.

9 The school arena (RQ3)

RQ3: What institutional circumstances and practices enable or undermine how pupils' digital competencies and practices are recognised (RQ1) and integrated into teachers' practice (RQ2)?

RQ2 indicated that there was very little evidence of teachers' pedagogical practices aligning with children's digital practices outside school. However, as demonstrated in Section 8, schools within the study were making use of ICT, sometimes extensively. There were many instances of ICT being used in the study schools which had changed or had the potential to change what and/or how children were being taught, which could not have been achieved without ICT. They were innovative in that sense. In order to do justice to the schools that were making extensive and at times transformative use of ICT, RQ3 was expanded so that it not only addressed the institutional circumstances and practices that undermine the recognition and integration of children's out of school digital practices within teachers' pedagogy, but also seeks to understand the factors that impact on the extent to which and ways in which teachers integrate ICT into their practice.

As before the overarching sociocultural model (see Figure 3.3.1) has been used as a guide to structuring the report. Our focus in this question is on the arena of each school, which makes visible what the school has taken up from the constitutive order and how it has mediated that in the form of rules, facilities, expectations and other enduring elements of the school's social order. In Section 11 the focus shifts to people in action (settings) in order to explore from a more overtly theoretical stance the extent to which individual teacher's pedagogic practice (realted to ICT use) is innovative.

9.1 Location and school type

The arena of the school is in part defined by the location of the school. Thus, for example, Byrne Primary, which was located in the Highlands of Scotland, was subject to a different set of curriculum, assessment, and accountability requirements than all the schools that were located in England. This will be explored further under the headings of Curriculum, Assessment and Accountability below.

The location also determines to a large degree the nature of the school intake. This potentially has implications for social justice, which is a focus of Section 10.

When trying to identify potential schools to take part in the research that seemed to be 'doing interesting things with ICT', the research team noticed the preponderance of schools that fitted that description appeared to be in very remote locations. The view that being in a remote location in some way increased the extent to which schools engaged with ICT was confirmed by a number of head teachers who were contacted. The researcher's perception was that this was due to the schools being sufficiently 'off the radar' to be able to experiment and take risks. Whilst none of the members of the senior leadership teams questioned about this disagreed with this suggestion, they tended to emphasise the need to overcome the constraints that being in a remote location imposed in order to provide their pupils with access to the world, to widen their horizons, enhance their educational opportunities and raise their aspirations. Staff in other schools (e.g. Mr Brown (Head teacher, Byrne Primary), Mr Baker (Assistant head teacher, Stepside Primary), Ms Bennett (Head teacher, Park Primary), Ms Griffiths (Keyston Primary)), some of which were much closer to London, made similar comments about needing to overcome the disadvantages that their pupils experienced due to being located in 'deprived' areas. However, the data on Quantity of use presented in Table 8.1.1 do not support the view that schools in more remote or low socioeconomic areas make greater use of ICT. This may however, reflect the fact that for pragmatic reasons a number of schools were not included in the research because it would have taken the researchers too much time to get to them.

Table 9.1.1 The location of the study schools

	From London Miles / Hours by public transport	SES	Area	Location
Byrne Primary	>500 / 10	Low	Town	Rural Highlands, Scotland
Highden Primary	230 / <4	Low	Urban	North East England
Norgate Primary	200 / >3	Low	Suburban	Northern England
Park Primary	130 / 2.5	Low	Urban	West midlands
Village Primary	70 / 2	High	Village	East England
Keyston Primary	70 / >1.5	Low	Urban	South of England
Riverview Prep	60 / >1	High*	Village	East England
Coast Prep	<60 / >1	High*	Urban	South England
Glenville Juniors	<50 / <2	High	Village	Central England
Fairfield Lower	<50 / >1	High	Village	Midlands
Holme Infants	25 / <1	Low	Urban	London
City Primary	6 / <0.5	High	Urban	South West London
Stepside Primary	6 / <0.5	Low	Urban	North London

* These are both private schools

The type of the school was also important in determining its constitutive order, with different requirements placed on maintained schools (e.g. community and foundation schools) and independent schools (which includes academies and private schools). For a fuller breakdown of types of schools in England see https://www.gov.uk/types-of-school/overview.

It should be noted that, with the exception of Glenville Juniors, the data on the school arena for the exploratory study schools that did not become case study schools is relatively thin. Hence the predominance of the case study schools and Glenville Juniors in this section.

9.2 Curriculum, assessment and accountability

Throughout Section 9.2 assessment is used to refer to summative assessment.

Due to differences in the requirements placed on schools depending on their type, this section looks separately at three groupings of schools:

- Maintained schools in England (Fairfield Lower, Glenville Juniors, Village Primary, City Primary, Norgate Primary, Highden Primary, Stepside Primary, Keyston Primary)
- Independent schools (including academies and private schools) in England (Holme Infants, Coast Prep, Riverview Prep, Park Primary)
- The school in Scotland (Byrne Primary)

9.2.1 Curriculum, assessment and accountability in maintained schools

All of the maintained schools were legally required to follow the English National Curriculum in Years 1 to 6, were subject to inspection by Ofsted, and their children were expected to undergo annual national testing (SATs). For children in the early years there was a different, but still statutory, curriculum and assessment framework (the Early Years Foundation Stage) and children underwent assessment ('progress check') at age 2 and at the end of the Foundation Stage.

A new national curriculum had been introduced at the start of the academic year in which the data collection for this research took place. The nature of the change in emphasis (and theoretical positioning) of this new curriculum was described in Section 2. This had clearly placed an additional burden on schools, in terms of professional development linked with both the content of the new curriculum, the expectations about learning outcomes, and the ways in which children's performance was to be recorded (with the removal of Level descriptors):

> So at the moment, we're in a trajectory where there's a new curriculum a new assessment a new this a new that a new the other. We're back at base. We're back at just getting the baseline stuff right, …
>
> (Ms Walker, Head teacher, Glenville Juniors)

The ICT coordinator in Norgate Primary saw the new national curriculum as being too prescriptive:

> I just think we need a little bit more of a balance of some of these practical skill, cooking skills, sewing skills, a bit of woodwork skills in there but you know, things where they can express themselves, maybe a bit more art work in there, but it's become very prescriptive
>
> (Ms Harris, Norgate Primary)

This was echoed by others, including heads of the maintained schools who were also concerned about the direction taken by the new national curriculum, which further undermined its relevance and ability to engage children by focussing on discrete skills or 'knowledge':

> I think the things that I think are important, the things that are important that also I think that actually, you know everybody thinks are important, the Government think are important, I would, I just think I would be doing it in a more exciting, integrating way...
> All of the experiences that we want our children to have, whether it's going out on trips and doing their learning there, whether its performing, playing an instrument. We want them to be able to do all of that but also we want them to be able to write a good narrative where actually it's the narrative that's important, erm, not just the grammar or not just the spelling and that when you're doing a piece of writing we know that you focus on different things at different times and it's a shame the way things are going erm, because you know, children can get, you know, expected or, you know, a deeper learning in literacy for example, but not actually be able to write anything probably interesting and I think that's a shame, I think that's a shame...
>
> (Ms Almasi, Head teacher, Stepside Primary)

Some schools tried to address this by bringing in additional elements to the curriculum, such as a 'Learning to learn' programme in Village Primary and 'Philosophy for children' (P4C) in Keyston Primary.

Some schools were finding that they were having to fill gaps that had been created between the expectations of the old and new national curricula:

> If you look at Year 2 they've had to be rigid this year because they're catching up on curriculum that we're trying to fill in gaps with, with the new curriculum
>
> (Mr Baker, Assistant head teacher, Stepside Primary)

The new national curriculum and expectations about children's performance clearly drove practice. For example, the focus on literacy and numeracy was reflected in the schools' scheduling of lessons, with all the schools focussing on discrete literacy and numeracy teaching in the morning (when they perceived children to be most able to learn) and other subjects (often with some overlying theme which was intended to provide some coherence) in the afternoons. The new national curriculum and associated assessment also appeared to be leading to changes in the ways in which the maintained schools organised their provision:

> So we, we focus on whole school units often in the second half of the term, in the first half of the term is very much coverage of that curriculum …
> Our assessment data drives everything in terms of where our money goes and resources goes, erm, in terms of our staffing particularly because we know that we have to hit targets
>
> (Mr Baker, Assistant head teacher, Stepside Primary)

> because the new curriculum expects all of the children to get to national expectations, all of the children need to be exposed to what national expectations are. So all that really happens is that any child who is falling behind or any child who is struggling, gets identified and then they get given extra kind of interventions to boost them up or to help them to try and get them to catch up. The only thing that is really different is in maths, there is core group of children, about 6 or 7 children across the whole year group, who we've identified that are so significantly far behind everybody else that they aren't going to be able to catch up, so what we're now doing is we're putting into place a, a structured scheme of work to try and give them the core foundations so that when they go into secondary school, that they will have the basics that they need in order to, to succeed at secondary
>
> (Ms Griffiths, Keyston Primary)

> I mean I guess where we stream the most actually is phonics in the, low down, because we've got to pass this blimin phonics test in year one. So, I think we do stream some phonics so that we're absolutely spot on with what they need to do that.
>
> (Ms Mitchell, Head teacher, Keyston Primary)

The maintained schools clearly felt that their children, and hence the staff in the school, were under pressure from the expectations of performance within the new national curriculum and assessment regime:

> it's [a more integrated curriculum is] not something that we want to lose but as you know we have pressures because, you know, we have to perform otherwise there's a stick, there's a stick
>
> (Ms Almasi, Head teacher, Stepside Primary)

> I think the thing in teaching is there's so little time, you never feel like you've got everything done as much, with the best will in the world you'd love to try out every single thing that someone suggests it to you and there just isn't time. And particularly we're in Year 6 now, we've got SAT's coming up, we're being moderated for writing, we've got all these objectives we've got to hit
>
> (Ms More, Stepside Primary)

> Yes and we do get to the SATs and they are in tears and it's so sad, it is so sad, you shouldn't have to be going through that at eleven
>
> (Ms Harris, Norgate Primary)

This wasn't just the case for the Year 6 children:

> I think the expectations. I think we are pushing the children at the moment to such high expectations at such a young age. I think some of that needs to be taken away. I think lower down it needs, it should be more play and that, you could have some of your technology in with that play but I think the restraints that's being put on the early years and on the infants, what the children have to get through, I think it's a turn off. So I think it ought to be a little bit more relaxed. I think the expectations for some of the children should not be as intense because we find we have to run a lot of interventions to play catch up and ... So I think expectations need to be lowered a little bit. Not that I feel we don't need to be pushing the children a bit but it's just too much what we're asking of them at the moment and I think for the children then that are struggling, I think that makes them feel even more, incapable … It's an awful lot of pressure on young children.
>
> (Ms Harris, ICT Coordinator, Norgate Primary)

Often the schools felt that the regime was counterproductive if the intention was to enhance children's learning:

> You have to do it, you haven't got a choice, it's statutory that you can't use apparatus in Key Stage one SATs, but it is bonkers and it's not pedagogically sound, because that's not the way the children will learn the best, and that's difficult
>
> (Ms Mitchell, Head teacher, Keyston Primary)

and felt that there must be better ways of assessing learning:

> I wouldn't want to test them. I want to, you know this is a portfolio of this child work in literacy for example, this is what they can do
>
> (Ms Almasi, Head teacher, Stepside Primary)

> Let's start a week and say we are going to Skype somebody and then you tell me what are we learning this week, you know rather than saying we've got to meet this SATs objective so now we are doing all about fronted adverbials, lovely you know I get that there is a need for an understanding of that but I think, you could, if for example we did the mystery Skype week you know you could teach fronted adverbials if they were saying 'oh we want to, you know, look at writing a, you know, a recount of what we did yesterday', 'okay well let's use fronted adverbials', you know there is a way that you can kind of crowbar in that stuff if it was more free, and the children maybe feel like they had that free choice, even it wasn't as free as they think, yeah I just think it could be a lot different
>
> (Mr Silva, ICT coordinator, Keyston Primary)

However, all the schools felt that they had to 'play the game':

> We've really got to get better at maths. Our maths results were, let us down last year
>
> (Ms Mitchell, Head teacher, Keyston Primary)

> I've got to be honest, it's a tough balance, erm and I think certainly there is a danger that if you bark against it [assessment of individuals] completely that actually you're gonna fail the children ultimately and fail the school because it's important that you keep, you know, you reach the full target for example
>
> (Ms Almasi, Head teacher, Stepside Primary)

> You have to play the game a bit don't you so you have to play the game so you have to jump through the hoops that we have to jump through for SATs but we always have the moral dilemma that that's not what we agree with
>
> (Ms Miller, Glenville Juniors)

It seemed clear that the SATs did directly impact on what teachers taught:

> ...we went on an Assessment Moderation Course last week, the other Year 6 teacher and I. We found out we are going to be moderated for writing. That has changed our view of things a little... so for moderation of writing there's certain objectives that they look at which are not all of the objectives for Year 6, they're the ones that they've decided are the key objectives
>
> (Ms More, Stepside Primary)

However, it appeared that some were willing to go further than others in order to jump through the assessment hoops:

> So we're trying not to do what we don't agree with. So things like the reading test, I know that I could get, for years I taught Year 6 for sort of six years before this um and I know I could get a really good reading SATs result if I give them SATs tests of Reading but um morally I don't what to do that so what we've tried to do is things like we're just launching Kindles at the moment to try to get them to read off different devices, um analysing a text on the iPad, things like that that are different but the same
>
> (Ms Miller, Glenville Juniors)

Accountability, and in particular perceptions of Ofsted requirements, clearly impacted on practice across the maintained schools. For example, in Fairfield Lower teaching assistants were seen taking photographs of children's practical work in both observed lessons, "to document learning" (Ms Smith) and "provide evidence" (Mr Jones). Ms Williams (Fairfield Lower) commented that she thought that all the teachers would like to have less paperwork so that they could focus more on "the actual teaching".

In Glenville Juniors it was clear that being accountable to both Ofsted and Local Authority Inspectors was a major concern and was directly responsible for a reduction in the use of iPads within the school:

> you're playing the balance of the game of what you believe you want to do, what you can do, and what you have to do. So what do I have to get in the books to prove to the government that I'm doing the game they want to do. What is it I believe I should be doing morally, but I know is right, and what can I do with the time constraints that I've got, and you're balancing, it's a balancing act
>
> (Ms Walker, Head teacher, Glenville Juniors)

> I think at the moment thinking about Ofsted and thinking about you know we have to get these things done for standards and for all this kind of stuff um quite a lot of the time it's always as the end of the day make sure you have something in the books and make sure that you have something down and that you can then see what they are doing and how they are doing it.
>
> (Ms Wilson, Glenville Juniors)

> In Year 5 they're doing a big space project {Yeah} … we want, they're doing um reports of astronauts back to NASA and things like that {Yup} they're writing at the moment. What we want to do, is um get the iPads and do some green screening {Yeah Yeah Yeah} um from their point of view as if they're the astronaut in space and report back {cool}. We had the English inspector from [the local authority] in on Friday who looked at our books and we just haven't got, en enough whole pages 'I want children to be writing two pages each day' and the thing is we're in a battle now

> between what we know is morally right that we want to do {Yeah} that you know's rich real purposeful stuff and stuff we've being told has to go in books
>
> (Ms Miller, Glenville Juniors)

In Stepside Primary the head teacher seemed to view inspection differently:

> I knew it [the Ofsted inspection] was going to come, but I wasn't going to do that [change anything about what we do because of Ofsted coming], and I actually banned the word, so we're not allowed to say the word. We know that we're doing the right thing by our children. We know we're doing what we should be doing. They will come in and see what we're doing and I think we should get Outstanding for it.
>
> (Ms Almasi, Head teacher, Stepside Primary)

One aspect of accountability where all the maintained schools had school policies was e-safety. All schools in England are subject to statutory guidance about 'keeping children safe' which includes requirements relating to e-safety (DfE, 2016). Specifically, "governing bodies and proprietors should ensure their school or college has appropriate filters and monitoring systems in place" (DfE, 2016, p.62). These systems must take into account "the age range of their pupils, the number of pupils, how often they access the IT system and the proportionality of costs vs risks" (DfE, 2016, p.62). E-safety is an area that is specifically inspected by Ofsted. As noted in Section 7.3 all of the schools did indeed have filters in place and several schools had used 'walled gardens' to educate their children about e-safety and/or to try to draw them away from using 'real' social media tools such as Facebook. This was one area where schools often actively engaged with parents, for example running e-safety events for them. This was sometimes a difficult balancing act for schools – "it's not for us to tell the parents they [children] can't do it [have a Facebook account]" (Ms Harris, Norgate Primary) – particularly where the school felt that the parents were themselves doing inappropriate things and thus acting as poor role models (as noted for example by the head teacher of Glenville Juniors). Indeed, the assistant head at Stepside Primary explained to one of the researchers on their final visit how difficult he found it, because if he knew the children were doing something inappropriate (such as using software in breach of its terms and conditions or uploading images of themselves to the internet) then he felt duty bound to take action. However, because of the regulations such action was generally counterproductive because it not only didn't help educate the children about how to manage their online presence but also pushed them into hiding what they were doing. He felt the regulations needed to change to reflect the reality of the situation – children were going to use sites such as Facebook and upload material to YouTube, and schools ought to be able to engage openly with them about how to do that in ways that were safe.

Ms Alamasi (Head teacher, Stepside Primary) also commented on e-safety, and more generally about being accountable to parents. However, as with many of the maintained schools, accountability to parents seemed to be less of a concern than meeting statutory obligations. All of the schools had mechanisms for pushing information out to parents, with some going to great lengths to make information, particularly about things their children had done available to parents. For example, Mr Baker, the assistant head at Stepside Primary, explained how they had carried out a survey of parents (in the run up to an e-safety parents' meeting), to find out about their Internet access at home:

> We know 97% of our families have access to the internet, from whatever way that is they are accessing. Some of it is through their mobile device, some are through the tablet, some are through their neighbour's broadband. That kind of thing. So they have ways of getting on-line. So we know that when we communicate stuff to them, we know how many are getting text message
>
> (Mr Baker, Assistant head teacher, Stepside Primary)

Stepside Primary communicated with parents through a range of channels, including:

- every Monday a newsletter was published digitally on-line, on paper and a text version was provided on the website so that parents could use Google translate to translate it into their home languages

- every Friday they sent a 'Help at home' text message to tell parents what the children were learning the following week
- uploading content to the school website, such as videos of every class assembly and PowerPoint presentations to help parents understand how children were taught in the school
- using Facebook, Twitter, Instagram, and email

However, despite this, parents who were interviewed seemed to have little idea about what their children did with ICT in school and, even one of the parents who was a school governor didn't seem to think it was her place to find out:

> I think it's good that there's, that the ICT is in the classroom, it's not like there's a separate place for it, it's in the classroom and I think there's electronic white boards and so if the tablets they use and things, yes seems to, I suppose, I don't know what happens exactly in the classroom obviously, and it's not my place to come and barge in and have a look
>
> (Daniel's mother, Stepside Primary)

Carers from Keyston Primary who were interviewed seemed to have equally little idea about what went on in school. Similarly, there was little evidence of carers from Village Primary knowing what their children did in school, although the school kept in touch with parents frequently via Twitter and Facebook and said that there were frequent opportunities for parents to come in to school to take part in various aspects of school life such as maintaining the school grounds and curriculum-related sessions (e.g. assessment evening).

Some of the maintained schools seemed to deliberately try to keep parents at arm's length. For example, the head of Fairfield Lower said that parents had to leave their children in the playground but could talk with teachers at the start or end of the day in the playground or could leave a message at the school reception. She noted that there was "limited parental involvement' in classes. Glenville Juniors went further and didn't allow parents into the playground, though they could go to the school reception to leave a message for a teacher (with an expectation that the teacher would phone them within 24 hours). Glenville Juniors had also replaced parents coming in to school for assemblies with listening to radio shows that the children produced instead. Glenville Juniors appeared to have almost no parental involvement in classes. However, the head said that this reflected the fact that her parents were so busy and that she had tried to increase parental involvement in things like parents' evenings for example by offering that they could attend via Skype.

In contrast Norgate Primary had what the head described as "a very public open door approach". Like Stepside Primary they used a range of media to communicate with parents:

> We text, we write, we use the website. We try and phone them, we do a lot of, if the child has for example behaviour issues we do lots of postcards home, phoning up for good things as well as bad things, so we try and do as much as possible. You can always do more, there's always- oh and we do an annual survey, in addition to an Ofsted type stuff, the parent view, we do an annual survey, and that feeds in to what we do the following year. It's just a continuous cycle …
>
> (Ms Clarke, Head teacher, Norgate Primary)

The deputy head of Norgate Primary also, independently, talk about wanting to create an atmosphere of trust and involve parents. This seemed to be reflected in actively encourage parents to come into school, at least in the early years at the end of the school day:

> … in early years they bring all the parents in and teach them how to use the blog, so we do a blog lesson for parents because they're four/five year olds, their parents are collecting them at the end of the day, so instead of them waiting outside, we open the door and bring them in, and say look this is the blog on the interactive whiteboard, this is what you do, it's not hard, your children can do it.
>
> (Ms Clarke, Head teacher, Norgate Primary)

In practice, it appeared that for most of the maintained schools the focus was on accountability to officialdom rather than to parents. There was little discussion of being explicitly accountable to children, though it was clear that most of the teachers were deeply committed to doing the best that they could for their children within the constraints within which they had to operate.

Overall, it was clear that for the maintained schools the externally defined curricula, assessment and accountability regimes played a major role in shaping the school arena in ways that constrained teachers' pedagogy. Indeed, these three interlinked aspects of the constitutive order seemed to be largely responsible for the lack of alignment between teachers' pedagogical practices and children's out of school digital practices. They also clearly impacted on the ways in which teachers used ICT. However, given the variations in use of ICT within individual schools, it seems likely that other factors were more important in influencing the use of ICT in school by children.

9.2.2 Curriculum, assessment and accountability in independent schools

Even though not required to do so, all of the independent schools, used the National Curriculum to some degree as evidenced by their websites as well as comments such as these from Riverview Prep:

> We don't have to do the national curriculum, but stick pretty close to it
>
> (Mr Wilkinson, Head teacher, Riverview Prep)

> So I can cover, I cover the national curriculum. As a starting point, because why not. {Yeah} It seems to make sense. And, and, and the advantage of that kind of go with the national curriculum is that there are lots of supporting, there's lots of, there's lots things to support it {Yeah} whether it be on-line or off-line, or wherever.
>
> (Mr Phillips, Riverview Prep)

However, they generally aimed to go beyond the national curriculum:

> We have a very simple mandate, which whether it was handed to me, or whether I created, or whether we just agree it with the Headmaster, was let them leave here enjoying science. {Ok} Create an interest… and I have a sort of wide mandate
>
> (Mr Phillips, Riverview Prep)

The children in the two academies were required to take SATs (in the same way as in the maintained schools), and this equally seemed to impact on their practices:

> but there is just that constant kind of assessment of reading. And they want to move up. They're all 'Can I try a gold now, or can I try' and it would be the same for maths. Well it will be the same for most subjects. But definitely for reading, we're really on top of that, and for literacy and maths. So there'll be constant assessments, I won't say constant assessments, that's probably the wrong word. But we are {You're monitoring them} monitoring, that's the word I was looking for yeah. So we monitor their progress constantly, and then we're probably looking at each class with two TAs, so if there's one group you're a little bit worried about you can concentrate all your focus on that group and then two TAs can take the rest of the class.
>
> (Mr Murphy, Holme Infants)

The children in the two private schools did not have to take SATs. Riverview Prep had engaged with SATs in previous years but had decided not to do so in future:

> So as of, so as of last, up to last year, [teachers of] maths and English were having to go through their SATs prep, preparation, and shooting themselves in the head, I suspect. {Yeah Yeah} Certainly, I mean maths, SAT's, no that's not entirely true. SATs preparation in maths is just maths {Yeah yeah} it doesn't matter. SATs preparation in English {There's a lot of stuff} is, is, is a lot of, is a lot of exam prep and not a huge amount of actually developing their English
>
> (Mr Phillips, Riverview Prep)

However, that didn't relieve the pressure on the teachers to assess their children, though it seemed that at least some of the staff had had the opportunity to input into the new assessment criteria:

> **Ms Phips**: Yeah well depending on what head office kind of want us to do.
> **Ms Peak**: So the new assessment thing we're following we've got key performance indicators. So we have devised it with the other [schools in the group] of what children should be able to achieve by the time they've left a year group.
>
> (Riverview Prep Staff interview)

They went on to explain that they had to do a baseline assessment at the start of the year for every child in each year group, and then half-termly assessments for maths and English, with a main assessment at the end of the year. The data from this was sent back to 'head office' so they could monitor how well each of the schools in the group were doing. Mr Ryan commented, "I don't feel under pressure, apart from getting these assessments done". Indeed, the general ethos in Riverview Prep seemed to be much more relaxed with teachers given considerable freedom to decide what to teach and how to teach it:

> I don't feel under pressure that I should be doing things. No one's going to come why are haven't you done this or why haven't you done that? So I don't really feel any constraints to what I'm teaching
>
> (Mr Ryan, Riverview Prep)

Ms Peak echoed this sentiment:

> We're given the freedom to try things that we want to try, and no-one ever says oh no don't try it. There's the opportunity there. I mean you might succeed, you might fail, but no-one's going to blame you if you've taken a class outside the classroom and a lesson didn't work
>
> (Ms Peak, Staff interview, Riverview Prep)

Similarly, in Riverview Prep the staff felt under much less pressure to provide a paper trail of evidence for the benefit of inspectors and said they were happy storing work digitally:

> **Researcher**: Does it matter that it's on there [an iPad] rather than on paper?
> **Ms Proctor**: To us no.
> **Ms Peak**: No, I mean we print it off or stored on Showbie.
> **Ms Whitlock**: There's this database called Showbie {Yeah} so, if any asked what did you do in this lesson we can show them all the pictures, the video clips the explain everything activity.
> **Ms Peak**: It's all in one place for the child. The class or the year group.
>
> (Riverview Prep Staff interview)

Mr Phillips, the head of science, whilst agreeing that they were under less pressure to provide evidence for external inspectors, noted that he needed to monitor the science work of all the children in the school, and expected to be able to do that by collecting in their exercise books:

> Whilst we are lucky in a, in a private sector that we're not quite, well nowhere near going through the same sort of hoops and requirements to assess and prove our assessments and all that sort of stuff for the pupils, the reality is, me as a, as a department head, or [Name] as a head, head, have to be able to assess what's being, what's being done, what's being produced and what's being learned. And the, and the easiest way to do that is to, is to have the key learning areas, and the key stuff being put into these books, into the hard copies of the books
>
> (Mr Phillips, Riverview Prep)

In terms of accountability to parents, the two academies seemed to attempt to engage with parents more than some of the maintained schools. Park Primary talked about the difficulties

that they had had in communicating with parents because they tended not to have email addresses and frequently changed their mobile phone numbers. They had tried to set up email addresses for parents, but that was beset by problems. They had found that using Twitter was the most effective way to communicate though it had had limited take up. Park Primary were in the process of creating a 'flip learning' page on their school website, and were running workshops each half term so their parents could come in and work with their children, with the aim of showing them how they could support their children at home. Holme Infants provided a full-time parent support advisor and a dedicated space within the school for support work to take place. They had also run workshops aimed at equipping their parents to support their children's learning. This more inclusive approach to parents seemed to be reflected in the comments of one of the four carers, though it seems unlikely that all of the parents could be accommodated in this way:

> **Jackson's mother**: I will come in and then I will speak to the teachers. If I still don't understand, I will say to [the head who she calls by his first name] I'm struggling here with this and that, what should we do? So he goes all right, come in maybe tomorrow at 10.00am. I'll come in. He'll do photocopies for me. I'll bring in my little pad and pen.
> **Researcher**: Lovely.
> **Jackson's mother**: Yes. And he'll put it up on the screen and explain what they are doing now; how I can help. So I'll sit down with him and we'll go through it so when I go home I'm more equipped to understand what he's doing.
>
> (Jackson's mother, Holme Infants)

The private schools had what Ms Gupta described as "different service expectations", and this permeated much of the provision in Riverview Prep. Indeed, Riverview Prep seemed to have an open-door policy, and parents were in evidence in the school lobby area and/or hall at different times of day on all of one of the researcher's visits to the school. As noted in the teacher vignette (Section 5.3) parents of younger children were more likely to come into school than those of the Key Stage 2 children. As seemed to have been the case with most of the study schools Riverview Prep communicated with parents electronically. In contrast to teachers in most other study schools, Mr Ryan had given out his email address to the parents of children in his form group.

Both private schools (Coast Prep and Riverview Prep) had 1:1 iPad provision. In Coast Prep the iPads were kept in school, whereas in Riverview Prep the Year 5 and 6 pupils were allowed to take them home. This had caused some issues with parents, which had contributed to the school placing tighter restrictions on the iPads and the available apps. The Director of E-Learning in Riverview Prep had also responded to these parental concerns by writing a 56-page booklet on digital parenting. Whilst the head teacher in Riverview Prep felt that they had become too fixated on Internet safety, the Director of E-Learning, who was ultimately responsible for the school meeting its statutory requirements in relation to e-safety explained why they had imposed strong internet filters and monitoring, and restrictions on the iPads:

> We have [had children accessing inappropriate material], and then what happens when you have a lot of parents coming to the door and saying, not that this has happened but it's not safe in your school. We have that too. And then you've got these inspectors who come on-board and say yeah your WiFi filter's completely open or you don't have enough controls for instance, and therefore you don't pass your inspection for instance.
>
> (Ms Tomar, Riverview Prep)

Overall, as with the maintained schools, the curriculum, assessment and accountability played a major role in preventing teachers' pedagogical practices aligning with children's out of school digital practices. In the case of Riverview Prep accountability to parents played a greater part in this than accountability to the inspectorate. In line with the maintained schools, the variability in levels of use of ICT within individual independent schools suggests that factors other than curriculum, assessment and accountability were important in influencing the extent to which ICT was used in schools by children.

9.2.3 Curriculum, assessment and accountability in Scotland

Byrne Primary, which was in Scotland, followed the Scottish Curriculum for Excellence. This is radically different in design to the English National Curriculum, placing much greater emphasis on and integration of all aspects of children's learning, not just traditional 'subjects'. Thus, for example, it defines curriculum as "everything that is planned for children and young people throughout their education, not just what happens in the classroom" (Education Scotland, 2016a) and whilst placing an emphasis on literacy and numeracy, it highlights pupils' wellbeing as being critical, placing it on a par with literacy and numeracy. In stark contrast to the English National Curriculum, which places a heavy emphasis on books (not texts), the Curriculum for Excellence defines literacy as:

> the set of skills which allows an individual to engage fully in society and in learning, through the different forms of language, and the range of texts, which society values and finds useful
>
> (Education Scotland, 2016b, p.3)

This provides far greater scope for the incorporation of ICT into teachers' pedagogic practices in schools in Scotland than is the case for the English National Curriculum.

The guidance on how to implement the Curriculum for Excellence places an emphasis on relevance and pupil choice. Thus, Curriculum for Excellence aligns more closely with constructivist and social constructivist views of teaching and learning than the English National Curriculum. This is reinforced by the absence of annual testing for all 11 year olds, as happens in England. Instead, the Scottish system relies on teachers' assessments which are enhanced by "quality assurance and moderation approaches which supports a shared understanding of standards and expectations" (Scottish Government, 2017). Learners towards the end of primary school develop a profile, with the help of teachers, which aims to be "a summary of the learner's best achievements both within and outwith school and a statement of the skills developed by the learner" (Scottish Government, 2017). This is complemented at the national level by a 'sample based survey' that monitors performance in literacy and numeracy in alternate years at P4 (Year 3) and P7 (Year 6). This survey includes questions for pupils about their attitudes and experiences in class (Scottish Government, 2017). Similarly, the inspection system, aims to be more attuned to enhancing school improvement than the system of Ofsted inspections in England. For example, schools can negotiate one of the quality indicators that the inspectors will use, in order to "bring about improvement through professional dialogue" (Chief Executive of Education Scotland, June 2016).

It is perhaps not surprising therefore that neither the head teacher, nor any of the other staff or children interviewed flagged up the issue of the curriculum, assessment and accountability as being major barriers to teaching in the ways that they felt were most appropriate and effective. Indeed the only reference to summative assessment noted by the researcher was a comment about having moved from paper to digital journals for logging children's progress.

However, there was good evidence that the staff in the school had a very different view of the relationship between the school and home than had been evident in either the maintained or independent schools. As was the case in all the schools when talking about children, Byrne Primary didn't frame their relationship with parents in terms of keeping them informed or being accountable to them. Instead they talked about being inclusive, supporting their learning, and being at the heart of the community:

> It's being inclusive of the parents, it's not just about being used for social media it's about seeing the potential of what there is and that the community we live and work in – we have a range of social classes, a range of what they have at home, but making sure that ALL of them have as many opportunities and chances that are the same and also building that knowledge for the parents as well. That home-school thing is only going to work if they understand, that the GAFE [Google Apps For Education] platform it's not about if you can't afford it, it's just there, and you've all

> got the potential to interact with it. It's trying to ensure that parents, who are never going to move as quickly as their children, but they're moving with us. …
> We have to help parents get over their fears, and whilst lots of them use, they're maybe not realising what they are actually they are able to do, and that's a huge thing … It's changing the dynamic how we as staff and a set of teachers actually work with the parents
>
> (Ms Douglas, ICT Coordinator, Byrne Primary)

The school ran fortnightly ICT training sessions in which parents could use the Chromebooks and extend their ICT competence. These were reportedly well-attended, particularly when parents were given the opportunity to work with their children on an ICT-based task. The school reported that this provision was being expanded as they increased the number of Chromebooks throughout the school.

The nature of the relationship with at least some parents did seem to have changed, with evidence of increasing engagement and dialogue (not just one way information transfer). This was evidenced for example in the comments that parents were leaving on their children's online portfolios – of the entries that the researcher observed most typically had 10-15 reads and up to three comments. The four carers who were interviewed agreed that the school was good at keeping them informed of issues about the school generally and about their individual children. The school Facebook page was clearly very active and well-used, and the carers seemed to feel that they knew what was going on:

> I like that you always know what's going on. It's not like it used to be when I was at school, I never gave my mum letters about anything. She knew nothing.
>
> (Isla's mother, Byrne Primary)

Overall, it seemed that the curriculum, assessment and accountability were less important factors in constraining Byrne Primary than had been the case in any of the other study schools. There seemed greater scope in Byrne Primary for their teachers' pedagogical practices and children's out of school digital practices to become aligned than was the case in any of the other schools. However, there clearly were additional factors, beyond the curriculum, assessment and accountability that were inhibiting this alignment as well as restricting use of ICT per se by the pupils in school. Some of these potential factors are considered in the following sections.

9.3 Educational Vision

In the main heads were clear about their educational visions, and could summarise them, for example:

> we want every child to play their part and do their best. Every child to be the best they can be, which is, every schools got those.
>
> (Ms Mitchell, Head teacher, Keyston Primary)

> … our vision of the school is for a place, a secure place where children enjoy learning and really reach their, you know, full potential.
>
> (Ms Bennett, Head teacher, Park Primary)

Though sometimes the visions were not expressed so succinctly, for example:

> … my vision for the school is that we, you know, that I, or we, make sure that we produce children who are ready to go out into the world and that they have all, you know, everything that they need to equip erm, themselves in the world, erm everything that they need to do the very best they can, everything that they might not know that they can do, that they've had an opportunity to explore and actually go out of school having a kind of, a tenacity for learning, erm and trying new things and doing new things. Erm, I think that's our kind of role really
>
> (Ms Almasi, Head teacher, Stepside Primary)

> … every child who comes to us will be given the opportunities to develop the, the vital things of, in my view, which are long-term, skills to give them, the, the sort of possibility and motivation to be successful in the long term, and to have the kind of facilities and the skills in the staff, the quality of teaching and the quality of experience that enables anybody who comes to us to go to the next stage of their education and, and be ready to do it and be successful. But to know themselves and care about others, self-esteem, and self-motivated I suppose and to be mentally and physically prepared for a healthy life
>
> (Mr Wilkinson, Head teacher, Riverview Prep)

or came from the school prospectus or a poster on the wall:

> In this school we believe that each child should have the opportunity to shine by inspiring excellence and nurturing resilience, whilst developing creative thinkers in a community of mutual respect and aspiration
>
> (Highden Primary School prospectus)

Often the vision was encapsulated in straplines or catch phrases such as:

Building foundations for the future

Unite – inspire – excel

Small school. Big future

Adventurous learning

Always be curious

Byrne Primary was the only school that explicitly talked about their vision, values and aims having been developed with input from pupils, staff and parents, and they noted that they would continue to consult with pupils and involve them in the decision-making process. Their vision statement read:

> Working together as a community to:
>
> Aim for excellence
> Be friendly, enthusiastic and resilient learners
> Challenge, inspire and achieve
> Develop the skills for learning, life and work
>
> (Byrne Primary School handbook)

Glenville Juniors's vision was slightly different, in that it seemed to focus less on achievement, and more on the process of learning and coming to know your place in the world:

> So our vision is I want people to learn with and from each other, and I want them to be respectful with and from each other, I want them to hold views, with and from each other.
>
> (Ms Walker, Head teacher, Glenville Juniors)

In most cases heads talked at length about the values underpinning their vision and made explicit links between those values and their pedagogic practices:

> We have, I know it's on our school website, we have this, you know, everyone's good at something, you know, a talent and its, for us as a school to develop and nurture that and support children, you know, with their strengths and allow them to develop but also then support them with their areas of development and make them, you know, as much as we can become strengths for our children. We believe very much in the pedagogy of teaching. As a school we really look to how, what makes good teaching and how as a professional, you know we are all learners, how we can develop and refine our teaching practise to have the best impacts on our children's outcomes. As a school we have core values and as a trust and our trust is called [Name of trust], …we have 'proud to be me', 'enjoy learning', 'achieve success' and 'respect for the world'. So those are our values and our ethos of the school that's gone right through the school at you know, governor level, senior leadership levels, right through to the children and all classes have displays and they do work around those core values and I suppose they are, they are our centre. I suppose if you, we have, do you want to show you my tree. Okay so this is our tree really for how we see teaching and learning within our school and how we teach children to learn. So it's a symbol of a tree, it's not [laughing], it euphonic, yeah, voluntary [laughing]. So at the bottom we've got our personal development. Our children, a lot of our children, you know, have social emotional difficulties, you know, we have a percentage of children who struggle with attachments, you know and they have you know high anxiety levels but also self-esteem and confidence issues so I would say one of the biggest strengths of our staff is their relationships with the children, the ability to, before you can go anywhere with the children, we need to get those relationships right, we need to develop our self-confidence in the children, their self-esteem and their self, you know their self-worth. So that's at the heart of us, that's at our roots that we all make sure that that happens. We then look then at our curriculum and our curriculum needs to be you know, engaging for our children but also aspirational and showing them the wider, you know, options for them. So we have ambitions week every couple of years where we have people from all walks of life come in to talk to the children about their careers, about their life journeys. Well as you say we go on, we value trips and experiences, we go on outdoor residential trips, right through Key Stage2, you know, we try to make our curriculum relevant and personal to the children and purposeful, you know, especially like writing for instance. It's very hard for children to write about something when they haven't had experience of it, so we really build in a curriculum that's you know all encompassing as much as we can and then we go to

> our teaching and learning and at the heart of that really is three main areas as a school that we believe we need to work on teaching them to enable the best out of our children. So the first is matched learning, so making sure our learning is matched to all individuals. So this is through the technology, through flip learning, so enabling teachers to come away from that, you know, standing at the front of the room delivering to thirty children but having groups that you know, are working independently from the off, you know, it's a fluid learning approach that would make you move round groups. Our teaching assistants will lead a group. So the learning is match, it's not taught to the activity that you know, the national curriculum states, its where those children are now, what do they need to know next and that could be different, you know for a number of groups in that classroom or individuals. … So that would then lead into our feedback, so looking at how we provide feedback to children, not as a bolt on, you know at the end of the event through marking, but actually how can we build opportunity for feedback during lessons and how children can engage with that feedback to make progress with their learning and then our speaking and listening, so how can we ensure that we develop high quality speaking and listening for all our children across the school and because we believe that that will have a direct impact into their writing, you know, when they can form sentences correctly orally and you know they've got a better chance of doing that you know in their work but also being able to communicate, will know how to communicate with different people. So you know in a formal context, in a social contest, you know, it's all those, you know, it's all those skills that the children will need, life skills really to help them develop further. So that's sort of our tree.
>
> (Ms Bennett, Head teacher, Park Primary)

It was clear that, as indicated in the previous section, there was often a tension between their values and vision and the externally mandated curriculum, summative assessment and accountability requirements. For example, in Glenville Juniors, where the head teacher was clear about the need to find and nurture each child's individual passion and strengths, and provide authentic and relevant learning experiences:

> David Beckham had a passion. He couldn't even string a sentence together. And through his passion, he learnt to speak, to write and to present, and to, to be better for it, to gain confidence through what he could do, but what he was able to do was through, through something he was passionate about, and I really believed, as somebody that was told, I could never do anything, because I was an army child all this rubbish, that if you're passionate about something you will achieve. So you've gotta find what that person's passion is, and then they will excel. … So if you can get the children to say what they're good at, and if you can give them their head, and they will lead you. And you can't be frightened by it, or think they can't do it. My job is to find a way round it …
> So my vision is about learning with and from each other. It's about inspiring, having real audiences for learning …
> So real audiences for learning. Active {Yeah} Active. Real relevant and motivating. Okay, nothing to do with a SAT

However, she also had very high expectations of children's performance:

> So pragmatically, whatever anybody tells you, it sounds cynical but this is true. Only the scores on the door that is important, and I can play that scores on the door game, but actually developing a whole child is more important and you can get any child through a system and they can learn nothing.

In practice, it appeared that achieving the scores on the door took priority over her espoused vision much of the time, at least from the perspective of new staff. Thus, for example, staff were expected to carry out detailed feedback marking, writing comments on every child's work, which the child then responded to, and the teacher then commented back. Whilst this didn't have to be done on every piece of work, it clearly took many hours of teachers' time, often leaving little capacity to do other things. It also seemed clear that meeting the learning

objectives in the lesson plans was more important than following children's interests, as evidenced by this interaction with a member of Glenville Juniors' senior leadership team:

> **Researcher**: If it started to snow would you take all your class outside to play in the snow
> **Ms Miller**: If I look back from when I was an NQT as, well I did stuff on teaching practice but I didn't really realise, it wasn't your class, you weren't responsible for their data, {yeah} so you used to have, I used to do some things, when I look back I think why did I do that? That was fun, they didn't learn any not that they always have to learn, you go out in the snow not learning are you you're playing, which is lovely [laughs] we always would like to do that, but some things, I look back and I think, I did that but I don't know why I would do that, but anyway, and then when you actually become responsible for the class and someone is like well why haven't [bangs table] they made progress. Oh god! I shouldn't have done that, I should do this.
>
> (Ms Miller, Glenville Juniors)

Overall, it was difficult to unravel the sometimes internally inconsistent claims that heads made about their school's vision, values, beliefs and practices, yet alone draw out important distinctions between them for ICT use. All of the schools were concerned with 'maximising every child's potential', though they sometimes didn't phrase it in that way. Most of the heads talked about starting with the child's interests and about developing children's independence, though there was a lack of clear evidence of this was happening in practice much of the time. They all talked about the importance of engagement and motivation, and often saw ICT as being one way of ensuring that. They all saw their role as preparing their pupils for their future lives, which again often linked with using ICT. What was evident, was that all of the heads said that they saw ICT as being a priority, but had made different choices about the most suitable ICT strategies to pursue.

9.4 ICT strategies

All of the schools had adopted different ICT strategies, though they had all invested in at least one class display in each classroom and sometimes in other teaching areas too. Table 9.4.1 provides a summary of the ICT provision in each school. It is clear from the table that schools had very different levels of provision, reflecting different priorities within the senior leadership team:

> Really important [to have the backing of the senior leadership team] because at the end of the day, technology in this school, the biggest issue and hold back to technology in the school is money. It's expensive. And I'm the one with the budget. At the end of the day if you're the Head Teacher and you don't really care about it, you won't put any money into it. I put tons and tons of money into it.
>
> (Ms Mitchell, Head teacher, Keyston Primary)

Table 9.4.1 ICT provision in the study schools (excluding class displays and associated computers)

	ICT Suite	Shared	In each class
Byrne Primary	No	F-Yr3 50 laptops Yr4 to Yr6 >1:2 ratio Chromebooks	
Coast Prep	Yes		1:1 iPads kept in school
Stepside Primary	No		Yrs1/2 1:3 ratio laptops Yrs3/4 1:2 ratio, iPads & laptops Yrs5/6 1:2 ratio iPads + 3 Touchscreens
Riverview Prep	Laptops		Yrs 1/2 Class sets of iPads Yrs 3/4 1:1 iPads kept in school Yrs 5/6 1:1 iPads taken home (loan)
Norgate Primary	No	Netbooks ½ day per week in each class	8 iPads per class
Keyston Primary	32 touchscreen PCs	Yrs 1/2 16 laptops per 2 classes Yrs 3/5 16 laptops + 8 iPads per 2 classes	Yr 6 1:1 Windows tablets + 6 iPads
Holme Infants	No		1:3 ratio of iPads (+ various laptops) 5/6 built in PCs
Highden Primary	29 PCs	16 iPads across school, timetabled for half day per week in each class 16 iPads across school, bookable for minimum of 1 week	2 PCs
Glenville Juniors	15 laptops +++	35 iPads per 3 classes 4/5 PCs per 3 classes 2 sets of 15 laptops across school	BYO iPad
City Primary	No	20 laptops + 16 Macbooks + set of iPads + a few laptops in corridors between classes	
Park Primary	No	1 set of iPads and 1 set laptops timetabled in classes	5 iPads
Village Primary	16 PCs		Yrs1/2 1 iPad Yrs 3/4 2 iPads Yrs 5/6 3 iPads
Fairfield Lower	15 PCs	15 iPads and 14 laptops across school	1 PC per class or 2 (in Yr4)

Investment in ICT in Keyston Primary included investing in a full-time network manager:

> he's [the full time network manager is] absolutely key to our success in technology, because I can have all the most wonderful kit and tech in the world, but if the staff don't know how to use it, or its unreliable, it doesn't work, that's the end of the world then isn't it? That's it. So, but my staff wouldn't use it, because there is someone

> here to come to and phone, we've all got, everyone's got a phone in their classrooms and [Name of network manager] on the button. So you press it, [Name of network manager], I'm just doing this and it hasn't worked, and he'll, be with you in two minutes. And he's in the classroom and he makes it work, because it's got to work. It has to work, otherwise you won't use it, you won't be brave enough to take risks …
> (Ms Mitchell, Head teacher, Keyston Primary)

Several of the other schools, including Holme Infants and Glenville Juniors also employed full time ICT support. In Riverview Prep this included a team of staff, led by the Director of E-Learning, and including several technical staff who worked across the prep and senior schools, with at least one ICT support person on the prep school site at all times. The technician in Glenville Juniors managed all of the ICT resources, including setting up the IRIS Connect cameras in classrooms and helping with the technical aspects of running the radio station. Other schools, including Norgate Primary and Highden Primary, had remote or onsite technical support available throughout the day. In some schools, such as Stepside Primary, the teacher responsible for ICT did not have class teaching responsibilities, in this case because he was the assistant head.

Not only did the level of resourcing vary but so did the model of provision. Several of the schools retained ICT suites with sets of desktops, or in the case of Riverview Prep with more flexible provision of laptops. There seemed to be three main reasons for having an ICT suite. Firstly, to study computing:

> So every child has computing, we have what we call our computing curriculum. And they all go to the ICT room. There's a big focus on online safety etc. … So we have a timetable, a lesson slotted every day for every year group in terms of computing.
> (Ms Tomar, Riverview Prep)

Secondly, to learn how to use specific software that they will then use across the curriculum in their other lessons:

> They learn the various tools that not only will they use in computing itself but also in classrooms. So that way when they go into the classrooms and they're doing things with their teachers, particularly also the teachers are teaching them how to use the tools they've already learned it in the computing lessons.
> (Ms Tomar, Riverview Prep)

> I still quite firmly believe that children need to be taught, they will learn some things, just because they learn from each other, they learn all sorts of things, but there is some things that it is best to teach them. And I think that it's, if you want them to be able to use an animation to show how much they understand about their science growing topic, you've got to make sure they understand how to use the animation software. If you want them to use some, an App to do something you need to show them how to do it. Whatever you want you still need to show them
> (Ms Mitchell, Head teacher, Keyston Primary)

Thirdly, to use software in support of subjects other than computing, typically 'educational games' that are being used as Support (on the Mode dimension of the ICTIF – see Section 4.5):

> then in the afternoon we're down in the ICT suite doing Lexia which is more spellings, grammar, type stuff
> (Ms Griffiths, Keyston Primary)

Riverview Prep aimed for their ICT suite to become more of a media lab:

> And when I say ICT room it's not a room full of desktops. We have now got laptops and they're kind of put away, but when they need to bring it out they bring it out. They all have their iPads, so it's quite a flexible project based learn maker room. In there they learn things about computing, the computing side of things, programming.
> (Ms Tomar, Riverview Prep)

Glenville Juniors had also done away with their ICT suite and replaced it with a large flexible media room, which included: 15 laptops, 3 stand up PCs, a CTouch (large touchscreen that could be vertical or horizontal), games consoles, 3D printers, a green screen, a wall you could write on, banked seating, small tables that could be moved easily by the children and configured in a variety of ways, and a wide range of peripherals. This was also where the ICT technician was based.

Fairfield Lower and Highden Primary had one or more desktop PCs in each class. Glenville Juniors had a cluster of five or six PCs in the shared areas between classes. These appeared to consist of older equipment reflecting a previous model of ICT provision. In contrast, Holme Infants had invested in five or six PCs built into the desks in many classes. These appeared to be used primarily in ways that would be described as Support on the Mode dimension of the ICTIF. Mr Davies, one of the teachers in Holme Infants explained that 'the desktops' were often used to play 'educational games':

> There's such a range, so for a phonics lesson, if you want them to learn frequency words we might have a word program and they just have to type a word, read the next box, move to the next one, type it, so it's just very repetitive, but also on, the tablet we normally play a loo roll, so the loo lifts up and it says the word, and it shuts, and they have a line of letters and they have to choose the right letters to spell that word, and they flush the loo if they get it correct. For maths we have maths ace games, and there's hundreds of games on there, which ask the children to do one more, one less, two more, two less. Times eight. Maths is more animated, there's a chicken or a dinosaur, and they have to help the teddy bears, and it's a lot more visual, whilst maths space, is just pictures, I'd say it's less interesting, but they love doing Mathspace as well
>
> (Mr Davies, Yr1, Holme Infants)

This was further evidenced during one of the observations of this class, where all the children were in different groups doing writing activities. The children on the built-in PCs had a word document on their screen with a table in which the words 'we, pull, yes, ran, water and people' were listed in the left-hand column with 5 spaces on their right for children to type each word 5 times. They worked in pairs, taking turns to type the words.

The majority of schools had or were in the process of moving towards using mobile devices. For example, the head of Fairfield Lower said that buying more iPads was one of their priorities in this academic year; the head of Village Primary said they had planned to buy more devices, but had had to spend the money on repairing the school roof instead; and during the data collection in Keyston Primary a further 75 iPads were delivered to the school (these are not included in the figures used in this report as they had not been set up during the data collection period). The mobile devices that schools were buying and the ways in which they were being deployed varied considerably (as illustrated in Table 9.4.2).

All the schools had WiFi throughout the school building, and often across all the school grounds. Connection speeds were up to 100Mbps, with some schools having considerably less than that. However, in most cases staff and/or students complained that the WiFi was not adequate, particularly at points, such as early in lessons, when lots of classes were trying to access the Internet simultaneously.

Table 9.4.2 Type and distribution of mobile devices

		Netbooks/Laptops	Tablets
School Sets	**timetabled**	Norgate (1 set netbooks) Park (30 laptops)	Highden 16 iPads
	bookable	Fairfield Lower 14 laptops	Fairfield Lower 15 iPads
		Byrne F/Yr3 50 laptops per 4 classes Byrne Yrs 4/6 >1:2 ratio Chromebooks	Highden 16 iPads (minimum 1 week)
		Glenville 2 sets laptops	Glenville 35 iPads per 3 classes
		City 20 laptops+ 16 MacBooks	City 1 set iPads
		Stepside Yrs1/2 1:3 ratio	Stepside Yr5/6 1:2 ratio iPads
		Stepside Yrs3/4 1:2 ratio laptops or iPads	
		Keyston 16 laptops per 2 classes	Keyston Yrs 3/5 8 iPads per 2 classes
,Class set (per class)		Holme Infants (some laptops)	Holme Infants 1:3 iPads
			Norgate (8 iPads)
			Riverview Yrs 1/2 1 set iPads
			Keyston 6 to 8 iPads
			Park 5 iPads
			Village Yrs 1/2 1 iPad Village Yrs 3/4 2 iPads Village Yrs 5/6 3 iPads
Individual devices			Coast Prep 1:1 iPads (school)
			Riverview Yrs 3-4 1:1 iPads (school) Riverview Yrs 5-6 1:1 iPads (home)
			Keyston (1:1 Android tablets in Yr6)

Park Primary, who didn't have an ICT suite, timetabled the use of their 30 laptops to teach computing:

> Yes, so because we've got these three classes in Year Three, once they roll through and we are back to two form across the school, we'll have a spare room. So my vision is at that point we'll have a lovely computer room put in, need to start saving for it really but until that point we need to make sure those skills are not dropped and then I think that I've been to schools who've just got iPad and you know, that's the only device, they use that for the whole of their curric, you know, their computing curriculum and I suppose [the Deputy] and I are both of the opinion that children need to have a range of devices, you know and that's why I think it took us so long to go down the iPad route because we value the use of a laptop, we value the use of a computer and again, you know, it's different and I think as a school were at a point where we're learning to adapt without a computing, a computering but it's also making sure our, I think we're very good with ICT across the curriculum but I think where we are is looking at how we teach the computering side of the curriculum.
>
> (Ms Bennett, Head teacher, Park Primary)

There were differences between the schools that had bookable sets of devices, which seemed to be related to the number of devices. Thus, as in Fairfield Lower, where there were relatively few devices, they were bookable across the whole school. Highden Primary, which had one set of iPads timetabled in each class for half a day per week, recognised that effective use of the iPads often required a longer time frame, and so they had an additional set of iPads that was intended to be booked for a minimum of one week at a time. In schools with higher device to pupil ratios the devices tended to be shared within a year group. Thus the booking was less formal in that two or three teachers would negotiate between themselves who was having the devices at different times.

A number of schools, shared Park Primary's view that it was important for children to experience multiple devices. Stepside Primary organised their resources so that as the children moved through the school they would have different opportunities, spanning both form factors (e.g. laptops and iPads) and operating systems (e.g. Windows and Mac) and hence applications. Their deployment was deliberately organised so that teachers within a year group could potentially have 1:1 access to a set of devices at least some of the time.

Many of the schools appeared to desire to move to 1:1 provision, and were gradually increasing their supply of devices. In two cases, Glenville Juniors and Holme Infants, the schools had set up purchase schemes to help parents buy devices, which could then be used at home or in school. In both cases these schemes appeared to have been discontinued, though Glenville Juniors continued to operate a Bring Your Own iPad strategy. Whilst many of the children in Glenville Juniors had a 'school iPad' (over a third according to the staff who were asked about it) far fewer brought their devices in to school each day.

In the majority of the schools that had multiple sets of devices and/or devices dedicated to each class (i.e. Byrne Primary, Village Primary, City Primary, Stepside Primary, Riverview Prep) older year groups were allocated more devices. In Keyston Primary the Year 6 classes had 1:1 Android tablets plus 6 to 8 iPads. In Riverview Prep, whilst all the pupils in Years 3 to 6 had a dedicated iPad, the Year 5 and 6 pupils were allowed to take their devices home, whilst the Year 3 and 4 pupils had to leave them in school. Coast Prep, which also had 1:1 iPads did not allow them to be taken home.

Byrne Primary, whose head teacher was clear that "learners are at the heart of everything and have a basic entitlement to technologies to support their learning", had experienced "serious teething troubles" as they attempted to renegotiate a nationally agreed contracts with a network management company so that they could move away from managed networked devices to a cloud-based open network with 1:1 provision of Chromebooks. This had meant that they had not achieved 1:1 provision when the research took place, which as noted in Section 7.8, the head saw as a huge compromise that fundamentally undermined his vision for how ICT should support learning.

As well as differences in devices that school had invested in, there were differences in the ways that they managed those devices and shared resources over the network. A small number had moved to using cloud based services, and in particular Google Classroom and/or Google Apps for Education (e.g. Byrne Primary, City Primary). Riverview Prep was moving to use Office 365 and had just finished rolling out Apple Classroom, which enabled teachers to control the children's iPads (including remotely viewing what children were doing on their iPads and locking the devices). Stepside Primary was an active user of and contributor to the London Grid for Learning. Several schools were using Showbie to enable sharing and management of children's digital work (e.g. Byrne Primary, Glenville Juniors, Coast Prep, Riverview Prep, Park Primary). Whilst Byrne Primary and Riverview Prep were both looking to fully integrate ICT into teaching and learning, there seemed to be a difference in emphasis between the two schools. Byrne Primary were clearly focussed on the children's use of ICT to support their learning, whilst Riverview Prep, at least during the period of the data collection, seemed to be concentrating on putting in place systems to support staff:

> Full integration. {Full integration} Absolutely. They are looking, so I mean, well, the declaration, the declaration of employing someone like [the Director of E-Learning] is that they want to, they are taking it very seriously, rather than just being a reluctant sort of, this ICT thing. It's coming. And so they have been proactive on that. {Ok} The introduction of iPads clearly is also a massive, massive commitment financially
>
> (Mr Phillips, Riverview Prep)

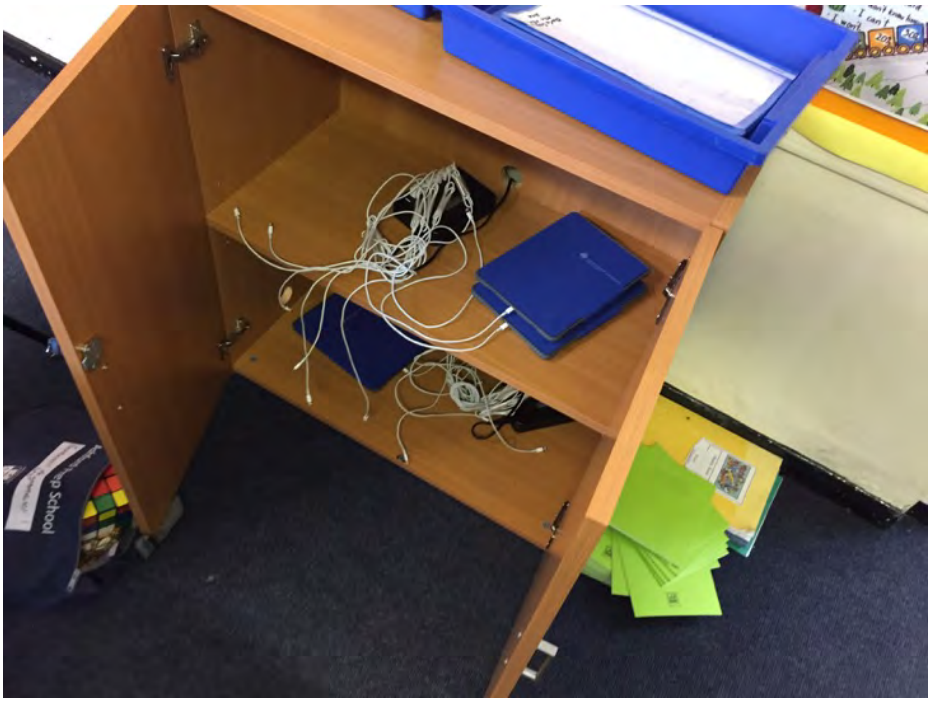
> What they said to me initially is that there's too much out there, we don't know what's important and what's not. And I'm always going in there saying I don't deliver specific subject apps, that's your job. My jobs is to introduce applications or a workflow that will help you streamline your teaching,
>
> (Ms Tomar, Director of E-Learning, Riverview Prep)

In one of the weekly timetabled CPD slots that the Director of E-Learning ran (during the school day) she was observed to demonstrate how to use Reflector to three teachers and set them the task of trying it out and reporting back in the next CPD session. In an earlier session she had clearly introduced Kahoot!:

> … and I only have 20 minutes in each session and yes I'm introducing the software or app or whatever it may be, because they're trying to understand that, they're following my button pressing, if that makes sense. This is how you start it up, this is how, that's the question, how do you create a Kahoot!, how do you create a question? Okay, I get it. And then maybe the last few minutes is spent how do you think you'll apply this in your teaching? And there's just not enough time for that because I need to demonstrate.
>
> (Ms Tomar, Riverview Prep)

Staff in several of the schools talked about the need for CPD: "We've done masses more training than we ever did before …" (Ms Turner, Head teacher, Coast Prep). Here too there was a diversity of approaches. Riverview Prep appeared to be the only school where teachers were timetabled, during the school day, to have a weekly 1 to 1 or small group ICT CPD session. The head of Village Primary allocated a specific budget for this to every member of staff. Byrne Primary, Glenville Juniors and Keyston Primary used IRIS (an in class video system) to support reflective teaching practices (not always linked to the use of ICT). All of the study schools engaged with research (many viewed taking part in this project as part of developing their understanding of how they might use ICT in schools), and some, such as Norgate Primary, were involved in other research projects too. Byrne Primary had been involved in a long term pilot project, and then extended discussions involving members of three school communities prior to the merger of the three schools and the setting up of Byrne Primary with ICT at its core. They continued to have weekly CPD sessions, which usually included an ICT focus.

In order to try to identify the extent to which these different ICT strategies impacted on the use of ICT in each school the different models of provision were compared with the analysis of the ICT use in each school using the ICT Innovation Framework (ICTIF).



9.5 The relationship between ICT strategies and ICT use

The analysis of the instances of ICT use that were noted in each of the study schools (which is described in Sections 4.4 and 4.5) were compared with the ICT strategies used in each school. Tables 9.5.1 and 9.5.2 (on the next two pages) provide a summary of that analysis.

It was clear from the data that the Quantity of use was not solely dependent on the level of ICT resourcing within the school. Thus, for example, Coast Prep and Riverview Prep both had 1:1 provision of iPads, but in both cases the proportion of teaching time that children spent using ICT was less for some or all of the teachers than in Byrne Primary (which had a roughly 2:1 ratio of children to Chromebooks in the classes we observed) and Norgate Primary (which had 8 iPads per class plus a set of netbooks timetabled in each class for half a day per week). Indeed, within a school, where the level of resourcing appeared to be the same across the teachers involved in this study, the quantity of ICT use varied considerably (as shown in Table 8.1.1).

Both logic and the data support the claim that there is a minimum threshold of ICT resourcing below which pupils' use of ICT will be minimal, irrespective of other factors. Thus, for example, all the teachers in both Fairfield Lower (which had an ICT suite with 15 PCs, plus 14 laptops and 15 iPads shared across the school) and Village Primary (which had an ICT suite with 16 PCs and a maximum of 3 iPads per class) pupils appeared to spend less than 10% of their school time using ICT.

Furthermore, there was no obvious pattern in the data relating the ICT strategy with the Focus and Mode of ICT use. Thus it appeared that the extent to which and ways in which ICT used was dependent to a large extent on the agency of the teacher, so long as a minimum level of ICT provision was in place.

Table 9.5.1 ICT strategies alongside the analysis of ICT use on the ICTIF

	Suite	Shared	In each class	Quantity	No	PICT	S	E	(T)	T
Byrne Primary	No	F-Yr3 50 laptops Yr4 to Yr6 >1:2 ratio Chromebooks		>40% to >50%	9	7	1	1	2	3
Coast Prep	Yes		1:1 iPads kept in school	<20% to <50%	5	5	1	0	2	2
Stepside Primary	No		Yrs1/2 1:3 ratio laptops Yrs3/4 1:2 ratio, iPads & laptops Yrs5/6 1:2 ratio iPads + 3 Touchscreens	<10% to <50%?	20	14	3	1	2	6
Riverview Prep	Laptops		Yrs 1/2 Class sets of iPads Yrs 3/4 1:1 iPads kept in school Yrs 5/6 1:1 iPads taken home (loan)	<10% to <40%	25	19	5	1	11	2
Norgate Primary	No	Netbooks ½ day per week in each class	8 iPads per class	<20% to <40%	18	11	6	0	2	1
Keyston Primary	32 PCs	Yrs 1/2 16 laptops per 2 classes Yrs 3/5 16 laptops + 8 iPads per 2 classes	Yr 6 1:1 Windows tablets + 6 iPads	<10% to <25%	24	17	5	0	10	2
Holme Infants	No		1:3 ratio of iPads (+ various laptops) 5/6 built in PCs	>20%	32	26	13		10	1
Highden Primary	29 PCs	16 iPads across school, timetabled for half day per week in each class 16 iPads across school, bookable for minimum of 1 week	2 PCs	20%	9	6	1	0	4	1
Glenville Juniors	15 laptops +++	35 iPads per 3 classes 4/5 PCs per 3 classes 2 sets of 15 laptops across school	BYO iPad	<10% to <20%	14	10	3	0	4	3
City Primary	No	20 laptops + 16 Macbooks + set of iPads + a few laptops in corridors between classes		<20%	7	3	0	0	3	0
Park Primary	No	1 set of iPads and 1 set laptops timetabled in classes	5 iPads	<20%	8	6	2	1	3	0
Village Primary	16 PCs		Yrs1/2 1 iPad Yrs 3/4 2 iPads Yrs 5/6 3 iPads	<10%	5	4	1	0	3	0
Fairfield Lower	15 PCs	15 iPads + 14 laptops across school	1 PC per class or 2 (in Yr4)	<10%	9	5	1	0	0	0

No = The total number of instances of ICT use noted in each school
PICT = Pedagogical use of ICT to support learning across the curriculum (on the Focus dimension of the ICTIF)
S = Support on the Mode dimension of the ICTIF; E = Extend on the Mode dimension of the ICTIF;
(T) = Had the potential to be Transform on the Mode dimension of the ICTIF;
T = Transform on the Mode dimension of the ICTIF

Table 9.5.2 ICT strategies alongside the analysis of ICT use on the ICTIF

	Suite	Shared	In each class	Quantity	No	PICT	S	E	(T)	T
Byrne Primary	No	F-Yr3 50 laptops Yr4 to Yr6 >1:2 ratio Chromebooks		>40% to >50%	9	78%	14%	14%	29%	43%
Coast Prep	Yes		1:1 iPads kept in school	<20% to <50%	5	100%	20%	0%	40%	40%
Stepside Primary	No		Yrs1/2 1:3 ratio laptops Yrs3/4 1:2 ratio, iPads & laptops Yrs5/6 1:2 ratio iPads + 3 Touchscreens	<10% to <50%?	20	70%	21%	7%	14%	43%
Riverview Prep	Laptops		Yrs 1/2 Class sets of iPads Yrs 3/4 1:1 iPads kept in school Yrs 5/6 1:1 iPads taken home (loan)	<10% to <40%	25	76%	26%	5%	58%	11%
Norgate Primary	No	Netbooks ½ day per week in each class	8 iPads per class	<20% to <40%	18	61%	55%	0%	18%	9%
Keyston Primary	32 PCs	Yrs 1/2 16 laptops per 2 classes Yrs 3/5 16 laptops + 8 iPads per 2 classes	Yr 6 1:1 Windows tablets + 6 iPads	<10% to <25%	24	71%	29%	0%	59%	12%
Holme Infants	No		1:3 ratio of iPads (+ various laptops) 5/6 built in PCs	>20%	32	81%	50%	0%	38%	4%
Highden Primary	29 PCs	16 iPads across school, timetabled for half day per week in each class 16 iPads across school, bookable for minimum of 1 week	2 PCs	20%	9	67%	17%	0%	67%	17%
Glenville Juniors	15 laptops +++	35 iPads per 3 classes 4/5 PCs per 3 classes 2 sets of 15 laptops across school	BYO iPad	<10% to <20%	14	71%	30%	0%	40%	30%
City Primary	No	20 laptops + 16 Macbooks + set of iPads + a few laptops in corridors between classes		<20%	7	43%	0%	0%	100%	0%
Park Primary	No	1 set of iPads and 1 set laptops timetabled in classes	5 iPads	<20%	8	75%	33%	17%	50%	0%
Village Primary	16 PCs		Yrs1/2 1 iPad Yrs 3/4 2 iPads Yrs 5/6 3 iPads	<10%	5	80%	25%	0%	75%	0%
Fairfield Lower	15 PCs	15 iPads + 14 laptops across school	1 PC per class or 2 (in Yr4)	<10%	9	56%	20%	0%	0%	0%

No = The total number of instances of ICT use noted in each school
PICT = % of No categorised as Pedagogical use of ICT to support learning across the curriculum (on the Focus dimension of the ICTIF)
S = % of PICT categorised as Support on Mode dimension of the ICTIF; E = % of PICT categorised as Extend on Mode dimension of the ICTIF;
(T) = % of PICT categorised as having the potential to be Transform on Mode dimension of the ICTIF;
T = % of PICT categorised as Transform on Mode dimension of the ICTIF

9.6 Summing up findings for RQ3

The data from the study schools did not support the view that there was a relationship between how remote a school was and the degree to which they had embraced ICT. However, this might have been due to the pragmatic constraints that meant that the study schools tended to be in less remote locations. It was the researchers' perception, which was reinforced by discussions with potential schools, some of whom were in very remote locations, that there was some sort of relationship. This warrants further investigation.

It seemed clear that for the maintained schools and academies the externally defined curricula, assessment and accountability regimes played a major role in shaping the school arena in ways that constrained teachers' pedagogy. Indeed, these three interlinked aspects of the constitutive order seemed to be largely responsible for the lack of alignment between teachers' pedagogical practices and children's out of school digital practices. They also clearly impacted on the ways in which teachers used ICT. However, given the variations in use of ICT within individual schools, it seems likely that other factors were more important in influencing the use of ICT in school by children.

The curriculum, assessment and accountability played a less critical, but still important role in the private schools in preventing teachers' pedagogical practices aligning with children's out of school digital practices. In the case of Riverview Prep, accountability to parents played a greater part in this than accountability to the inspectorate. In line with the maintained schools, the variability in levels of use of ICT within individual independent schools suggests that factors other than curriculum, assessment and accountability were important in influencing the extent to which ICT was used in schools by children.

In Byrne Primary, which was located in Scotland, it seemed that the curriculum, assessment and accountability were less important factors in constraining the school than was the case in England. There seemed greater scope in Byrne Primary for their teachers' pedagogical practices and children's out of school digital practices to become aligned than was the case in any of the other schools. However, there clearly were additional factors, beyond the curriculum, assessment and accountability that were inhibiting this alignment as well as restricting use of ICT per se by the pupils in school – one of which was the fact that the school had not yet achieved its intended 1 to 1 ratio of Chromebooks to children.

In all the schools in England, the school's values and beliefs, as encapsulated in their educational visions and tag lines, were often at odds with the curriculum, assessment and accountability regimes within which they had to operate. Their ICT strategies often aimed to align with their overall educational priorities. A range of different models of provision were evident, though the same aims were sometimes met in different ways (e.g. teaching computing using an ICT suite or a timetabled set of laptops). Older children were often provided with more access to ICT than younger ones. There was a general move towards greater use of mobile devices, and iPads in particular.

There did appear to be a minimum threshold of provision below which the level of ICT use was minimal. However, once this threshold had been exceeded, there was no clear relationship between the model of ICT resourcing and the extent to which or ways in which ICT was used. This seemed to be more down to the agency of individual teachers. This is explored further in Section 11.

10 Consequences for learning (RQ4)

What are the consequences of the answers to RQs 1-3 for learning in terms of social justice, and across and within subject domains?

This section addresses RQ4. Section 10.1 focusses on how ICT was used differently within and across different subject domains and the consequences of these different practices for learning. Section 10.2 examines equity issues, specifically in relation to the impact of 'ability grouping' on children's use of ICT and the implications for learning. Section 10.3 draws on the findings in RQ1 relating to gender and explores possible consequences for children's learning in school. Section 10.4 summarises the implications of what these practices mean for children's learning within the subject domains and in terms of achieving more equitable learning opportunities with ICT for all children.

10.1 Consequences for children's learning across and within subject domains

In order to clarify the consequences for learning of differences in how ICT is used across subject domains this sub-section outlines: the extent to which ICT appeared to be being used in different subjects across the study schools (Section 10.1.1), the types of use in different subjects (Section 10.1.2), and the extent to which that use changed what or how children were taught in different subject domains (Section 10.1.3). The possible reasons for any patterns emerging and the impact on children's learning are then discussed (Section 10.1.4).

10.1.1 The extent to which ICT is used across subject domains

In every observed lesson the teacher was noted using the class display at some point. In almost all cases teachers and children reported that this was typical. A Year 2 child in Stepside Primary said:

> I do computers sometimes at school, yes to do maths with but now we don't do it anymore that much, and yes so I think that's mostly all, we are looking at the whiteboard screen
>
> (Charlotte, Stepside Primary)

A teacher in the same school commented that ICT is:

> … an integral part of my role as a teacher, I use it in every single lesson it's very rare that there's a lesson that there is no technology at all used, even if it's just a presentation on the whiteboard
>
> (Ms More, Stepside Primary)

Whilst in another school a teacher talked enthusiastically about using the class display:

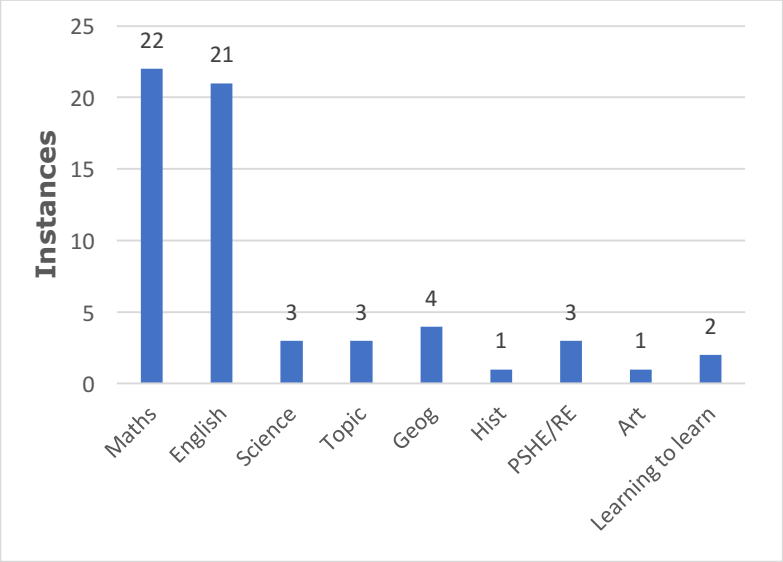
> I couldn't live without my SMART Board. I could, I do use flipchart more than I used to. But I love being able to do the amount of things you can do, and manipulate things on the board, and you can get rid of bits that you don't need, it's not wasting loads of paper ...I think there's a lot that you can do with a SMART Board that I don't, yeah, don't take it away from me. Its mine, I love the SMART Board.
>
> (Mr Silva, ICT Coordinator, Keyston Primary)

The ICT Innovation Framework (ICTIF), which was introduced in Section 4.5, is concerned with children's use of ICT. This might include the use of a class display, so long as a child is actively engaged with it, rather than 'just' observing. Similarly, the use of a tool such as Showbie,

Airdrop or Reflector would be included in so much as the children are using their devices to send or receive files or mirror their work on the class display.

The number of instances of ICT use by children that were observed in each subject is presented in Figure 10.1.1. The high levels of use in English and maths may reflect the fact that during the case studies the researchers explicitly asked to see one maths lesson, one English lesson and one other lesson that was not computing for each teacher. This was not the case for the exploratory studies in which the researchers asked to observe any subject except computing. In some cases computing lessons were observed, but these have been omitted from this analysis.

Figure 10.1.1 Observed instances of ICT use by children by subject domain



It was notable that no lessons were observed in PE, music or design technology. However, that did not necessarily mean that ICT was not being used in those subjects. Figure 10.1.2 shows all of the reported uses of ICT in each of the study schools; these were not observed. The Other category in Figure 10.1.2 includes instances that were either not subject specific (e.g. using the school radio station to replace assemblies) or where the subject was not specified (e.g. finding information using a search engine).

Figure 10.1.2 Reported instances of ICT use by children by subject domain

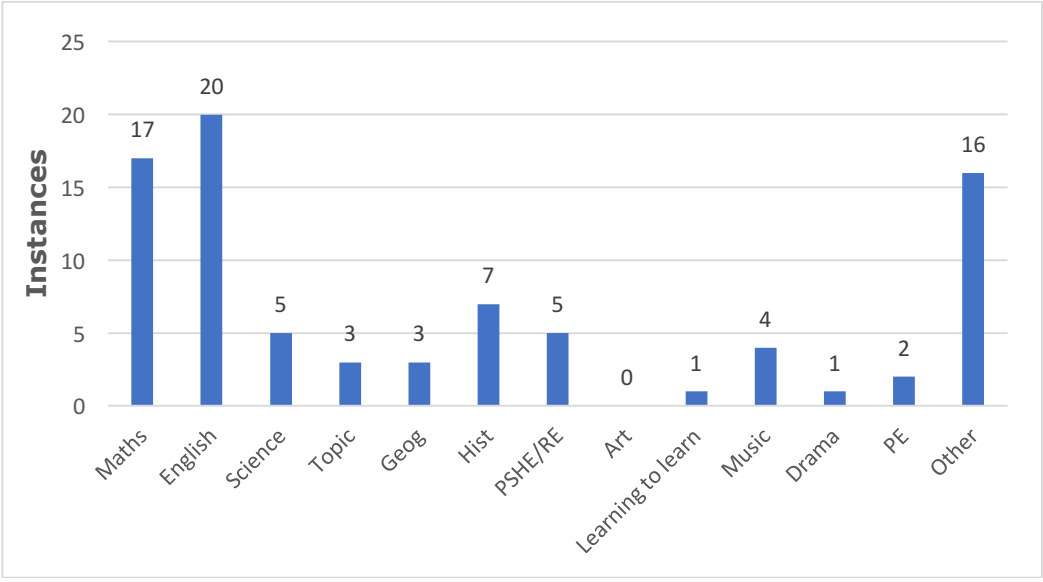
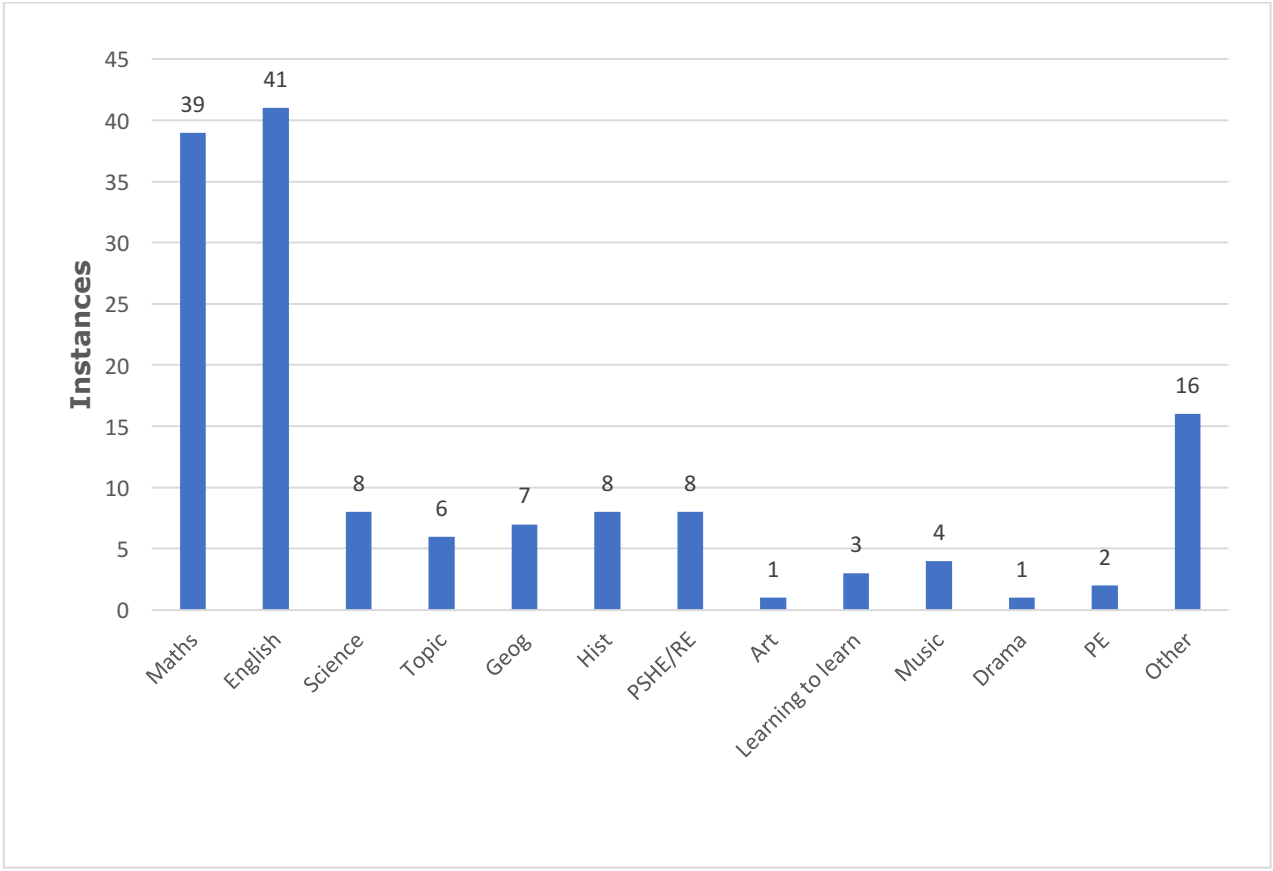


Figure 10.1.2 seems to suggest that ICT was used most frequently by children during English lessons, followed by maths. The relatively high levels of ICT use in maths and English may reflect the fact that in most of the study schools children appeared to spend roughly two hours per day explicitly on these two subjects, with slightly more than two hours per day on all of the other subjects combined. DT was again noticeably absent from the list of subjects in which ICT was used in the study schools, and ICT was not reported being used in Art.

Figure 10.1.3 shows a combination of all the observed and reported uses of ICT. This may provide a more reliable picture of the extent to which ICT was used across subjects, than either of the previous charts in isolation.

Figure 10.1.3 Reported and observed instances of ICT use by children by subject domain

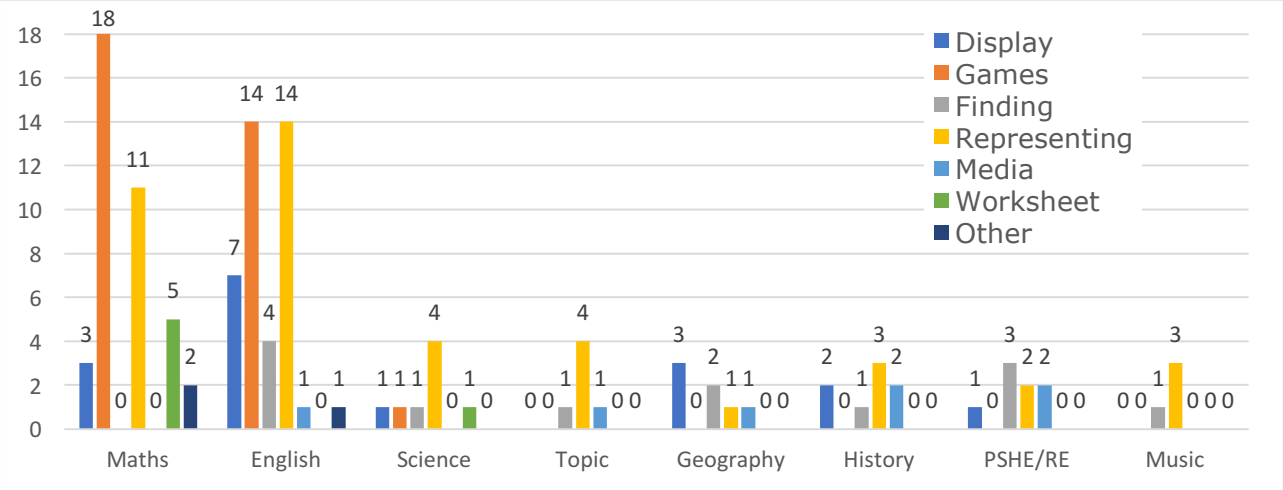


There did appear to be variations across subjects in the frequency of ICT use. Overall there were 80 observed and reported instances of children using ICT in maths and English, and 63 in all other subjects combined. There were similar levels of use in English and maths (each of which have roughly the same amount of time devoted explicitly to them). Any firm claims about differences in the frequency of use across other subjects are difficult to make due to variations in time allocation for these subjects and the fact that they are often taught in an integrated way. Indeed, the subject 'Topic' inevitably includes elements of other subjects. Furthermore, the 'Other' category will have included uses that spanned one or more of the subject areas. Analysis of the types of use across subject, in the next sub-section, appears to reveal more robust findings.

10.1.2 Types of use in different subject domains

The analysis of use of ICT reported in Section 7 resulted in a categorisation of ICT use by type. This included categories such as: using class displays; 'playing' games ('real' and 'educational'); finding information; representing, including taking photographs and making videos; and social media. The instances of ICT use in each subject domain were analysed using these categories or types of ICT use by children, as shown in Figure 10.1.4. Subjects with less than four instances of observed plus reported use were omitted from this figure.

Figure 10.1.4 ICT activities by type in subject domains



It would seem that teachers use ICT in very different ways depending upon the subject being taught. Section 7 provides a detailed account of examples of many of these different types of use in various schools involved in the research. Figure 10.1.4 reveals some clear differences in ICT usage in different subject domains, which are summarised below.

Games feature strongly in maths lessons (46% of instances) and to a lesser extent in English lessons (34% of instances), but do not feature at all in history, geography, music, PSHE or topic work. As highlighted in Section 7, the type of game varies between these two core subjects. 'Educational' games, many of which are designed for drill and practice, are used in both maths and English but 'real' games are used much more extensively in Literacy (English), usually as a stimulus for writing. There was only one mention of using 'real' games in maths, in Stepside Primary where Minecraft was used to explore volume on one occasion.

Class displays (as defined in Section 7 included devices such as the IWB and visualizer or large touch screen devices) were observed or reported to be used by children across all subjects except topic and music. In the core subjects children using the class display was more prevalent in English (17% of instances) than maths (8% of instances), usually involving children's work being mirrored on the class display so that it could be commented on.

Children were encouraged and enabled to use ICT to find information in all subjects except maths. Finding information seemed to be used relatively more often in PSHE/RE (38% of instances), and to a lesser extent in geography (29% of instances) and music (25% of instances), compared with other subjects. Though the low number of instances of ICT use in these areas mean that a single example represents a high proportion of the use in that subject. Finding information was relatively infrequent in English (10% of instances).

Representing, which included such things as word processing, taking photographs, making and editing videos or animations, and multimedia creations, was one of the most common used of ICT across all subjects. It was relatively less common in geography (14% of instances) and maths (28% of instances). All of the instances of representing in maths involved either taking photographs of 2D or 3D shapes (four instances) or the use of tools such as Explain Everything, which enable children to represent the process they use to solve a maths problem (seven instances). Representing accounted for 34% of ICT use by children in English, which

perhaps reflects the fact that in most cases children wrote on paper rather than using ICT. ICT provided opportunities for new ways of scaffolding writing, for example by using audio recordings to enable the children to rehearse what they wanted to write. ICT also provided new multimodal forms of communicating information and ideas, such as using animations or digital audio and/or video recordings. For example: using Puppet Pal to make an animated film of the chapters of book being read in class, which was then exported using Dropbox (City Primary); Year 6 in Byrne Primary illustrating a line from a Robert Burns poem using Sumo Paint; or digital film-making so that children could retell stories in a multimodal format using moving images, text and sound (Stepside Primary). Sometimes, this multimedia composition flowed through into the use of social media, such as in Stepside Primary where Year 6 children

> … did a 360 degree video of Michael Rosen's book so we tweeted it to Michael Rosen for a response …
>
> (Ms Harrison, Stepside Primary)

Using social media (e.g. Skype, blogging) was not that common in English, but was relatively more frequently reported in PSHE (25% of instances), History (25% of instances), Topic (17% of instances) and Geography (14% of instances). These uses included blogging or tweeting, and linking up with experts or in one case with children in another country.

In thinking about the types of ICT use in schools, it needs to be borne in mind that this varied not only across subjects, but also at different points in time:

> I think I use technology, some weeks it might be there a lot, some weeks it may be virtually there for the children and I'm using it all the time as a teacher, but it depends what we're doing and whether its needed or useful. I don't use it all the time but I use it when I know it's gonna help us.
>
> (Ms Allen, Stepside Primary)

Teachers described how they made their decisions about the value of ICT in a particular subject domain with one highlighting that ICT was felt to be useful for practicing basic skills (e.g. spelling and simple maths):

> …we still use basic things like straightforward, on the computers there's a group of children who go do Lexia every morning, they just know they've got to do that. They go and do their spellings and things, and … easy maths and things like that, they just go up and use MyMaths for homework
>
> (Ms Mitchell, Head teacher, Keyston Primary)

A teacher in another school chose not to use ICT in maths other than games:

> …don't use ICT for maths so much other than we do play games and things on the board and sometimes I might direct them to the games… and literacy it would mostly be for research purposes
>
> (Ms More, Stepside Primary)

Ms More's colleague in Stepside Primary provided further insights into how teachers' view ICT in different subject domains:

> Okay, so I think it's something that, why do you need tech, good question. So it's a tool, right. So it depends what you're trying to do. If you're trying to cut paper your iPads of no use whatsoever but I think there are some things that it's useful to have tech, so for example, one of the things I put on your questionnaire was something about reading comprehension and research which I've done quite a lot of those type of lessons, especially with Year 2. One of the things you want for a Year 2 child to be able to do is not just read and forget everything they've read or not understand what they've read but actually retain the information and understand the information and be able to reflect and infer and deduce from the information. Now we read every day with books but what you want to do as well is make it come alive in another way on

> top of that so you've got it in lots of different areas of the curriculum. So reading is coming through in other areas. Now, yes you can still do that with a book, I can order a book that has all the information {Yeah} but the internet has got it all there for me in a multimedia format that the children are going to interact with in a different way and be differently engaged with potentially.
>
> (Ms Allen, Stepside Primary)

As already highlighted in Section 7.3, a number of teachers also talked about using ICT for research:

> …it does make research a lot easier... because we do have access to Britannica which has got a wealth of research on there and articles and it's all at differentiated levels so that's just at the tip of your fingers which is much easier than going, for instance to the library
>
> (Ms Griffiths, Keyston Primary)

The same teacher however seemed a little uncertain about why or how she would use ICT in different subject domains:

> I guess in English, for example, you're trying to use the ICT as a tool to support the children to achieve the learning that you want them to achieve. Whereas with geography, if there's stuff out there that's already there, then it, it is not, I suppose it's still a tool isn't it, not sure.
>
> (Ms Griffiths, Keyston Primary)

The teachers' comments suggested that perceptions about the nature of the subject being taught played a role in determining the extent and type of ICT used. In maths for example, no teacher mentioned creativity or finding information, although creativity is valued in children's writing. The lack of 'finiding information' in maths contrasts with all the other subject domains included in Figure 10.1.4. The focus on using ICT in maths for games, the vast majority of which involve drill and practice, aligns with a deductivist rather than a heuristic view of a maths (Lakatos, 1976 cited in Hudson, Henderson and Hudson, 2015). From a deductivist standpoint maths involves 'obligatory' styles of presentation and the focus is on procedures and right or wrong answers (Henderson et al. 2015). Deviations from the methods taught seems to be discouraged, which perhaps explains why Stepside Primary made 210 videos of Power Point presentations for parents to help them know how the school teaches maths.

The view of the nature of other subjects, such as history, leads to different pedagogical practices and different uses of ICT:

> I think they're beginning to be allowed to follow their own pathways more. So if they're researching in things like history they're able to look for their own examples. They're learning to, to, research and sift and, and, and give evidence for arguments. And that's a very exciting way of doing it.
>
> (Mr Wilkinson, Head teacher, Riverview Prep)

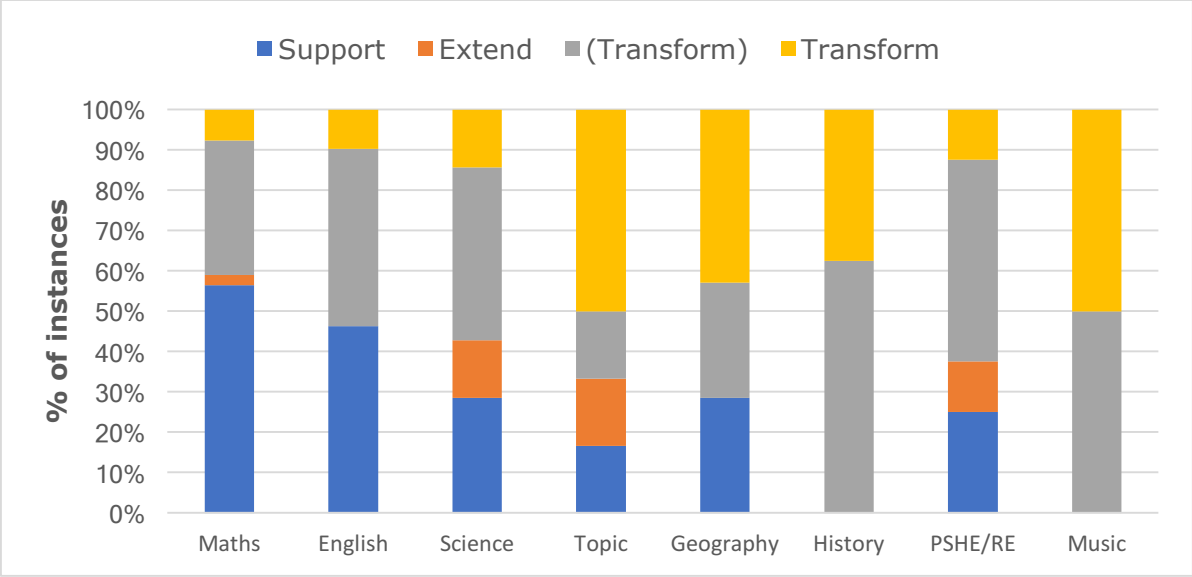
> ...we manage to do history at the level that it's worth doing, real history, … real history, absolutely, being a historian and you know, not just ticking the boxes
>
> (Ms Almasi, Head teacher, Stepside Primary)

The comments made by these two headteachers suggest that the nature of 'knowledge' varies between subjects, with history for example, being less about 'facts' (relative to maths for example) and more about perspectives and particular narratives situated in social, cultural and temporal contexts. This view of 'knowledge' potentially provides the space for ICT to be used in ways that change what or how children are taught.

10.1.3 The impact of ICT use in different subject domains

The ICT Innovation Framework (ICTIF), which was introduced in Section 4.5, was used to analyse the extent to which children's use of ICT in different subjects impacted on what or how they were taught. Figure 10.1.5 provides the results of this analysis, showing the ways in which ICT use by children in different subject areas were categorised on the Mode dimension of the ICTIF.

Figure 10.1.5 Modes of ICT use in different subject domains



The small number of instances of use in some subjects leads to individual examples of use representing a high proportion of all use in that subject. This may distort the picture, particularly as it seems likely that teachers chose to describe examples of ICT use that they deemed to be 'good' or potentially of more interest to the researchers. However, it is noticeable that all of the examples of ICT use in history and music were categorised as having changed or having the potential to have changed what and/or how the children were taught and could not realistically have been achieved without ICT (i.e. Transform and (Transform) on the Mode dimension of the ICTIF).

In maths over half the noted use of ICT was categorised as Support; in other words it did not fundamentally change either what or how the children were taught, though it may have made it more engaging, effective, or efficient. Slightly under half of the instances of ICT use by children in maths did change, or had the potential to change, what or how the children were taught and could not realistically have been achieved without ICT. These uses included using tools such as Explain Everything, which have the potential to support reflection, and if used collaboratively can support the development of shared understandings through joint endeavour. In English just over half of all instances of ICT use were categorised as Transform or (Transform), indicating that they did, or had the potential, to change what and/or how the children were taught in ways that could not have realistically have been achieved without ICT. This included not only the use of multimedia authoring tools, but also class displays to share children's work with the class. However, in practice these latter uses often failed to achieve that potential because of the ways in which they were transacted. This raises a question about what supports and constrains transformative uses of ICT?

10.1.4 Discussion of differences in ICT use across subjects

Possible reasons for teachers' diverse uses of ICT, often within the same school, include: the view of the subject (and by extension the role of teacher and learner); teachers' facility with and knowledge of 'appropriate' ICT resources; views about children accessing the internet and the creation of 'walled gardens' (see Section 7.7 for an explanation of 'walled gardens'). All of these factors are also influenced by the school arena (which was discussed in Section 9) and the classroom setting:

> …research must recognise that teachers and pupils work within specific contexts (subject, topic, learning objectives): the influence of this context needs to be appreciated
>
> (Cox, Webb, Abbott et al, 2003, p.35)

Without a rethink about the 'nature' of different subjects and a consequent change in the pedagogy of primary teachers there is a tendency to use ICT to support existing pedagogical practices. This has implications for how and what children are taught. In maths for example, there tends to be a focus on teaching maths creatively rather than encouraging children to view maths as creative (Bolden, Harries and Newton, 2010). This has implications for how ICT is used, as illustrated in the following example. The teacher was clearly keen to ensure the children were engaged and appeared to value collaboration between children. She chose to use traditional pen and paper alongside a YouTube video and, perhaps in an attempt to align with their interests, included an 'educational' game to help a small group of boys get to grips with division:

> I've got a YouTube video of how to do short division with remainders. Ravi is very much my highest in maths and he is very confident already with short division. So, in putting in the remainders, because I know that he'll support the others and show them how it works. So they'll watch a video on that and then they've got this game, which is a football game and it's red versus blue. So because there is four of them, two will be in red, two will be in blue and they'll work together so it will give them a division question with four possible answers, they've got to solve it in their maths book and once they've got that they can click it and try and score a goal and get the points
>
> (Ms Parker, Park Primary)

Despite the obviously careful planning that has gone into this lesson. The pattern of the session ties in with a common structure of primary maths lessons (Scottish Government, 2012) which involved the children listening to the teacher (or in this case someone on YouTube) explaining what needed to be done and then the group being left to 'get on' whilst the teacher supported other children. When the children were interviewed after the lesson it became apparent that the teacher's expectation that the game would support their learning, and that Ravi would help the others was not fully realised. This may have been because the children identified their own purposes, which revolved around winning the game. The children were able to clearly articulate the teacher's purposes:

> **Researcher**: Can you tell me a little bit about what that lesson was about?
> **Ravi**: That was about, we had to do division and we had to do it on the computers.
> **Researcher**: And Jasper?
> **Jasper**: We was playing short division game on the computers.
> **Researcher**: Short division game, Ben.
> **Ben**: We played short division on the laptops and the laptop gave us a question of dividing and then you have to get the right answer.
>
> (Post-observation group interview, Park Primary)

However, when asked whether they thought the lesson had gone well it became apparent that the children were focusing on winning the football game rather than focusing on the maths:

> **Researcher**: And Ben [inaudible] said it worked really well for him and you said it didn't go well for you?

Ben: Because he lost.
Researcher: Was that just because he lost at football?
Matt: I didn't get that many points.
Researcher: You didn't get that many points?
Matt: Yes.
Researcher: So why do you think that was?
Matt: I got most of the questions wrong.
Researcher: Was there, was it something about the questions that you were finding difficult?
Matt: Yes.
Researcher: Can you explain a little bit more about what you find difficult?
Matt: When I had to divide the thousands.
Jasper: Thousands and millions.
Researcher: And so what did you do when you were finding it difficult to get help?
Matt: I just did it, tried to do it.
Jasper: Sometimes you guess.
Researcher: Sometimes you guess and when you didn't want to guess who did you go to for help?
Matt: Ms Parker.
Researcher: And what about Ravi, did he help you?
Matt: He said no.
Researcher: How come?
Matt: Because he was against me.

(Post-observation group interview, Park Primary)

Even Ravi, who the teacher thought had a firm grasp of the concept and she thought could, if needed, teach the others, found the task challenging. This may have been partly because he too lost sight of the teacher's intentions in his determination to 'win' and his comment about statting to 'lose it' could apply to concentration (as the researcher suggested) or, possibly, losing the game:

Researcher: Ravi did you say it was harder?
Ravi: Hm, it's hard on the computer.
Researcher: How come?
Ravi: I don't like the answers because sometimes it's different and I'm like we should show [inaudible 06:19] confusing.
Researcher: So the answer you got isn't in the list?
Ravi: Yes I just.
Researcher: A bit confused.
Ravi: Yes and I tried again but I started to like lose it.
Researcher: You started to lose it?
Ravi: Yes because I feel like confused.
Researcher: Ah, so you find it, so you lose concentration?
Ravi: Yes.

(Ravi, Park Primary)

Reflecting on the group's learning, their teacher felt pleased the children had remained on task but then acknowledged how the game had changed the children's focus and in so doing had impacted negatively on their learning:

> …because they were so eager to play the game, they weren't necessarily getting their mathematical thinking correct or trying, they were just wanting to get the answer. But it got them hooked in and got them wanting to do it
>
> (Ms Parker, Park Primary)

The nature of different subjects along with the requirements of the national curriculum and teachers' pedagogical positionings all impact on identified learning objectives and outcomes, the use of ICT and hence, potentially, what children learn. A teacher provided an example of how leaning objectives would vary for ICT-based activities in different subjects:

> Sometimes we'll have very formal learning objectives, success criteria which kind of become like your steps to do the activity, other times that's not there because it's almost implicit within the activity. So for the animation, I've done, I have done sometimes done that way they've had the very clear steps, especially when they're first trying it, you know, 'check your fingers aren't in the way', you know. That kind of thing, 'watch what you'. But when they've done it once or so you don't need that anymore, that's kind of within what they already know, erm and then your outcomes might be 'check your story makes sense when you watch it' or you know. But actually I don't always do that. For any lesson, maths, literacy, sometimes I'll do that, sometimes I won't. It will kind of, I'll do it if it seems it's gonna help them. Maths you often have it cos it's more of a steps related kind of thing, you know 'first do this', 'check that', you know, 'this will be your bit', 'you're gonna fall over', 'look out for that'
>
> (Ms Allen, Stepside Primary)

Another teacher within Stepside Primary felt that learning intentions could limit children's learning:

> .. we have a learning intention but the learning intention is decontextualized, or should be decontextualized so actually you concentrate on what you are actually learning, not that it's about the War or the Blitz, but it is what I'm actually learning, and the success criteria we've built in ... [but] success criteria can be very limiting, and it can take away a lot of thought and it can take away a lot of the learning, because if you've written down here's step one, two, three, four, what are the children actually thinking, so there's elements within maths particularly, but also within English work where success criteria is under some debate. Some teachers will print it out and have it in a box because one of the things we're getting children to do more and more is to really think about whether they're succeeding.
>
> (Mr Baker, Assistant head, Stepside Primary)

It is apparent from what teachers and children have said that using ICT in ways that changes what and/or how children learn requires a rethink about the nature of different subjects and for teachers to review their pedagogical practices.

Research suggests that teachers need to become more familiar with the ICT resources available and how they can be used with children (Cox et al, 2003). In some schools there were regular weekly CPD sessions, during staff non-contact time in Riverview Prep, and every Friday in Byrne Primary. To help overcome the problem of unfamiliarity with software another school adopted a 'three app policy' of using the same small number of apps throughout the school, as they felt this would help ensure they were used successfully and would aid the development of flipped learning (Head teacher and Associate Principal, Park Primary). As noted in Section 5, at least one head teacher, articulated the importance of ensuring that teachers know why they are using particular ICT resources:

> …support needs to be more tied in with a vision of what the teachers are trying to do, rather than what the vision of the, what the technology can now do.
>
> (Mr Wilkinson, Head teacher, Riverview Prep)

Teachers may be in a better position to use ICT in transformative ways if they become more familiar with the children's home digital practices and are able to identify the positive elements of what children do at home. The diverse digital competences, skills and attitudes towards ICT that children bring to school could then potentially be built on and developed. In Stepside Primary 'real games' such as Minecraft and Temple Run were used in literacy and maths (Section 7.2). In Highden Primary, Ms Young used Myst, a 'real' game based in

a powerfully illustrated and choreographed virtual environment to provide engaging auditory and visual stimuli to fire the children's imaginations to help them with their descriptive writing. In Keyston Primary the ICT coordinator seemed to have been very wary of using Minecraft due to e-safety issues raised in a BBC documentary and also did not seem to feel that children's practices on YouTube or social media were necessarily positive, although he could see the value in certain games which children in the school were known to play at home:

> … for example Minecraft … although I'm not a fan of it […] in terms of actually building things, I think they have got a lot better understanding of how to make and create things using a computer so I think that's good
>
> (Mr Silva, ICT Coordinator, Keyston Primary)

Both Mr Silva and Ms Griffiths in Keyston Primary felt that more could be done to build on children's home digital practices:

> I think they do probably have a lot of ICT competencies that we just don't appreciate or we don't use
>
> (Ms Griffiths, Keyston Primary)

> I don't think we probably do capitalise enough on some of the skills they do have
>
> (Mr Silva, ICT Coordinator, Keyston Primary)

The analysis would suggest that although there was scope for ICT to be used effectively across subjects, a number of factors (e.g views of knowledge in different subject domains) impacted on the extent and pattern of ICT use. Children tended to encounter ICT in maths and English lessons for 'drill and practice' purposes although some teachers were using ICT more creatively in not only both English and Maths but also other curriculum areas (e.g. music). It is also apparent that children's learning in different subject domains is also shaped by teachers' confidence with using different software and an understanding of the potential different software has for providing richer learning opportunities. For ICT to be used effectively within classrooms it is also clear that teachers need to consider the extent to which the use of ICT will result in an alignment of children's and teachers' purposes.

10.2 Consequences for learning in terms of 'ability'

This sub-section discusses the social justice implications of children's digital experiences at home and teacher's use of ICT in school. It became apparent in the data analysis for RQ1 that there was insufficient data to draw any conclusions about the impact of the family's socio-economic status, ethnicity and cultural or linguistic background. This section therefore focuses on the issues of 'ability' grouping and gender where there was more robust data.

It is worth noting however, that looking at the body of data for all of the participants, it was apparent that there was no definitive link between socio-economic status and children's access to devices, access to the internet or use of ICT. Whilst some children's families did not have internet access because of the cost, other children's access was prevented or severely curtailed by their parents (Section 6). Indeed, there were several instances of children who attended private schools, and thus were presumably from high SES homes, whose use of ICT was severely restricted. For example one girl in Coast Prep was only allowed to use her iPad for ten minutes twice a day and another girl from the same school said she was not allowed any ICT at home until she was 13. Thus, the assumption that SES determines ICT access may need to be re-examined. This finding is supported by a large-scale research project in a number of European countries which suggested that children's home digital experiences are influenced by the interaction of a number of factors which may include socio-economic status but also includes parenting styles, education and parents' confidence with ICT (Chaudron et al., 2015).

One of the key issues to tackle in closing the attainment gap between socio-economically 'advantaged' and 'disadvantaged' children in the English education system is the role of the widespread practice of 'ability' grouping. 'Ability' grouping as a practice has had a resurgence since the late 1990s in primary schools in England. It has been recommended by successive Governments (Hallam et al., 2003). This is despite evidence that it is not an effective practice even for higher attaining children and indeed contributes to widening the socio-economic attainment gap (Francis et al., 2017).

Research on 'ability' grouping practices indicates that one of the reasons why lower attaining children are disadvantaged by 'ability' grouping is that these children are more likely to experience lower quality teaching practices and a narrower selection of teaching styles (Francis et al., 2017) ostensibly aimed at raising attainment in tests. This is problematic from a social justice perspective, not least because children from low socio-economic and some ethnic minority backgrounds are more likely to be over represented in lower 'ability' groups (Kutnick et al., 2005) and therefore seemingly experience more teaching-to-the-test practices where their agency is presumably limited.

This section focusses on the ways in which children in different 'ability' groups used ICT in school to understand whether there are differences between those labelled as 'high' and 'low' ability. Specifically, this sub-section examines whether there is a difference in how children use ICT in the same classrooms depending on their 'ability' group membership in three of the study schools (See Vignettes 10.2.1 to 10.2.3). These three school were ones where data indicated that children's learning opportunities were shaped by their 'ability' group membership. This is not intended to be representative of other schools in the study and shorter examples from some of these other schools are given to supplement the three main cases. Indeed, there was evidence is some of the schools that not all the teachers involved in the study felt that 'ability' grouping was valid:

> Well ability suggests that something is fixed isn't it and I don't like that and also I understand that if you talk about higher ability pupils, which I still occasionally say for want of a better, higher attaining, I prefer. But then even with higher attaining, I mean I've got a child in my class who can barely read and write but is attaining fairly highly at maths. So where does he fit in there? So I don't really talk about children in that sense.
>
> (Ms More, Stepside Primary)

This same teacher went on to say:

> ...we talk a lot about growth mindset. Formative assessment, we did an action research programme where three members of staff went and talked about it. We talked a lot about this, about fixed and growth mindsets and not using that term ability. You're either able to do something or not. It's not, you know, whereas we're all learning, including adults, we're all still learning, we're all learners of maths, we're all learners of English, learners of everything. So I prefer to think of it more as a journey, but it's difficult to find the terms sometimes
>
> (Ms More, Stepside Primary)

It needs to be borne in mind that it is possible that teachers' practices that incorporate ICT differ in situations where 'ability' grouping is not used but where they adjust their practice according to their perception of the child's current level of competence or attainment.

Vignette 10.2.1 – Keyston Primary – ability grouping

In Keyston Primary children were grouped according to 'ability' during English and maths, but taught in mixed 'ability' groups for non-core subjects. Children in lower 'ability' groups appeared on the whole to be offered fewer opportunities to use ICT in English and maths and when they did use it, it seemed to be in a less agentic way. In Ms Griffiths' class fluid 'ability' groupings were used so that children were grouped according to 'ability' in relation to the specific skill they were working on. This was intended to mean that children could move between 'ability' groups for different tasks within the same subject, although it isn't clear whether children actually made any significant moves up or down the 'ability ladder'. The biggest difference in how ICT was used in the observed lessons was between the 'lower' and 'middle' groups on the one hand and the 'higher' group on the other. In Mr Silva's class, the 'ability' groups appeared to be more permanent, although Mr Silva said that children could move between groups "if they improved". Again, no evidence was collected to suggest that children regularly did in fact move 'up' or 'down' a group. The research on 'ability' grouping suggests that upward movement from lower 'ability' groups is in practice infrequent even when these are intended to be fluid (see Francis et al. (2017) for a review).

In an observed Year 6 Maths lesson Ms Griffiths was assessing children's skills in counting and fractions. She differentiated the work according to children's 'ability' grouping for both the starter and main activity. The aim of the main activity for most children was to make a video explaining a method of scaling fractions for a website being developed by the school as an instructional resource for other children. It was not clear if all the videos were going to be uploaded or only 'the best one'. Children from the 'higher' group who had already made their video were told to do their next MyMaths lesson independently and to use it as a tool 'to teach themselves'. The 'lower' group worked with one of the TAs to make a video. However, it was the TA who filmed the children whilst they used blocks to work out fractions in a very practical way. The 'middle' group were introduced to their activity in the classroom. Ms Griffiths demonstrated the method she wanted the children to use and then explained that some children were going to explain this method using 'rainbow fractions' in their books while the others were to use the Explain Me[4] app for the rest of the lesson. Some of this latter group of children were subsequently given the opportunity to share their videos with the rest of the class via the class display.

Ms Griffiths commented that she felt the 'higher' group had:

> …furthered their own learning. I think that they are going to enjoy pushing themselves on and I think now we've kind of opened that door
>
> (Ms Griffiths, Keyston Primary)

She also felt that the 'higher' group had shown 'self-motivation and perseverance' and had supported each other to develop their language around the topic. The 'lower' group and some

[4] Whilst the teacher said Explain Me, we assume she meant Explain Everything

children in the 'middle' group were not actually using ICT themselves and were thereby excluded from the opportunity to use it in the more agentic way that the 'higher' and some of the 'middle ability' children had done when making a video to explain a method of scaling fractions. The 'higher ability' children had moved from making their own videos previously to what the teacher described as 'to teach themselves' though in practice they were using a drill and skill maths program to consolidate their maths skills, which the lower and some of the 'middle ability' children were doing without the use of ICT.

This differentiation was reflected in the teachers' perceptions of children's ICT competencies and capability for autonomy in their ICT use. She explained that she felt many of the 'less able' children had found their activities more challenging than she had anticipated. Ms Griffiths said that she felt the children in the 'higher group' had better ICT competencies as they were more likely to solve an ICT problem when it was not working as it should than 'lower' children who were more likely to ask her for help. She also thought the 'higher group' were better able to choose the 'right' games when given the opportunity because they knew which learning intentions they were related to without having to be told.

Mr Silva, the ICT coordinator in Keyston Primary also differentiated between children's opportunities to use ICT based on their 'ability' grouping. In his lessons, 'higher ability' children were sometimes given more autonomy in the way they used ICT and were also given more opportunities to use ICT. In a Year 5 English lesson taught by Mr Silva, which was part of a series of lessons focussing on a story about dragons, the activity was in preparation for the next lesson where children were to write instructions for catching a dragon ('lower ability') or messing up catching a dragon ('higher ability'). The 'lower ability' children used simple instructions provided by the teacher. In contrast, for the 'higher ability' children the first step of the task was to research online to find instructions that they could use as a basis for their own set of instructions, using a search term the teacher provided. In the following lesson all of the children were going to use Explain Everything to write their dragon catching instructions.

In an observed maths lesson taught by Mr Silva, only the 'high ability' children were given the opportunity to use ICT in developing their articulation skills, whilst lower 'ability' children were tasked with working on their basic skills in their books. In this lesson, the 'higher group' worked in pairs to make a video using Explain Everything as a self-help guide for 'lower ability' children about the column subtraction method. The purpose of this was to give them the opportunity to create a teaching material for other children and to develop their skills in showing their reasoning behind solving a problem (which would be the task in a 'Year 6 paper'). The 'higher ability' children were expected to plan, rehearse and produce succinct explanations. The 'lower' and 'middle ability' groups (working individually) did not use any ICT during this lesson as the teacher did not feel an iPad would help them at this point, especially as the 'lower ability' group were still grappling with the column subtraction method.

In Keyston Primary there were also examples where all children got to use ICT in a similar way, although they still worked in 'ability' groups.

Vignette 10.2.2 – Holme Infants – ability grouping

Holme Infants had a high proportion of children eligible for free school meals, and was located in a very low socio-economic urban area. The school was considered Outstanding by Ofsted – with exceptionally high attainment levels and had received awards and recognition for its use of ICT. Pedagogy in the school was very focussed on improving children's 'basic skills' in English and maths in order to maintain its Outstanding status. This may have been exacerbated due to children having low prior attainment (this was confirmed by DfE statistics from the school's progress data).

Teaching practices with ICT across the school were very similar but differed significantly between core and non-core subjects, with activities in the former being of the 'drill and practice' variety with slightly more autonomous and agentic use of ICT in the latter. Throughout the school, it appeared that only one 'ability' group used ICT during each lesson in all classes and groups took it in turns to use the inbuilt desktop PCs or iPads. Yet the nature of

the work they did with ICT varied according to their 'ability' ranking particularly in terms of their level of independence and potential for agency. In all classes, children were grouped by 'ability' for English and maths and were taught and seated in these groups during lessons. However, the teachers said that these groupings were fluid.

Mr Murphy did not feel differentiation was necessary as "I think they're all pretty strong". He went on to say:

> **Mr Murphy**: You might help some more.
> **Researcher**: But in terms of the activities you set for them.
> **Mr Murphy**: Well for maths it would possibly, would be different. So the activity might be, the activity would be harder for the As in maths. But for most other things, like for writing they mightn't get the same amount done, but it would be a blank screen for everything. So it's a blank canvas kind of. You're expected, you probably wouldn't expect them to get as much done, but they'd still have the same opportunity.
>
> (Mr Murphy, Holme Infants)

Children in his class who were struggling would have TA support and the more 'capable' were expected to work independently. The teachers in Holme Infants said that all children were given equal quantities of time using ICT and would do similar types of activities, but with different degrees of independence. However, it appeared that 'higher attaining' children were afforded more agency and were less likely to engage in 'drill and practice types' of activity. Mr Murphy, explained how and why these differences existed:

> **Mr Murphy**: …some of the lower children you really just want them to work on their handwriting, so the more they're writing and they're building up their muscles in their hands just by writing. You kind of want them to, because I don't know, they might, just to keep practising. So it's letter formation and all that.
> **Researcher**: So they might spend more time doing handwriting and practising letters
> **Mr Murphy**: Yeah, well that would generally be writing or in writing. Where so, basically, I'm talking about [a higher attaining child] is working outside, outside the classroom independently. That might be an A or a B [higher attaining groups] who's really good at writing and handwriting. Whereas a C or a D might, a C might be good at handwriting but just needs to concentrate more on getting their adjectives or whatever done and put down on paper. But they would get, that child I was talking about, for the last few days he would be a caterpillar but he'd be an alligator for reading. So he has got the words but he just needs to speed up and write down more. So it's working for him that he's actually typing.
>
> (Mr Murphy, Holme Infants)

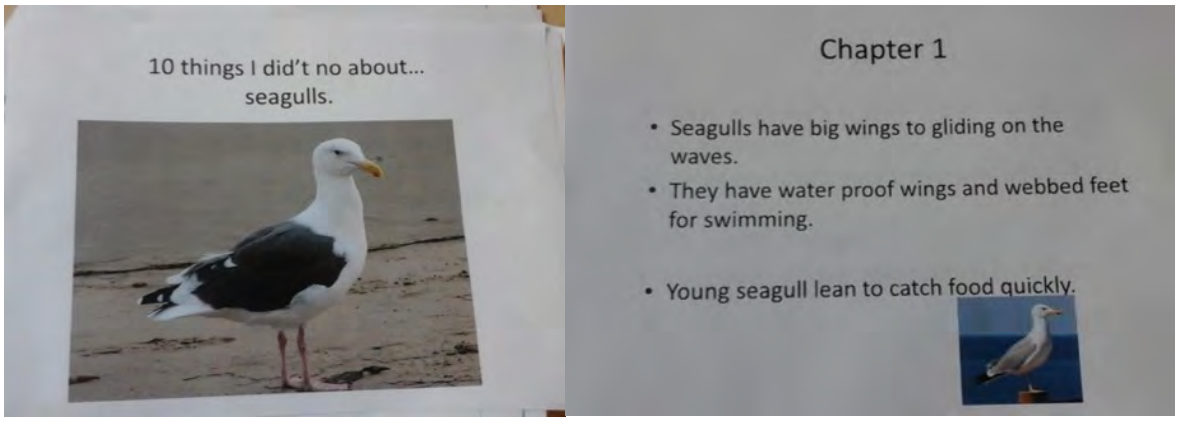
The following lesson was a typical example of an English lesson focussed on writing in the school, in terms of how different 'ability' groups used ICT in the school. In one of Mr Davies' Year 1 English lessons, children were engaged in a range of tasks related to writing. The children who were in the 'lower' and 'middle ability' groups were in the classroom whilst the two 'highest attaining' children were working outside the classroom. The children in the classroom were engaged in a range of activities. These included two girls playing an ICT game called 'Loo [sic], cover, write check', which had been used as a whole class activity at the start of the lesson. They used the class display at the front of the room and a tablet. The game was set in a bathroom where a small number of letters are lined up next to the toilet and the player had to drag the letters down to spell a word. When they got it right the toilet flushed and a new set of letters came up to repeat the activity. The girls took it in turns and chatted quietly and giggled occasionally but otherwise they were silent, which appeared to be what the teacher expected. Another group used the PCs, with two children per machine. Members of each pair took turns to write words repeatedly, using the 'look, cover, say, write and check' method (See Figure 10.2.1). They were silent throughout this and look bored at times.

The groups at two other tables worked with their writing books and worksheets. At the third table, the teacher did reading with the group. None of the children at these three tables used ICT.

Figure 10.2.1 'Look, cover, say, write and check'

The two 'highest attaining' children worked outside the classroom with iPads doing research and writing a presentation on PowerPoint. They were supervised by a TA, but mainly worked on their own. The 'higher attaining' children from the other Year 1 classes were also working in this area, doing a similar activity. The brief the two girls from Mr Davies' class had been given was to write a presentation using PowerPoint entitled '10 things I didn't know about [an animal of their choice]' and to research using both the school library and the Internet. The girls decided on seagulls and had been to the library to borrow a book on the topic and were using iPads to carry out more research. They were composing sentences and wrote them on a slide on a laptop. These were subsequently printed out (see Figure 10.2.2).

Figure 10.2.2 Researching and creating a PowerPoint presentation about seagulls



The task the two high attaining girls were engaged in, whilst set by the teacher, did allow some agency in deciding on an animal, using the library autonomously, carrying out searches on the Internet (although it wasn't known whether they were given particular websites to use), composing sentences, and designing the PowerPoint slides. They clearly had a higher degree of agency than the children working in the classroom.

Vignette 10.2.3 - Park Primary – ability grouping

The teachers in Park Primary also used 'ability' grouping and differentiated in terms of how children used ICT according to children's designated 'ability' and 'ability' group membership. The groups were fluid and children were regularly assessed, although it was not clear whether children were indeed moved between groups. Ms Parker described the overall rationale for the differences, which again featured 'higher attaining' children being offered a more agentic opportunity.

> It's [use of ICT is] normally based on what I am wanting them to be learning, so I might have my highest ability children who are beyond what the rest of my children are accessing, so I'll give them a challenge on the iPad and get them to have a go independently with that, while I work with the rest… or it might be the low ability children need extra support, they can use it for the support that they need ...or it might be for the middle ability embedding what they're doing in different ways like that. Sometimes my children, my reluctant writers it can be quite nice for them to use it if they're pretending to be a newspaper reporter rather than writing it.
>
> (Ms Parker, Park Primary)

Ms Parker described the kind of support children in the 'lowest' group had from using ICT:

> …the lowest group, the purples, they will just have an iPad because they've got the houses for them to do it on the sheets and then they can have a go at writing in their books but they will use the iPad to help them as a support. … I changed it because, so initially, the ['low' group] were just going to carry on doing their houses but without the computer element to it, but the computer element gives them that instant feedback and they can see that it's just those numbers, and I'm hoping that it will help them visually see the patterns, because when it's, when they're writing it their numbers can be a bit messy and that can't help them.
>
> (Ms Parker, Park Primary)

This activity was categorised by the researchers as Support on the Mode dimension of the ICTIF.

Ms Price made her own videos in Year 3 for the more 'advanced' group, showing them how to do advanced division which they could use autonomously as a resource to support themselves. The teacher had recorded how to do more advanced division than she was going to demonstrate in the lesson. The 'more advanced group' was sent the recording via Showbie - allowing the group to work relatively autonomously whilst the teacher provided face to face support for the main section of the lesson with 'lower attaining' children.

In other schools, there were examples of lessons where children of all 'abilities' or who were not grouped by 'ability' were given the same task and where they could use ICT more agentically. In Norgate Primary children in Year 1 and above did not appear to be grouped by 'ability'; this was corroborated in observations, where 'ability grouping' was never evident. This school was located in a low SES area and on entering the school the children were assessed as having 'low' prior attainment. In an English lesson all Year 5 children participated in a series of writing sessions where they used the app Bike Baron as inspiration (discussed in Section 7.2). In a non-core curriculum lesson in Year 5 all children were given the same task of researching facts about highway men on their iPads, using the Google search engine. Children were allowed to search freely, guided by the rule that they must not click on an advertisement if one came up during a search. Children were given 20 minutes for the task and were all told to use the time effectively. As had been the case in Keyston Primary, Ms Harris (Norgate Primary) thought that 'lower ability' children seemed to need more help from the teacher when using ICT, whereas 'more able' children could use the 'help file' to sort out any problems on their own.

Byrne Primary was another school in which children did not appear to be grouped by ability. In the observed lessons, all the children were given the same task and all had the opportunity to make choices about their use of ICT (see Section 7.8 and Vignettes 8.2.1 and 11.1.2).

The different patterns of ICT use in relation to 'ability grouping' has social justice implications for children's learning. In some schools, certain groups of children ('higher ability' children) appear to be offered more opportunities to use ICT to enrich and deepen their understanding and are also provided with more scope to work collaboratively, to be agentic and to be co-creators of knowledge. This is in stark contrast to the opportunities provided for children in 'lower ability groups' in these schools, as these children seem to be presented with more 'drill and practice' type tasks when using ICT. These different learning experiences are likely to impact more widely on children's self-esteem and their ability to be agentic learners in addition to the development of different views of the nature and status of school 'knowledge'.

10.3 Gender and ICT in schools

Although there was insufficient data to explore a wider range of social justice issues there was sufficient data to begin to flag up the possibility of gender-based differences in children's digital practices and in their digital competences, skills and disposition towards ICT. Schools need to consider these differences and the possible impact they have on the understandings, ICT competence and skills and dispositions that children bring to school, how children may position themselves with respect to ICT and also, very importantly, the different purposes and motivations children have for engaging with ICT.

Some of the teachers in the study showed a willingness to build on what they perceived to be the pupils home digital practices. One teacher for example talked about using Minecraft:

> [Minecraft is] an absolute addiction for some of the children, but obviously telling them not to do that, we used it to make maths rooms in Minecraft and create worlds around fractions, create worlds around timetables, or they had to write a piece of narrative where your setting was Minecraft.
>
> (Ms Harrison, Stepside Primary)

Whilst it may have been true that a number of children played Minecraft at home, the analysis for RQ1 revealed that girls and boys seem to engage with it in different ways and for different purposes. Developing maths lessons around the theme of Minecraft may heighten some children's interest in fractions or 3D shapes. However, for many children, mainly girls, who played Minecraft primarily for the opportunities it affords for social interaction, focusing on the construction aspect in Minecraft-themed lessons would not align with their focus of interest in Minecraft. As previously discussed in Section 7.2, the collaborative aspect appeals to many children so teachers could consider how to plan lessons which better align with children's purposes and draw on the collaborative and social features of ICT use.

Similarly, although it may appear that there are few difference between children's use of social media amongst primary-aged children, the analysis of the data revealed that girls appear to use it more than boys and are more excited by the possibilities it offers for interacting with others. Boys will often engage with others online in the context of playing games, so the type of talk and interaction will differ from girls. Girls may use language to build affective relationships and talk about their daily lives whilst boys may use channels such as Skype for functional talk (eg. Rory and Ashish playing Minecraft in Battle mode). Although schools do not feel that they can condone children using social media apps if under age, schools may need to consider ways in which they can build on children's existing skills and interest in using social media, whilst also engaging those who are not yet using these forms of communication.

Schools may also consider whether, as part of their e-safety remit, they should be considering how best to ensure that children who are already active on social media are helped to stay safe, rather than trying to prevent them engaging online with others. The mother's reaction when she found out her nine year old daughter's SnapChat account had been hacked (discussed in Section 6.5.1) is perhaps relevant here. The mother admitted that the incident had been distressing for her, as a parent, but the child's capable response had reinforced the mother's view there was "no point pretending this stuff doesn't happen" and stressed that banning access "teaches nothing" (Emma's mother, Byrne Primary). Schools, in common with parents, are faced with the dilemma of how to balance children's participation rights with protection rights. Banning use of social media in school combined with limiting children's opportunities to discuss and share their experiences with teachers could potentially increase some children's vulnerability as valuable learning opportunities could be missed. For the children in this study, the children most at risk would be the girls as they use social media far more than the boys, although boys do interact with strangers (e.g. when playing FIFA).

Children's digital experiences outside school influence their identities in relation to ICT inside school. Whilst all children have multiple identities many children seemed to find that their home-based digital identity as the 'best gamer' or 'good at computers' or 'tech nerd' were not

necessarily known or acknowledged in school, even when those same children were appointed as digital leaders. In some cases children concealed their home-based digital identity and as a result teachers were unaware of the breadth and depth of some children's sophisticated use of ICT.

Latifah, for example, expressed her fears that her high status school identity as a digital leader in Stepside Primary would be compromised if the school knew that outside school her identity incorporated being an active YouTuber as the school had said that the children were legally too young to have a YouTube channel. A younger boy in Park Primary, seven-year-old Noah, was fully aware of the school discourse as his mother revealed:

> **Researcher**: I know he's only seven but has he expressed any thoughts about what he might want to do when he's older?
> **Noah's mother**: Yeah, sit at home and play Xbox.
> **Researcher**: I can see the attraction of that.
> **Noah's mother**: And then he's like come to school and they were talking about what jobs they were going to do. He said 'I just told them I wanted to be in the army because they're, they're not going to accept me sitting at home all day are they?'
>
> (Noah's mother, Park Primary)

When Noah's mother said that her son was good at 'strategy type games' and was asked whether the school was aware of her sons' ICT skills she replied:

> **Noah's mother**: He is quite a little bit shy in school
> **Researcher**: So you don't think he necessarily shares all that
> **Noah's mother**: So unless he's completely confident with a certain thing then he will be a little bit cocky, like I know what I'm doing. And he will then, otherwise he'll just sit back a little bit.
>
> (Noah's mother, Park Primary)

Neither of these children's home digital practices had been recognised by the school but inequities are likely to occur when assumptions are made about children, particularly on the grounds of gender.

The ways in which ICT is used to support pedagogy also needs to be carefully considered. All the schools used class displays but research by Smith, Hardman and Higgins (2007) suggests that IWBs may exacerbate gender imbalances within primary classrooms with respect to the proportions and types of teacher-child interaction:

> IWBs increase directive teaching to boys. From the viewpoint of girls in a whole class session, boys receive more teacher attention, and the girls must listen to more directive teaching, which is aimed at boys.
>
> (Smith, Hardman and Higgins, 2007, pp.465-466)

The impact of the use of ICT in different curriculum areas needs to be considered carefully if schools are to ensure that certain children or groups of children are not side-lined. Increasingly schools are using computer software to help teach aspects of the music curriculum. Armstrong (2008) has highlighted how the use of digital technology in music has been uncritically accepted and praised because of the potential digital technology has to increase children's control of the their learning environment and provide tools for musical composition which are empowering and democratising in that all children can now compose music without having to be able to play an instrument. Armstrong (2008) also argues that this uncritical acceptance of music technology masks the diverse experiences children bring to learning and the very different ICT skills children may have. This becomes an issue of gender equity if the software used is configured in ways which are familiar to children who tend to play computer games. There was insufficient data to unravel and identify the different skills children would be learning from different games but our data strongly suggested that girls and boys played different games and engaged with games differently. Teachers need to ensure that they are familiar with the software they are using in their classrooms and confident that it accessible and useable by all the children and does not privilege some children over others.

10.4 Summing up findings for RQ4

It was clear that there was scope for ICT to be used effectively across subjects, but that the perceived nature of the subject, the view of knowledge, strongly influenced how ICT was used in practice. It was evident that ICT use had greater impact (or potential to impact) on what and how children were taught where subjects were perceived to be less 'fact based' and 'procedural', such as in history and music, compared with maths.

Much of the ICT use in English and Maths provided opportunities for 'drill and practice' types of learning, which supported the development of children's ability to meet the national curriculum requirements. In English ICT was used in a variety of ways to enhance writing where the writing itself was or could have been changed by use of ICT. Not only did ICT provide new forms of composition, but it also offered powerful opportunities to scaffold and stimulate writing. This included by providing a real audience, for example through the use of blogs, and the use of rich immersive worlds that can elicit strong emotive engagement in children. In Maths, ICT provided the possibility for children to articulate, share and co-construct understandings of particular mathematical methods, for example using Explain Everything. There were examples in maths of teachers trying to increase children's independence through providing access to video clips that explain various aspects of mathematics.

Teachers need to be confident in the use of software and aware of the pedagogical reason for choosing to use ICT in a particular way with a particular group of children. It was apparent that teachers need to be alert to the possibility that the children's purposes do not align with theirs, which could result in children's learning taking an unexpected direction or the children not learning what the teacher had hoped (as was the case with the boys playing the division game linked with football).

Whilst there was insufficient data to look in detail at social justice issues related to the socio-economic status of children, it was apparent from the data outside school that there was no definitive link between socio-economic status and children's access to devices, access to the internet or use of ICT. Whilst some children's families did not have internet access because of the cost, other children's access was prevented or severely curtailed by family routines or rules (Section 6). Thus, the assumption that SES determines ICT access at home may need to be re-examined.

In terms of social justice, the data suggest that there were differences in the both the amount and nature of ICT use for children where they were 'ability grouped'. The research on the effects of 'ability' grouping on children's learning has focussed on children's self-concepts as learners, the quality of teaching and outcomes in tests (see Hallam and Parsons (2013) for a review). The analysis and findings presented here suggests that children in 'lower attainment' groups may be offered fewer opportunities to use ICT, and use it in ways that offer less scope to be agentive. Children labelled as 'less able' need to be afforded similar opportunities to those labelled as 'higher ability' to use ICT, both in terms of the amount and mode of use. The provision of more independent and richer learning opportunities for more 'highly attaining' children was not only an issue in KS2, where practice might be expected to be most severely effected by KS2 SATS, but was also evident in KS1.

In relation to gender equity, it is important not to treat girls and boys in binary terms or as homogenous groups, and to recognise how gender is mediated by other factors such as ethnicity or social class. However, there were some patterns of ICT use at home in these data that teachers need to be aware of in order to consider ways in which their pedagogy can be inclusive and does not lead to or perpetuate gender-based inequities in children's use of ICT and development and learning. These patterns include: the ways in which children engage with games at home and the learning that accrues; the different patterns of communication on-line and the impact of this for children's language; and the platforms and apps which children become skilled at using. ICT use within the classroom needs to take into account whether or not certain software is of more interest to particular groups of children and teachers also need to aware of research into the impact of particular uses of ICT (e.g. IWBs and gender-based patterns of interaction).

11 To what extent did the data indicate innovative pedagogy?

How does the research inform how to represent and model a participative pedagogy of mutuality (Bruner, 1996; Wenger, 1998, Alexander, 2000; Murphy and Wolfenden, 2013) and engage teachers with that pedagogy?

RQ5, which is quoted above, aims to refine understanding of what a sociocultural framing of pedagogy might look like, the extent to which it was evident in the study schools, and how such a framework might assist teachers in moving towards a sociocultural model of pedagogy.

Drawing on the literature review (Section 2) a framework was devised to highlight and contrast the key features of a number of different theoretical models of pedagogy: Traditional (behaviourist/information processing); Constructivist (three variants); and Innovative (a sociocultural model). This framework is referred to as the Innovative Pedagogy Framework (IPF). The literature review states that "This divide between how learning happens in outside-school and inside-school settings is problematic; changing pedagogy to capitalise upon pupils' new digital practices is important to enhance learning in the classroom (Gurung & Rutledge, 2014)" (This report, p.18). It goes on to explain how sociocultural theory highlights key facets of out of school learning, and hence this research views the sociocultural model of pedagogy as being innovative pedagogy. A pedagogy of mutuality thus equates with the Innovative model in the IPF.

Whilst little evidence was found that pedagogy in the study schools aligned with children's digital practices outside school (see Section 7), the researchers did observe (and were told about) a range of uses of ICT that are outlined in Section 8, which did change what and/or how children were taught in ways that could not realistically have been achieved without ICT.

As explained in Section 4.8, the Innovative Pedagogy Framework (IPF) (Table 4.8.1) was used to help differentiate between schools' and individual teachers' practices. This aimed to draw out some aspects of the IPF, and highlight practices that were innovative in the sense of reflecting features of sociocultural models of teaching and learning. Firstly, examples of practice from Fairfield Lower and Byrne Primary were compared. These two schools were chosen because the schools as a whole seemed to have very different pedagogical models as well as very different levels of ICT use. Secondly, examples of individual teacher's practice within Stepside Primary and within Riverview Prep were examined. These two schools were chosen because within each there were widely differing levels of ICT use between teachers within the school.

In each of the comparisons vignettes are provided along with an analysis of those vignettes. Where a vignette is already embedded in other sections of the report the section reference is provided, but the vignette is not repeated here.

11.1 Comparing pedagogy between Fairfield Lower and Byrne Primary

Vignette 11.1.1 encapsulates what appeared to be key elements of Fairfield Lower's pedagogical approach. The head teacher talked about the importance of community, which is why they have lots of visitors to the school and go on 'lots' of school trips. This might suggest an interest in learning through participation, through the process of belonging to a community where practices are situated and learners become part of that community. However, all of the other evidence suggests that this is not the case. Visitors and visits seem to be more to do with providing stimuli to motivate and engage the children, and thus a focus on extrinsic motivation. The importance of pace is emphasised, and learning appears to be seen as a process of information being delivered to the children, who then work individually, before being delivered more information. This all fits within a Traditional model of pedagogy.

Vignette 11.1.1 – Fairfield Lower

Fairfield Lower was a two form entry community primary school in a prosperous village in Central England. Ofsted judged the school to be 'Good' in both 2011 and 2016. The head teacher described the school as increasingly popular due to their high standards. She said that their focus was on the whole child, not just academic success.

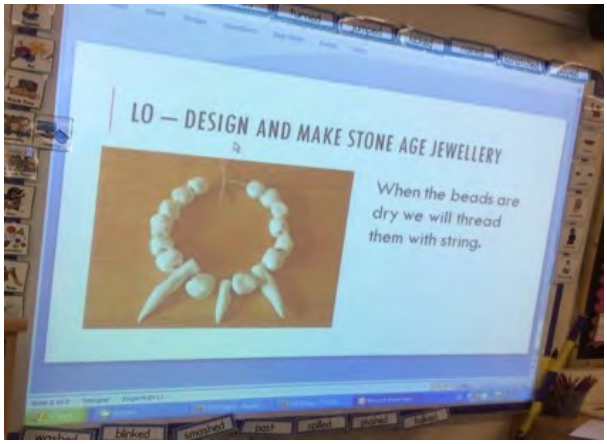
> We're a values-based school so we've always promoting values and encourage children to behave and conduct themselves correctly.

She talked about the importance of the local community, which was reflected in having lots of visitors (such as the local vicar) and every year group going out on a trip at least once per term, for example to the local church or railway station. However, the head teacher commented that there was limited parental involvement in classes. Fairfield Lower had sport coaches (e.g. for tennis), as well as having school clubs. They also had a specialist teacher for Science and the ICT coordinator taught computing in the ICT suite to all classes in Years 1 to 4. The head teacher described Fairfield Lower's pedagogical approach:

> Our approach is quite formal. Um we tend to do the maths and the English lessons in the morning for concentration purposes and then in the afternoon we tend to do the topic based curriculum, areas. Curriculum is subject based, topic subject based and that is fed into the English and maths as well
> …
> A good lesson? {Yeah} a very quick way of summing up a good lesson is a pacey lesson, a quick lesson, not a dull lesson. A lesson would start with children, being talked to by the teacher, so the input would be delivered by the teacher, the children would then go away and do an activity, and then they'd come back and they'd be delivered more information and they'd go away again and complete it. We always teach to the ability of the child, not the age. So if a child is ready to work at a higher level then they work at a higher level. So a good lesson is a pacey lesson, very pacey lesson where the children are completely engaged all the time {uhuh} involved, motivated, wanting to be there, um and not dull boring lesson [laughs]. A good lesson also has lots and lots of stimulus, um it might be whiteboards, it might be objects, it might be visitors, but just to keep the children engaged the whole time …
> …
> We do things called learning walks, which is where a member of the senior leadership team, will go for a wander around the school and just take down notes and then we feed that back as well, so we're constantly watching, we're constantly monitoring, and evaluating
>
> (Ms Russell, Head teacher, Fairfield Lower)

All of the classes had an interactive whiteboards (IWB), and most had their tables organised in clusters, although one of the Year 4 classes had desks in rows. Ms Smith and Mr Jones both independently reported that their lessons followed a standard format, with a learning objective on the board, teacher input, some questioning and discussion with 'talking partners', then carrying out an individual activity, and ending with a plenary.

Both lesson observations followed this format. In one case the teacher modelled writing an acrostic poem, with input from the children, before they individually wrote one of their own. In the second lesson the teacher initially introduced the topic of Stone Age jewellery, supported by images on the IWB. The children then worked individually to make a necklace using coloured clay, based on the image of a Stone Age necklace shown on the IWB.



Fairfield Lower seemed to contrast with Byrne Primary, which is described in Vignette 11.1.2.

Vignette 11.1.2 – Byrne Primary
This Vignette should be read in conjunction with Vignette 8.2.1.

Byrne Primary was a purpose-built primary and nursery school located in a town in one of the most deprived areas of the rural Highlands of Scotland. It's intake of 233 primary and 41 nursery children was made up of pupils from three local primary schools which were closed. The (initially unpopular) merger of the three school communities involved a two-year period during which Byrne Primary's senior leadership team engaged extensively with prospective pupils and parents in order to develop Byrne Primary as "the real heart" of the community.

ICT was explicitly stated as being at the heart of the head teacher's vision to maximise opportunities, extend horizons and develop "skills, independence of thought and resilience to succeed and contribute to society". In appointing staff the head ensured that they bought into this vision. Professional development for staff included mentoring and weekly TeachMeet style sharing of practice. The head teacher positioned himself as a learner and regularly dropped into lessons to talk with the children (often about their use of ICT).

An ethos of trust pervaded the school, with few school rules other than "Be friendly, enthusiastic, and resilient". Children were allowed to move freely around the school building (except the nursery) during breaks and were observed freely entering the staffroom and chatting with teachers. Pupils were seen 'covering for staff' on the school reception desk during lunch. Within the constraints of not yet having sufficient Chromebooks for every child to have their own, children were allowed to make use of resources (including Chromebooks) without always asking permission.

Ms Campbell talked about being

> here to facilitate things, and quite honestly we're always learning together and they know that. Particularly when it comes to using technology – they always know something more. That and local history – I come from Edinburgh and so when we were studying the Highland clearances recently, I had them teach me
>
> (Ms Campbell, Byrne Primary)

During all three observed lessons involving Ms Campbell, Ms Webb and Ms Roper, children in these P6 and P77 (Year 5 and 6) classes were allowed to choose whether to work on their own or collaboratively, what resources to use (e.g. whether to use ICT or not), and what format their final products would take (See Vignette 8.2.1 for a description of one of the lessons). The pupils in both focus group interviews confirmed that the observed lessons were typical. Though it seemed that in maths the teaching was a little more traditional, with Teacher A mentioning the use of Mathletics.

Whilst there is insufficient evidence to confidently map the practices in Byrne Primary to the Innovative Pedagogy Framework (IPF), it seems clear that it sits somewhere between the Constructivist and Innovative models in terms of ethos and the practices in the three lessons that were observed. Pupil agency (at least in the sense of being expected to make decisions about how to carry out tasks set by the teacher) and collaboration appear to be pervasive elements of practice in Byrne Primary. There appears to be a level of mutuality, at least in relation to ICT competence (and local history for Ms Campbell). More generally mutuality, and being co-participants in a learning community seems to be reflected in the trust and freedom of movement around the school that pupils enjoyed. This seems to fit the Innovative model within the IPF.

ICT is seen as being central in Byrne Primary, in contrast with Fairfield Lower where Mr Jones thought that ICT was sometimes detrimental, for example in reducing pupils' attention span and

> They [iPads] don't help them learn. I think they just change the way in which they learn
> …
> I can't think of any particular situation where they are sat with a piece of technology in front of them and that they couldn't have done it without it.
>
> (Mr Jones, Fairfield Lower)

These differences in pedagogical stance and views about the role of ICT are mirrored in the different Quantity, Focus and Mode of use of ICT by children in the two schools. Table 11.1.1 summarises these data, excluding instances of ICT use where there was insufficient data to confirm the Focus and Mode.

Whilst the number of instances of ICT use was not that different, the proportion that were deemed to be about using ICT to enhance learning across the curriculum (PICT) were substantially lower in Fairfield Lower. Furthermore, of those instances that were categorised as PICT on the Focus dimension there were many more in Byrne Primary that were categorised as changing or having the potential to change what and/or how children were taught, in most cases in ways that could not realistically have been achieved without ICT.

Table 11.1.1 Categorisation of ICT use in Fairfield Lower and Byrne Primary against the ICTIF

	Quantity	Noted instances	Focus is PICT	Mode (%) S	E	(T)	T
Fairfield Lower	<10%	5	20%	100%			
Ms Smith	<10%	3	33%	100%			
Mr Jones	<10%	2	0%	N/A	N/A	N/A	N/A
Byrne Primary	>40% to >50%	7	100%	14%	14%	29%	43%
Ms Campbell	>50%	5	100%	20%	20%	20%	40%
Ms Webb	>50%	1	100%			100%	
Ms Roper	>40%	1	100%				100%

Prior research (Maher & Twining, 2016) found that mobile devices supported constructivist pedagogical approaches – "turbo charging the pedagogy" according to one teacher. It seems possible that the differences in the Quantity, Focus and Mode of use of ICT by pupils in the two schools was at least in part due to the different pedagogical stances evident in the schools.

11.2 Comparing pedagogy within Stepside Primary

Ms Harrison and Ms Allen were chosen for comparison because, whilst they taught in the same school, they had very different levels of ICT use (Ms Harrison <50%, Ms Allen <10%), and each had been observed teaching at least once, with accompanying pre- and post-observation interviews.

The first lesson was in Ms Harrison's Year 6 class (see Vignette 8.2.4).

Ms Harrison described her views of teaching and learning at some length:

> because I teach Year 6, I feel that they've got to an age, obviously it's not appropriate for every lesson and it's whatever suits the intention that you're trying, the learning intention of the session, but I put a lot of emphasis on the journey and the discovery towards learning, and it's not as answer focused, a lot of collaboration, a lot of learning with and from each other, because then I tick off a lot of the PHSE things as well about being able to work with people and good listening and all the skills that actually yes you might need to know how to do long division but for life skills, being able to work with other people is probably a skill that you'll need to use a lot more in your adult life, in all walks of life, so I focus a lot on those things, … I'm quite creative in the classroom, I believe in a mutual respect with the children. I try and bring interesting context and do a lot of cross-curricular work. So, I will use a history topic to create a focus and a context for a piece of literacy or a piece of art or I'll do a maths challenge or something to science and then I'll do write a report on it to link it into English. So as I think that children if you teach them something which sounds quite abstract and they just know that they're in a maths lesson and they just know they're in an English lesson, but if you give them a bit of juice, maybe something real or you give them a story to hang it all off, or an idea to hang it all off the children have a lot more invested in what they're doing and therefore will produce better work because they'll have learnt more and that's what we want isn't it really.
>
> (Ms Harrison, Stepside Primary)

This seems to indicate that whilst Ms Harrison paid heed to learning intentions, she saw learning as being a journey, in which there are not fixed answers, collaboration was important, relevance to their lives outside school was important, as was mutual respect. This all seems to align with the Innovative model of pedagogy, though mediated by the constraints of having to meet curriculum targets. She seemed to be concerned with constructing learning opportunities from the perspective of the learner which would also align with the Innovative model, though you could argue that she was trying to motivate the children by making activities interesting (rather than drawing on their intrinsic motivation) which would tend towards the Traditional model. She went on to say:

> I believe in independent learners, all the kids' independent learning, when I talk about independent learning I mean children making their own academic choices, it might be choosing an activity that they do, it might be choosing the level that they're working at, it might be choosing the approach that they take. So if they are given a question it's how would you approach this? ... So for example a maths example is an easy one to give, you give them an investigative problem on the board or you say 'John has 17 bananas and so and so' for example and it's how would you work out, how could you prove this theory, or how could you disprove this theory or how could you find a pattern and it's up to them to make their choices
>
> (Ms Harrison, Stepside Primary)

Here too there were clear tensions between her espoused pedagogy ("children making their own academic choices") and curriculum demands (teaching maths). Her orientation was towards the Innovative model of pedagogy, though in practice this was not always possible due to curriculum and assessment constraints. The other Year 6 teacher talked about the constraint that SATs imposed, though it appeared that the school was supportive of the Year 6 teachers NOT changing what they did in order to jump through assessment hoops:

Ms More: You've got to though, that's absolutely what you've got to do, so I think that SAT's have, unfortunately they are going to have to have an impact on what we're doing, but we'll try and make it not too much, I think we've, as a school we've never really been a school to just push them on SAT's, we understand there's so much more.
Researcher: It must be really hard for them?
Ms More: It's really hard, I know really hard and they're so aware of it, when they came into Year six and at the beginning of the year and talked about what their hopes were, what their fears were, all of that and they were all, all thinking about SAT's, 'I hope that I get good marks in my SATs', 'I'm scared about SATS'. In September they were thinking that.
Researcher: It's scary isn't it, ten year olds getting stressed about tests.
Ms More: I know and they asked loads of questions, 'In the SAT's what about this', 'but what happens if I don't', already, and I very rarely mention it, very, very rarely. I might have mentioned it twice since September then only because they've asked me something about it.

(Ms More, Stepside Primary)

In Vignette 8.2.4, when she talked about written work not always being able to evidence children's learning and how film can enable children to demonstrate this through their actions, Ms Harrison was recognising that learner competence is what they 'do' well, it is used in action and may not be explicit or easily articulated. This too aligns Ms Harrison's espoused pedagogy with the Innovative model in the IPF.

As noted in Section 7.8, Ms Harrison appeared to allow her children a relatively high degree of freedom to choose when to use iPads. This too seemed to fit better with the Innovative model, in which pupils were seen as agentic.

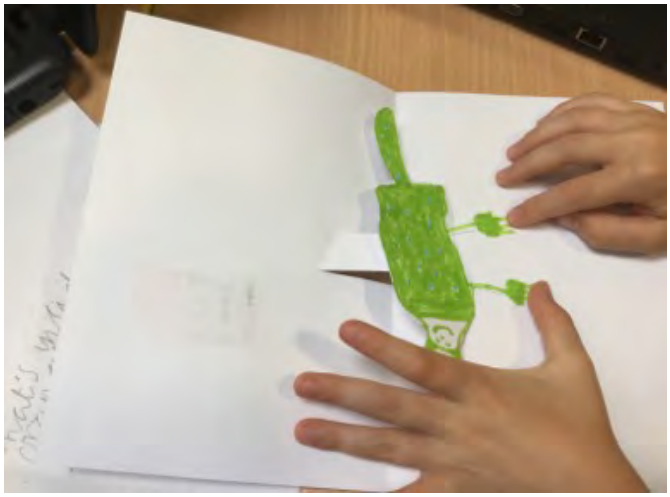
Ms Harrison's class (with tables stacked in the corner)

The second lesson was in Ms Allen's Year 2 class, see Vignette 11.2.1 below.

Vignette 11.2.1 – Stepside Primary Yr2 – 'Publishing'
Prior to this lesson with a Year 2 class, the children had read the book 'Bugs in boxes' and had then written their own sentences about what could be in their box. That lesson had been focussed on using contractions (e.g. apostrophes), questions (because they were being moderated and didn't have enough evidence of questions in their books) and 'exclamation sentences' (something Ms Allen said had been "invented by the government"). The children had written a series of sentences in the form:

What's inside that colossal sparkly box?
A small slimy caterpillar with a top hat!

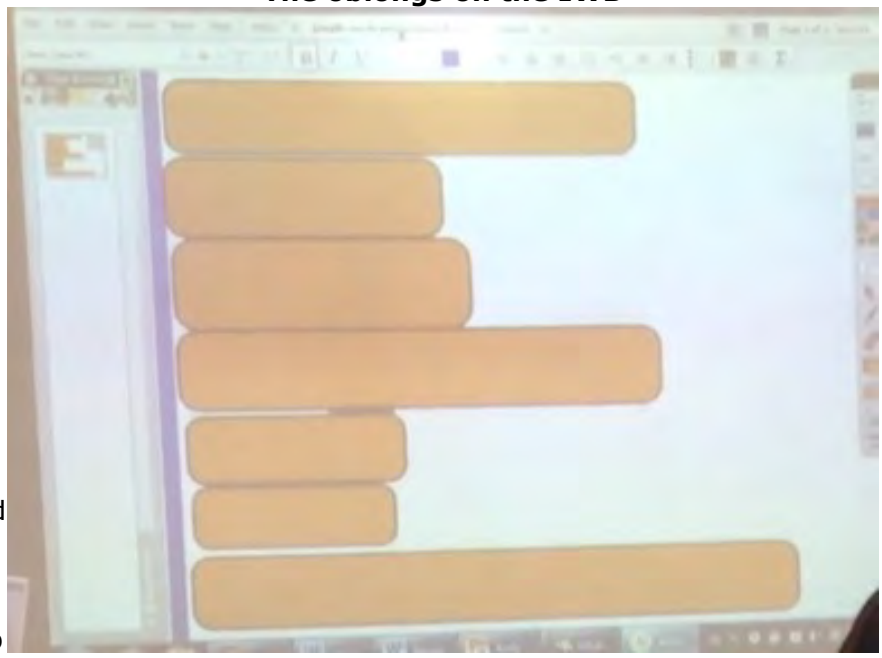
The inside of a booklet before the text is added



They had then chosen their 'best' pair of sentences and copied them out on paper "so they had them to hand" (Ms Allen). They had also created a pop-up book out of a sheet of A4 paper. They had drawn a picture of their box on the outside and the contents of the box on the inside to make a booklet.

The teacher explained that the purpose of this lesson was to help meet the Year 2 objective of publishing work in a variety of formats.

The oblongs on the IWB

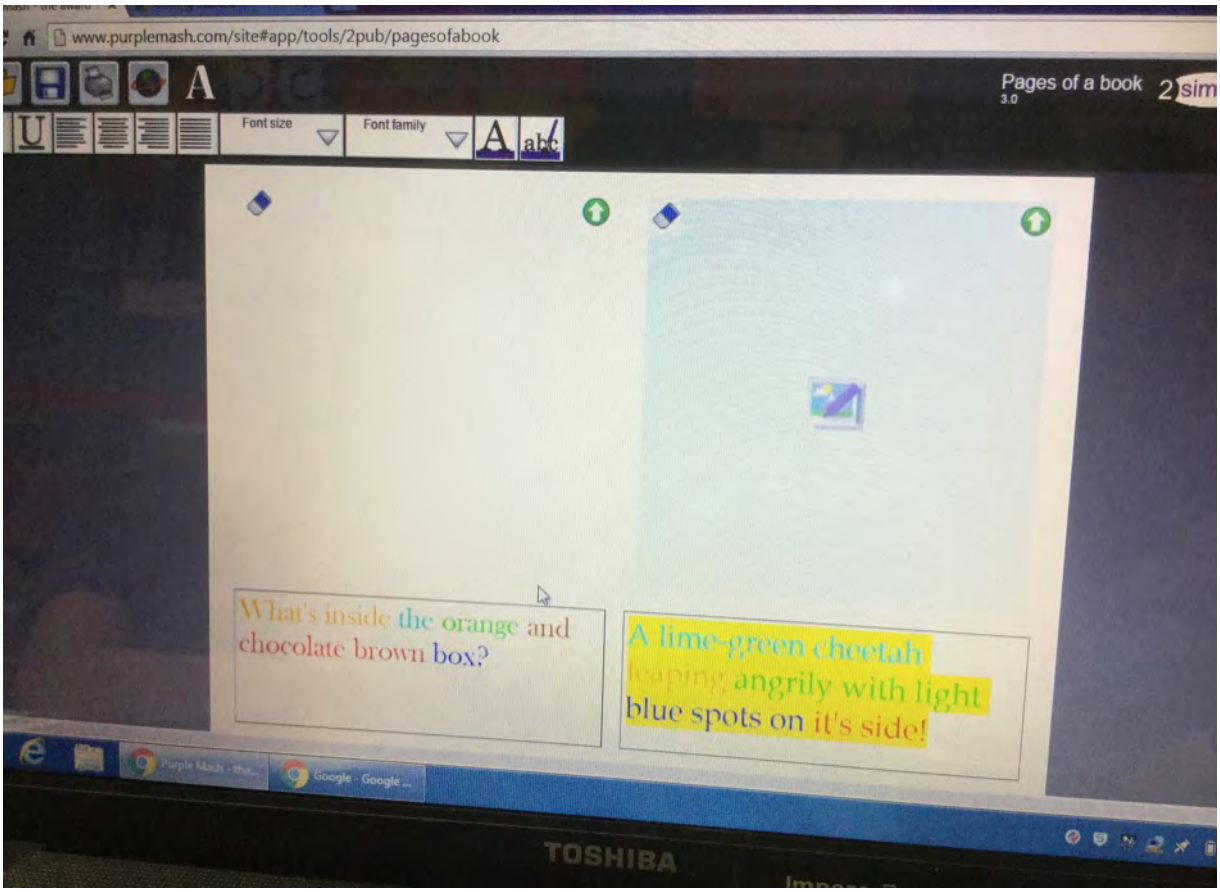


The lesson started with the children sitting on the carpet facing the teacher and IWB. The teacher explained that they were going to use Purple Mash to publish their sentences. The IWB showed seven oblong shapes lined up on the screen. Ms Allen gave the children a few minutes to talk with their partners about how to get into Purple Mash and print out their work. Whilst they were doing this another adult was putting out laptops on the tables. After a few minutes the teacher asked the children to talk her through how she could log in to Purple Mash. When a child correctly told her the first step she removed the top oblong shape to reveal the answer on the IWB.

Then, she demonstrated how to log in, load the program, and print out, as the children suggested what she should do next.

Once the explanation of how to log in was over the children went to sit at the tables, with one laptop between two children. Whilst they waited for a child to pass out the sheets with their sentences on they started to turn on the laptops and load up Purple Mash. Ms Allen circulated around the class, helping children who were having problems logging in.

Once they had loaded the directed app within Purple Mash the first child typed in their question and answer on the laptop. They then changed aspects of the font such as size and colour, before printing out their sentences.



Then the other child typed their question and answer, adjusted the fonts and printed them out. The children explained to the researcher that they were going to cut out the printed sentences and stick them onto the booklets that they had already illustrated.

When asked what her 'perfect pedagogy' would look like Ms Allen responded:

> Okay for me that's always gonna look different every time because it will always look different. {Ok} but there's going to be some input from, someone is going to up level what the children know or can do. So you're inputting something new, building up on what they already know {Yeah} The children then integrate within that, explore that, maybe follow a model or maybe deviate from a model that you've given them but they are active, very active. They're talking, they're involved, and they're doing. They may also be recording something, pen and paper, computer, whatever, but they are experimenting within that, making some mistakes, collaborating with peers, assessing themselves, assessing each other. So they'll always be some kind of a checklist or some sort of a mark that they know they should go back to to see 'have I done what we were trying to do'.

When asked about pupil choice she said:

> **Ms Allen**: it will vary. I try to build in choice and collaboration as much as possible really.
> **Researcher**: So give me an example of the sorts of choices that children might be given?

Ms Allen: So in a maths lesson I'll usually, well there's usually a couple of different levels of choice. The first one would be the level of the activity. So even within, I know that group don't need to know that, they'll be a choice for them between spicy and hot for example, mild, spicy and hot we tend to go for.
…
Researcher: So that's one sort of choice is the level.
Ms Allen: Yeah, the level. They'll be choice. I don't generally have places for them to sit in the classroom erm, so they can choose usually who they work near or with. There will be times that I will choose it.

(Ms Allen, Stepside Primary)

There seemed to be some contradictions within what Ms Allen said, and between her espoused pedagogy and the observed practice. For example, "someone is going to up level what the children know or can do" positions the children as passive (Traditional model) but contradicts "The children then integrate within that, … they are active, very active" (which fits better with a cognitivist or radical position within the Constructivist model). Ms Allen talked about collaboration being important, but in the observed lesson the children were taking turns, which fell short of cooperation or collaboration and would fit best within the Traditional model. In the observed lesson the teacher set a pre-defined problem for the children – how to log in to Purple Mash and print out their work – and then limited the information to be processed by asking them to tell her the next step in the process one at a time. This also seems to fit the Traditional model within the IPF. However, if the children had defined what 'best' meant and having reflected on their work negotiated the definition of 'best' with the teacher and/or peers then this would have positioned this within the Constructivist or Innovative model.

In contrast to Ms Harrison, Ms Allen determined when ICT would be used by her children. She said that this was because they only had two iPads, though according to the assistant head her year group had a 1:3 ratio of laptops to pupils, and enough for 1 to 1 provision if desired, and during the observation there seemed to be enough laptops stored in the classroom for one laptop per pair of children.

Here too it seems possible that the differences in Quantity, Focus and Mode of use of ICT by pupils in the two classes was at least in part due to the different pedagogical stances of the teachers. Table 11.2.1 provides a breakdown of the noted uses of ICT by children in each class, where there was sufficient data to be able to categorise them on the ICTIF.

Table 11.2.1 Categorisation of ICT use in Stepside Primary against the ICTIF

	Quantity	Noted instances	Focus is PICT	Mode (%) S	E	(T)	T
Stepside Primary	<10% to <50%	7	86%	50%	17%		33%
Ms Harrison	<50%	3	100%		33%		67%
Ms Allen	<10%	4	75%	100%			

Of the instances of ICT use noted by the researchers, Ms Harrison's were all categorised as Transform or Extend on the Mode dimension of the ICTIF, whilst Ms Allen's were all categorised as Support (or were deemed to be Computing on the Focus dimension so the Mode did not apply). Here too, it seems reasonable to conclude that the difference in the Mode of use reflected their different pedagogical stances within the IPF.

11.3 Comparing pedagogy within Riverview Prep

Mr Ryan and Ms Peak were selected to be compared because they both taught maths and English to Years 5 and/or 6 at Riverside Prep, but pupils in their classes appeared to spend quite different proportions of their time using ICT (Mr Ryan <40%, Ms Peak <20%).

Mr Ryan had worked for five years in the IT industry, and then moved into teaching. In his previous school he had been the ICT Coordinator and had introduced the use of Google Classroom in the school three years ago. He had only very recently moved to Riverview Prep.

He described a wide number of uses of ICT, including using: Kahoot! because children enjoyed the competitive element; QR codes to direct their web searches to specific sites; using String AR as a stimulus for writing; and using Morpho and Crazy Talk to encourage children to write scripts (and learn some history or other content in the process). The last three of these he hadn't had time to use in Riverview Prep yet.

Children he taught also talked about using TT Rock Stars to practice their tables "a lot" (Riverview Prep Group A post-observation 2) and showed the researcher some of the Explain Everything creations they had made in maths (e.g. 19÷4, though they had carried out the calculation incorrectly). Several of these examples of using ICT had the potential to be categorised as Transform on the Mode dimension of the ICTIF. Others, such as the use of Kahoot!, TT Rock Stars, and providing activity briefs (worksheets) on the iPad were categorised as Support.

Mr Ryan also used the class display at the beginning of lessons, for example showing videos as a stimulus, and occasionally reflected children's work onto the class display so that it could be shared.

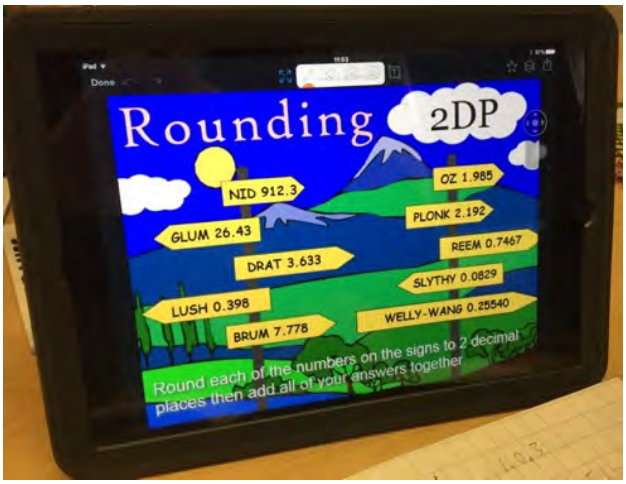
The observed lesson is described below in Vignette 11.3.1.

Vignette 11.3.1 – Riverview Prep Yr6 – Maths

Mr Ryan taught the 'bottom maths set' in Year 6. There were six children in this class. The observed lesson did not take place in Mr Ryan's classroom, which meant that he had less time to set up the lesson as he had to wait for the previous class to finish.

Once the other class had left he logged on to the desktop connected to the IWB and pushed the instructions for the first activity to the children's iPads using Showbie on his iPad. As the children came in and settled down they logged into Showbie, found the instructions, and started working on the task, which involved rounding numbers to two decimal places and then adding up the resulting numbers. Two girls shared an iPad, even though they each had one of their own. The other children used their individual devices. All of the children were working individually in their exercise books, referring to the iPad for the questions they had to answer.

A child's iPad showing the rounding task

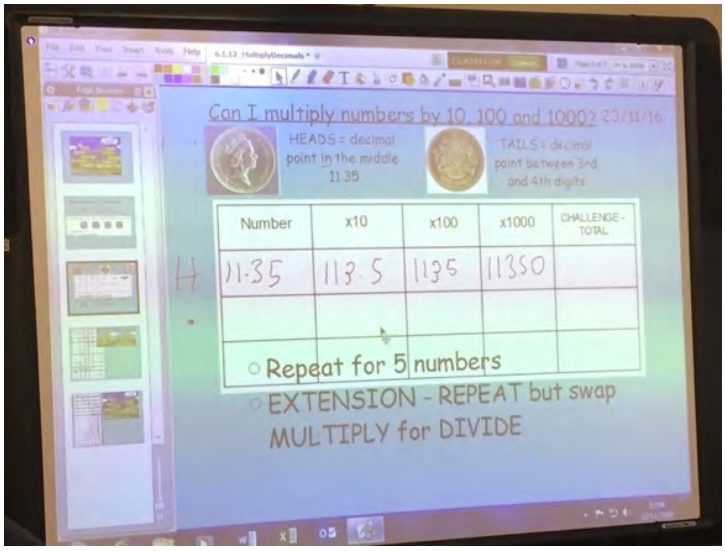


Mr Ryan circulated, talking with individual children, and ensuring that they understood what they were doing. The two girls who were sharing an iPad chatted as they worked.

When a child had finished all of the problems on the iPad Mr Ryan sent the answers to their iPad using Showbie. They then checked their work, and if there were any errors corrected it.

When the first girl had successfully completed the rounding task the teacher explained that they were going to carry on with another task that they had started previously, multiplying numbers by 10, 100 and 1000. Mr Ryan gave out sets of dice to the children and went over to the desktop PC and projected the task description onto the IWB. The children carried on with these tasks until the session ended.

The multiplication task on the IWB



Referring to his Year 6 maths set Mr Ryan explained that:

> I try to make it fairly fun and I'm quite lucky in that they're not refusers to learning. One of them maybe is a bit sometimes. But they want to learn, they just find it tricky. Behaviourally they're, I think you'll see they're pretty great.

Following the lesson Mr Ryan was surprised that the children had struggled with the initial decimal place task:

> .. but they never cease to amaze me those children, in that I thought they would go, I thought that would be a five, 10 minute job again. I really did. All I done was change

> it from, a virtually identical task. It was even signposts and stuff on yesterday's task, and I changed it from one decimal place to two decimal places. They had done their homework on decimal places last night, and they come in, and I've just marked their homework just now, and they got it all right, so I don't know what has happened. But that slight change and that is that, that's the crux of the problem I feel with those children, that if I put something in slightly out of context, they can get, it can take a long time, either they completely lose it or it took them a long time.
> …
> perhaps one might give them a sheet to do it on or something, but I'm loathe to do that when I want them to be resilient, I want them to become more independent and get stuck in themselves.

As with other teachers, there were a number of contrasting elements to Mr Ryan's espoused and enacted pedagogy, which were difficult to unravel. He seemed to think that competition was a powerful way to increase children's motivation, which fits with the Traditional model in the IPF. However, he also used Explain Everything, which if used as a tool to support meta-cognition and to negotiate shared understandings could fit the Innovative model. However, the examples that the children shared contained 'obvious' errors which suggested that no reflection had taken place. Mr Ryan seemed to assume that 'knowledge' (for example about place value) should be transferable between contexts, including being able to apply the process you use for dealing with rounding to one decimal place to round to two decimal places unproblematically, which could fit the Traditional or a Constructivist model. He wanted the children to be independent, which suggests that they would be active (Constructivist) or even agentive (Innovative). He was clearly happy for the children to work together, albeit with individual outcomes in the observed lessons. In the observed maths lessons, ICT seemed largely to be a tool to motivate children (extrinsic motivation – Traditional) and to support him (e.g. Showbie). Though in an observed science lesson it seemed to be being used as a tool, both to capture data (images of flowers) and to support children in thinking about the characteristics of the flowers (using Explain Everything).

It needs to be borne in mind that Mr Ryan was new to the school, having only been in post for five weeks, and his practice may not have fully reflected his preferred pedagogical approach in this transition period, while he established himself. He needed to become familiar not only with the school's norms and expectations, but also with its ICT setup, which was very different to the Google Classroom environment he was used to. It is also possible that his pedagogical practice varied when teaching different subjects because of his perception of the 'nature' of the subject. As discussed in Section 10, a deductivist view of maths is likely to result in teachers focusing on procedures, mathematical 'facts' and specified ways of representing mathematical concepts and ideas. Overall, Mr Ryan's practice didn't seem to fit clearly into any one of the pedagogical models in the IPF, he had elements of both the Traditional and Constructivist models.

The second teacher in Riverview Prep was Ms Peak. See the Teacher Vignette in Section 5.3.

Ms Peak seemed to primarily make use of three applications: Airdrop which is a tool to transfer files, TT Rock Stars which is a times table reinforcement program, and Kahoot! which is a quiz app. She also mentioned using Reflector in a poetry lesson, and was observed attending a training session in which the use of Reflector was explained on the first day of data collection. There seemed to be a good match between her use of TT Rock Stars and her views about learning and teaching. She thought that the elements of competition and pace were important, particularly for the children in the 'higher' maths set she taught. This seems to align with the Traditional model in the IPF. TT Rock Stars also enabled lots of practice of times tables, which would align with the Traditional model.

Whilst Ms Peak talked about Kahoot! as motivating children because of the competitive element, one of the drawbacks of Kahoot!, she felt, was that children would guess in order to be the first to answer, a phenomena she referred to (with her children) as "the thickest is quickest". In the observed maths lesson she tried to mitigate this by allowing a minute for children to answer each Kahoot! problem, and then spent time talking through the answer.

This seemed to conflict with her view of the importance of maintaining a fast pace, and might have fitted better within a Constructivist model. She also thought that using multiple choice had the advantage of enabling the children to work backwards from the answer which might position learners as active constructors of knowledge, aligning again with the Constructivist model in the IPF. However, it could also be argued that multiple choice has a tendency to narrow options and opportunities to explore alternative meanings and understandings as children are provided with a limited number of choices, one of which they have been told is 'right'. Taking this view would position the use of Kahoot! in the Traditional model of pedagogy.

Using Kahoot! and TT Rock Stars also seemed to align with her view that it was important to give frequent formative feedback, as both provided almost immediate feedback on how each child had done on each question. This might align with a radical constructivist approach in which teachers elicit children's prior knowledge and model learner's knowledge through a process of testing and retesting. Similarly, her use of Reflector to share children's poems, which she noted on her questionnaire, seemed to fit with a desire to give formative feedback. She wrote that they were discussing a poem and she was using Reflector to show children's work before commenting on good aspects and improvements. She referred to this as assessment for learning (i.e. formative assessment) which enabled the development of "shared understanding of what I am looking for, how to improve and where to go next". This fitted with her account of trying to give feedback on work as part of the lesson, rather than marking books after the lesson. She noted that children in her English class sometimes found this frustrating as it stopped their flow:

> but what's the point in carrying on and not using any punctuation in a long piece of writing, if you can't then stop it right at the beginning and really focus them on that?
>
> (Ms Peak, Riverview Prep)

Formative feedback, has the potential to support different pedagogical approaches ranging from the Traditional through to the Innovative model in the IPF. If it is used to listen 'for' rather than 'to' (Barrow, 2015) it will focus on ensuring children are demonstrating they have learnt what has been taught (Traditional model). Alternatively, formative feedback at sensitively judged moments could enable teachers and children to listen 'to' each other and this would facilitate dialogue and the sharing of meanings and collaboration which is more aligned to a socio-cultural pedagogy (Innovative model).

Using Reflector could also enable shared meanings to be developed in a context where there was mutuality, which would map onto the Innovative model of pedagogy. However, it seemed that this was not the case here; rather Ms Peak was telling the children what she was looking for and how they could meet her criteria. This fits better with a Constructivist model.

Ms Peak seemed to be focussed on individual work, and whilst she allowed children to work in pairs sometimes, she didn't allow children to share iPads "because that's pointless" (Ms Peak, Teacher group interview). In the follow up to the observed maths lesson in which two girls had been sharing a maths text book and talking quietly as they worked Ms Peak said:

> I mean that's what the lesson should be, that they can have that freedom if they need to scaffold each other … Yeah, sometimes not but actually it shouldn't matter so much unless it's something that I really want to see what they're doing. I mean that was the first time we've done pie charts so, but maybe on the next lesson when they're doing it they should be doing it on their own.
>
> (Ms Peak, Riverview Prep)

Whilst she talks about scaffolding, which would seem to align with a Constructivist model (social constructivist), Ms Peak clearly felt that working individually was most appropriate and necessary in order for her to assess what the children knew. This might align with a view of knowledge being a property of the individual (and hence a Constructivist model) or with learning being an individual activity (and hence a Traditional model of pedagogy).

Ms Peak also talked about using ICT as a carrot or a stick, again emphasising extrinsic motivation, and alignment with the Traditional model in the IPF.

Overall, Ms Peak's espoused and enacted pedagogy whilst not fitting neatly into any one of the pedagogical models in the IPF did seem to map most closely onto the Traditional model, with some elements of constructivism.

Table 11.3.1 Categorisation of ICT use in Riverview Prep against the ICTIF

	Quantity	Noted instances	Focus is PICT	Mode (%) S	E	(T)	T
Riverview Prep	<10% to <40%	14	93%	31%	8%	62%	
Mr Ryan	<40%	10	100%	20%	10%	70%	
Ms Peak	<10%	4	100%	75%		25%	

Given the difficulty in determining the pedagogical model from the IPF that fitted most closely with Mr Ryan's or Ms Peak's espoused or enacted practices it is not possible to draw any conclusions about whether or not there is a relationship between their pedagogical model and the categorisation of children's use of ICT in their classes. In both cases there are elements of ICT use being categorised as Support, which might align with the Traditional model, but also uses which had the potential to change what and/or how children were taught, which might align with a Constructivist or Innovative model within the IPF. Thus this data does not undermine the apparent relationship between categorisation of practice on the IPF and categorisation of ICT use on the ICTIF that appeared to exist in all the instances compared in Sections 11.1 and 11.2. However, it does hint at the importance of teacher identity as a determinant of ICT use, irrespective of the pedagogical stance of the teacher. It was clear that Mr Ryan saw ICT as important:

> I've taught, what, this is my 13th year of teaching. I think my first two years of teaching, I don't think, there was a Nimbus or BBC-something in the corner that nobody, I mean I came from, I worked in IT for five years for IT companies, so I came in, right where's my computer? A lot of the time I had a desktop and then very quickly, I suppose there was some government financing, it wasn't just a computer in the corner, they pushed money into the IT suite. Teachers got laptops. And very quickly I would plan, word process planning, I'd look for my resources online. I'd create lots of things myself for lessons and it underpinned pretty much how I teach. So if I didn't have IT I'd get by, but I like it. It's a really good crutch for me to…
>
> (Mr Ryan, Riverview Prep)

11.4 Summing up findings for RQ5

There was often insufficient data to be able to confidently locate practice within one particular pedagogical model within the Innovative Pedagogy Framework (IPF). However, the IPF did help to highlight differences in practice between the example schools (Fairfield Lower and Byrne Primary) and between Ms Harrison and Ms Allen in Stepside Primary. The picture was less clear in the case of Mr Ryan and Ms Peak in Riverview Prep, though in this case it appeared that Mr Ryan positioned himself as an ICT user, irrespective of his pedagogical stance.

There did seem to be some alignment between the pedagogical model that practice mapped on to on the IPF and the categorisation of ICT by children in schools/classrooms on the ICT Innovation Framework (CITIF). Though again, this was less clear for the teachers in Riverview Prep than for the comparisons between Fairfield Lower and Byrne Primary, and between Ms Harrison and Ms Allen in Stepside Primary. Table 11.4.1 provides a summary of these data.

Table 11.4.1 Summary of categorisations on the IPF and ICTIF

	Pedagogy	Quantity	Noted instances	Focus is PICT	Mode (%) S	E	(T)	T
Fairfield Lower	Traditional	<10%	5	20%	100%			
Byrne Primary	Constructivist / Innovative	>40% to >50%	7	100%	14%	14%	29%	43%
Stepside Primary								
Ms Harrison	Constructivist / Innovative	<50%	3	100%		33%		67%
Ms Allen	Traditional	<10%	4	75%	100%			
Riverview Prep								
Mr Ryan	Traditional / Constructivist	<40%	10	100%	20%	10%	70%	
Ms Peak	Traditional	<10%	4	100%	75%		25%	

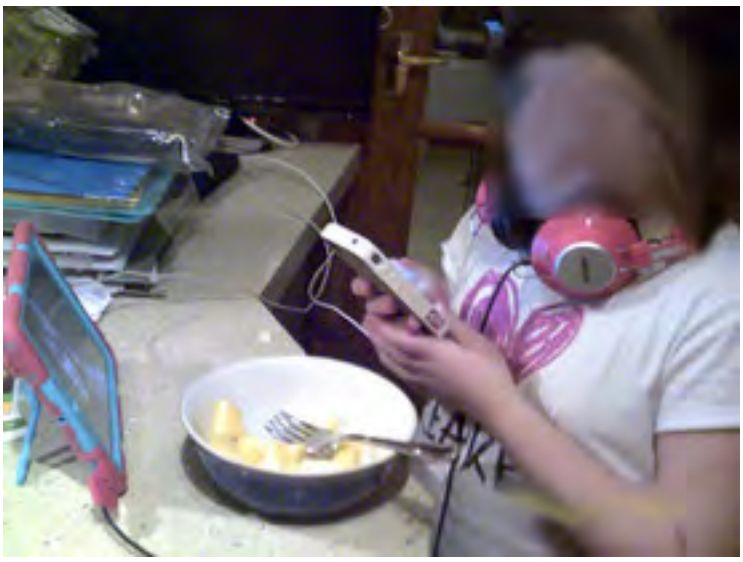
It is important not to underestimate the influence of the school arena on teachers' pedagogical approaches. In Stepside Primary, the head teacher talked about recognising her staff were 'professionals' and as such she was willing to provide a degree of freedom to her staff as to how they taught. She provided in an insight into the learning process the staff themselves went through and which she was willing to facilitate:

> …we went through a stage of looking at assessment for learning and looking at learning intentions and success criteria and it's been a journey that we've gone through and in terms of success criteria, you know, we just start to see teachers, everybody negotiating with their children, the success criteria, and it's not appropriate all the time. So it's doing it so you get practise of it and you know how to do it and you feel comfortable with it but then knowing actually, 'you know what, this isn't helpful, this isn't useful'
>
> (Ms Almasi, Head teacher, Stepside Primary)

The differences in teachers' practices both within schools and across the schools would suggest that despite certain constraints (e.g. the requirements of the National Curriculum and accountability frameworks) coupled with access to ICT resources, teachers nonetheless are able to be agentive in making decisions about how they teach, and how they use ICT to Support, Extend or Transform their children's learning. Teacher agency matters.

There is also some evidence to support the view that teachers whose preferred pedagogy fits the Innovative model on the IPF or who position themselves as users of ICT (as Mr Ryan did) will enable their children to make more use of ICT than teachers who either adopt a Traditional model of pedagogy, or who do not see ICT as an important aspect of their identities. This higher Quantity of ICT use seems to often be accompanied by use that changes, or has the potential to change, what and/or how children are taught.

11 Conclusions and recommendations



NP3 (New Purposes – New Practices – New Pedagogy) was funded by the Society for Educational Studies to explore the digital practices that children engage with outside school and the extent to which these are recognised, valued and influencing teachers' pedagogy inside primary schools.

The project was underpinned by a sociocultural theoretical position, which informed it approach and was reflected in its five key research questions (RQs):

RQ1 What are the digital practices that pupils bring to their learning in school?

RQ2 Across subject domains what do teachers' intended and enacted pedagogic practices indicate about their awareness of and the value accorded to pupils' digital competencies, and how do pupils' experience these pedagogic practices?

RQ3 What institutional circumstances and practices enable or undermine how pupils' digital competencies and practices are recognised (RQ1) and integrated into teachers' practice (RQ2)?

RQ4 What are the consequences of the answers to RQs 1-3 for learning in terms of social justice, and across and within subject domains?

RQ5 How does the research inform how to represent and model a participative pedagogy of mutuality (Bruner, 1996; Wenger, 1998; Alexander, 2000; Murphy & Wolfenden, 2013) and engage teachers with that pedagogy? This will be addressed through the meta-analysis of data across studies.

11.1 Data collection and analysis

Over a two year period over 100 children and more than 60 teachers in 13 schools took part in the study. 43 'log children' used digital cameras to capture evidence of the ways in which they used ICT 'at home' (which included any use outside school/school clubs) and were each interviewed individually at least once. More than 20 carers of these 'log children', mostly mothers, were interviewed individually about their child's home context and use of ICT. 31 teachers were observed teaching at least one lesson, with some being observed three times. These teachers were each interviewed at least twice (generally before and after each observation). Approximately six children from each of the observed lessons took part in a group interview following the

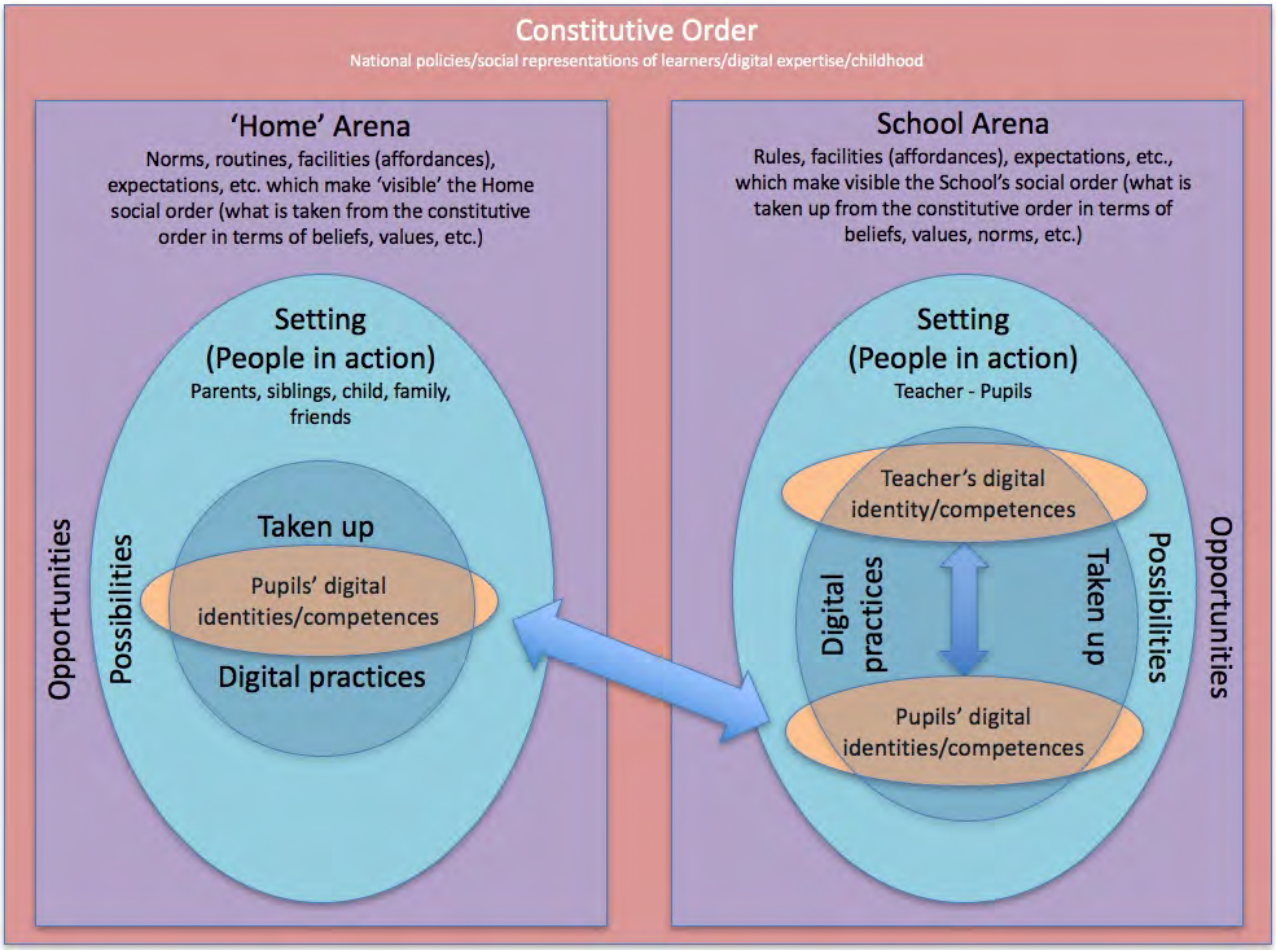
lesson, and in addition at least one group of children from the older year group in the school was interviewed about ICT use in the school more generally.

The data collection and analysis were informed by a sociocultural framework (see Figure 11.1.1), which focussed attention on:

- The constitutive order – the broad context within which homes and schools sit, which for example includes: national policies; social representations of learning, childhood, and ICT
- The arena of the school/home – the enduring features of the school/home that reflect how the constitutive order has been taken up in terms of beliefs and values. This would, for example, include: norms, routines, rules, facilities, and expectations. The arena frames the opportunities that are available.
- The setting (people in action) – the people within the arena who interact with each other and with the child. Through their actions people within the arena create and/or constrain what the child can do. The setting (People in action) frames the possibilities that are available.
- What is taken up, what individuals do within the setting (people in action), which is a reflection of their identities - what they see as being possible for them to do within the wider possibilities offered by the setting (people in action).

See the literature review (Section 2.1) for an academic introduction to the sociocultural underpinnings of the project, and Section 3.3 for a more detailed explanation of the project's sociocultural framework (Figure 11.1.1).

Figure 11.1.1 NP3's sociocultural framework (replicated from Figure 3.3.1)



11.2 Outcomes related to RQ1

The findings about children's digital practices outside school need to be viewed in the light of the inevitably unrepresentative sample of children and carers who took part in this aspect of the research.

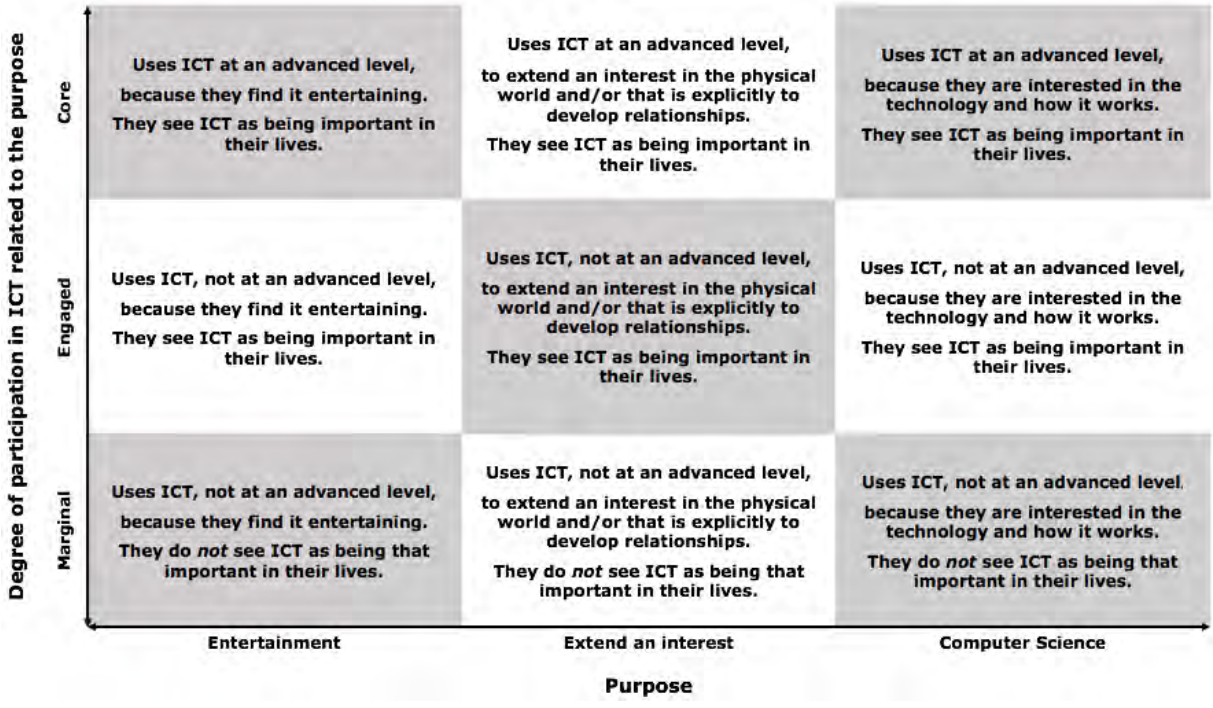
All of the 'log children' lived in homes where ICT was readily available, including access to mobile devices and WiFi connected to the Internet.

Children engaged in a wide variety of uses of ICT outside school, including, but not limited to:

- Playing games ranging from simple 'arcade' style games such as Snake or Angry Birds through to sophisticated use of virtual worlds such as Minecraft.
- Finding information, either using a web search engine such as Google or, very often, searching within YouTube
- Creating, editing and sharing images, videos and music, ranging from using painting apps, through to taking still photographs or videos with their mobile device, to sophisticated editing of video and audio and uploading to the web (e.g. to their own YouTube channel)
- Communicating with family and friends, and much less often with people they didn't know in the physical world. This included 'in game' communication (e.g. using built-in chat tools or other channels such as Skype)
- For some children sustaining relationships was the main purpose and specific communication tools such as WhatsApp, Facebook and/or Facetime were used
- Programming/coding whilst less common, was mentioned, usually as a minor interest compared with the other out of school uses of ICT
- Other 'fun' uses of ICT, including downloading and/or listening to music, watching videos/TV (often using a service such as Netflix or catch-up TV), reading e-books.

In order to make sense of the vast array of uses of ICT, and equally importantly the ways in which children used it outside school, the Digital Practice Framework (DPF) was developed (see Figure 11.2.1). This encapsulated key aspects of children's digital practices, which related to why they were using ICT (Purpose), and the level of sophistication of that use combined with the way in which they positioned themselves in relation to other users of ICT (Participation). For a fuller explanation of the Digital Practice Framework (DPF) see Sections 4.3.2 and 6.3.

Figure 11.2.1 The Digital Practice Framework (DPF) (replicated from Figure 4.3.1)



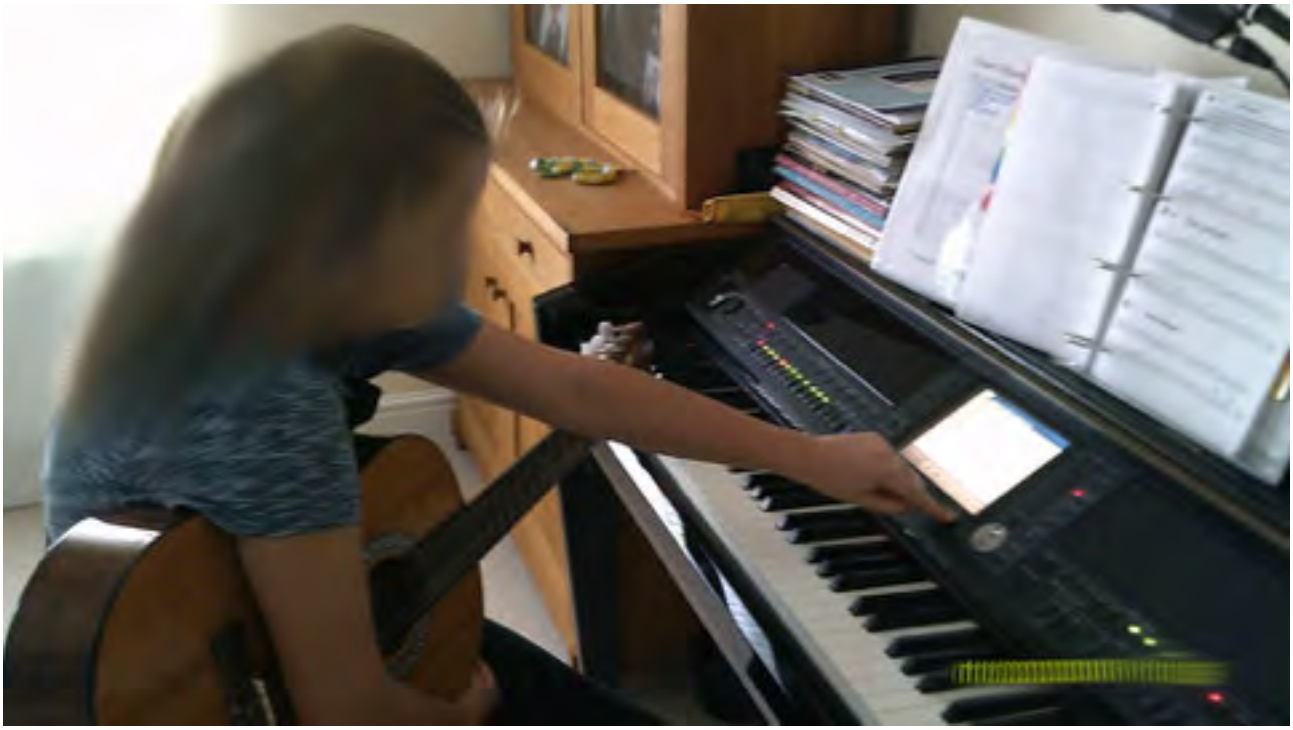
The 43 log children's digital practices were categorised against the DPF. Key similarities and differences between children whose practice 'fitted' into the different cells within the DPF (e.g. Entertainment/Marginal, Entertainment/Engaged, Extend an interest/Marginal, etc.) were looked for in relation to:

- the home arena, more specifically: level of ICT provision; family routines; rules/time constraints and access to the Internet; and parents' views
- people in action and children's identities (including gender identities)

A key finding was that there was a wide variation in levels of engagement and sophistication of ICT use. This was often due to constraints placed on the child's use of ICT within their home arena or due to lack of support due to parents' own levels of ICT competence and/or concerns about children using ICT. This challenges commonly held assumptions about the majority of children being highly competent users of ICT. Gender did appear to influence children's digital practices.

Another key finding, which is encapsulated in the Purpose dimension of the DPF, is that whilst the majority of children use ICT primarily for entertainment, others purposively use it to extend physical world interests. Children were agentic, they pro-actively and independently searched for information about things that they were interested in.

See Section 6 for a fuller discussion of the findings relating to RQ1.



11.3 Outcomes related to RQ2

In order to establish the extent to which pedagogy (linked to ICT use) in primary schools aligned with children's digital practices outside school, uses of ICT inside school were analysed against the Digital Practice Framework (DPF). This analysis showed that there were a small number of examples of pedagogic practices that did, or had the potential to, align with children's digital practices outside school. These related to:

- the use of school radio stations, where children became radio presenters
- digital leaders programmes, where they went beyond carrying out routine tasks such as managing equipment
- some uses of social media (such as class blogs), where teachers relinquished control
- programming, for a small minority of children
- and giving children control to decide, without having to ask permission, when and how to use mobile devices.

In almost all instances within the study schools the way in which ICT use was implemented meant that any potential alignment with children's digital practise outside school was not achieved.

A school radio station

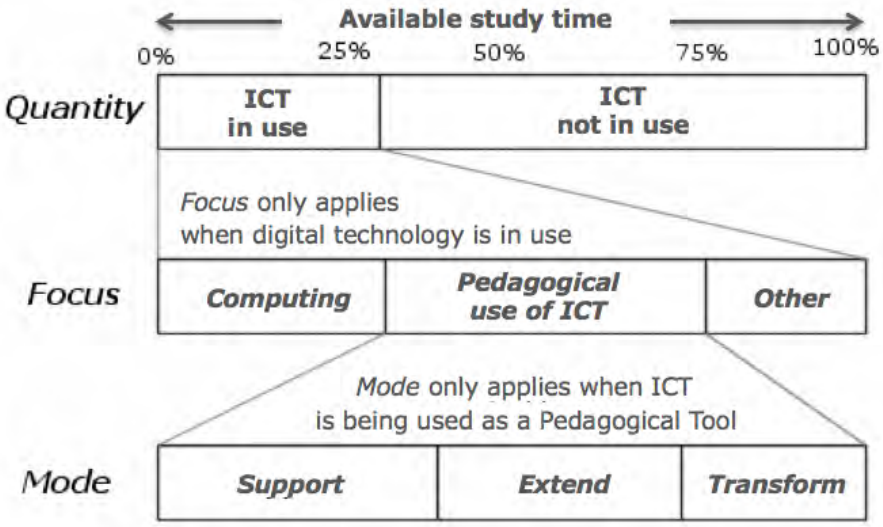
Children didn't feel that their out of school digital practices were relevant in school (except in relation to homework, where they often had a greater degree of agency).

This lack of alignment between teachers' pedagogical practices and children's digital practices outside schools seems at least in part to be related to constraints that teachers have to work within (which are examined more closesly in response to RQ3). Thus, for example, the purposes underpinning ICT use in school were almost always the school's or teacher's purposes rather than the children's. In addition, children's digital practices outside school developed over a prolonged period of time, and progressing from Marginal to Engaged on the Digital Practice Framework (DPF) involved sustained and increasing participation with others who shared similar interests. This was seldom the case in schools, where activities tended to be short term and isolated (even where intended to be linked by an overarching theme or topic).

See Section 7 for a fuller discussion of the findings in relation to RQ2.

Despite this lack of alignment between teachers' pedagogic practices with ICT and children's digital practices outside school there were many examples of effective use of ICT in the study schools. A further analysis was carried out using the ICT Innovation Framework (an updated version of the Computer Practice Framework (Twining 2002a, 2002b, 2004, 2008)). Figure 11.3.1 provides an overview of the ICT Innovation Framework (ICTIF). See Section 4.5.1 for a full explanation of the ICTIF.

Figure 11.3.1 The ICT Innovation Framework (ICTIF) (replicated from Figure 4.5.1)



This analysis of 159 observed or reported uses of ICT by children in the study schools revealed that:

- there were large differences in the proportion of time that pupils spent using ICT both within and across the study schools (see Section 8.1)
- there appeared to be a threshold level of ICT provision that was necessary in order for ICT to be used in ways that changed, or had the potential to change, what and/or how children were taught
- of the 91 instances of observed or reported use of ICT in classes where ICT was estimated to be used by children more than 10% of the time:
    - 11 (13%) changed what and/or how the children were taught in ways that could not realistically have been achieved without ICT
    - a further 36 (40%) had the potential to change what and/or how children were taught in ways that could not realistically have been achieved without ICT, but either there was insufficient data to determine whether this had happened, or they were implemented in a way that undermined this transformative potential
- of the total of 139 instances of ICT use that were categorised as pedagogic use of ICT across the curriculum (PICT on the Focus dimension of the ICTIF), which included instances where the quantity of use could not be estimated with any confidence:
    - just over 60% had the potential to change what and/or how children were taught in ways that could not realistically have been achieved without ICT
    - fewer than 20% did change what and/or how children were taught in ways that could not realistically have been achieved without ICT

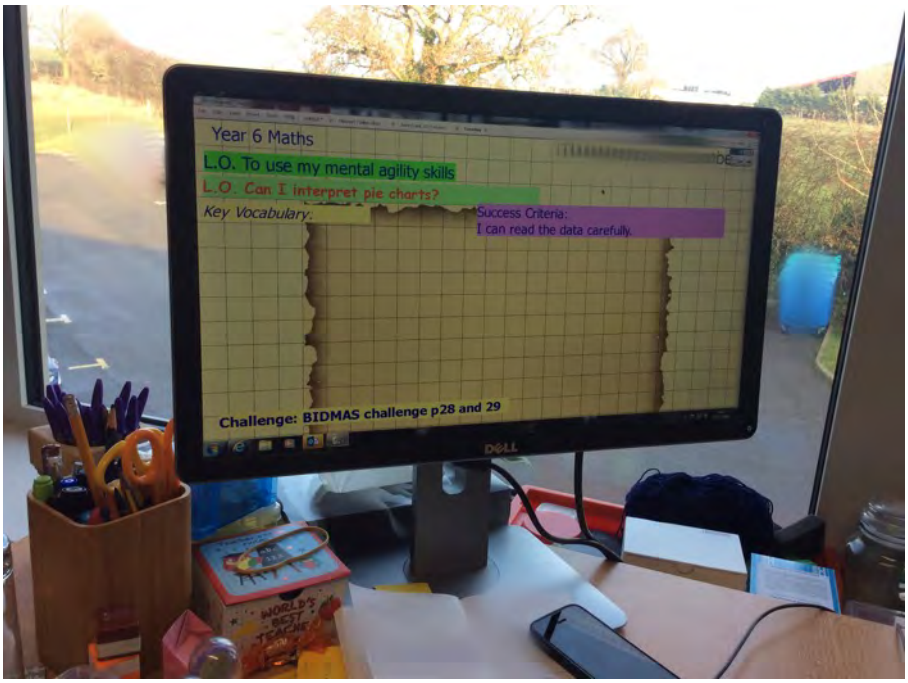
See Section 8.2 for examples of ICT use in the study schools that did, or had the potential to, change what and/or how the children were taught and could not realistically have been achieved without ICT.

11.4 Outcomes related to RQ3

This research question was expanded to include consideration of factors that impacted on all use of ICT in schools, rather than the narrower original focus on the factors that impacted on the degree of alignment between teachers pedagogic practices related to ICT use and children's digital practices outside school.

The data from the study schools did not support the view that there was a relationship between how remote a school was and the degree to which they had embraced ICT. However, this might have been due to the pragmatic constraints that meant that the study schools tended to be in less remote locations. It was the researchers' perception, which was reinforced by discussions with potential schools, some of whom were in very remote locations, that there was some sort of relationship. This warrants further investigation.

Key elements from the constitutive order, namely curriculum, assessment and accountability requirements, appeared to be major factors preventing teachers' pedagogic practices from aligning with children's digital practices outside school. This was less strongly evident in the independent schools, in which accountability to parents seeming to be more important than accountability to formal inspections.



It seemed clear that the curriculum, assessment and accountability regimes in Scotland were less important constraints on practice then those in England.

A range of different ICT strategies were evident across the study schools, often reflecting their overall educational vision and priorities (though these were often in conflict). Sometimes the same priorities were met in different ways, for example meeting requirements to teach computing by using a timetabled set of laptops rather than an ICT suite. There was a general move towards greater use of mobile devices. Older children were often provided with more access to ICT (at least in terms of resources allocated) than younger children.

There did appear to be a minimum threshold of provision below which the level of ICT use was minimal. However, once this threshold had been exceeded, there was no clear relationship between the model of ICT resourcing and the extent to which or ways in which ICT was used. This seemed to be largely down to the agency of individual teachers.

See Section 9 for more details of the institutional factors impacting on ICT use.

11.5 Outcomes related to RQ4

RQ4 was concerned with consequences of the answers to the previous research questions for learning in terms of social justice, and across subject domains.

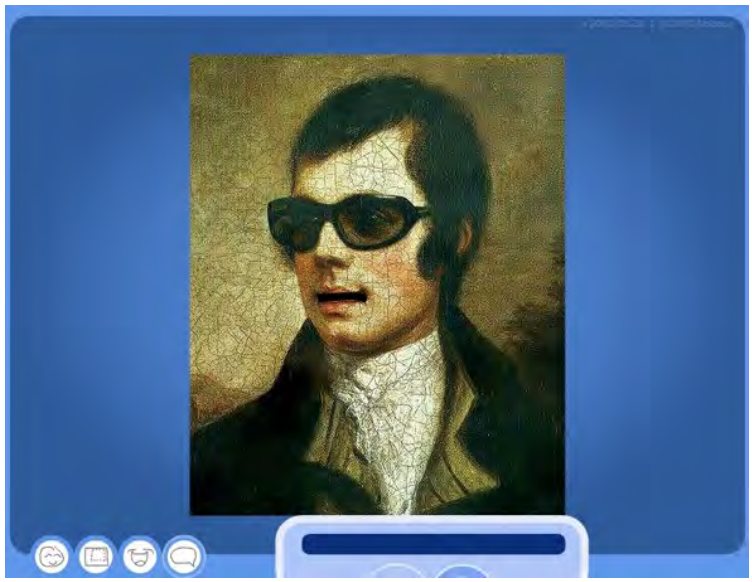
This analysis focussed primarily on differences in ICT use: across subjects; with children labelled as having different 'abilities'; and in relation to gender.

Whilst there was insufficient data to look in detail at social justice issues related to the socio-economic status of children, it was apparent from the data outside school that there was no definitive link between socio-economic status and children's access to devices, access to the internet or use of ICT. Whilst some children's families did not have internet access because of the cost, other children's access was prevented or severely curtailed by family routines or rules (Section 6). Thus, the assumption that socio-economic status determines ICT access at home may need to be re-examined.

It was clear that there was scope for ICT to be used effectively across subjects, but that the perceived nature of the subject, the view of knowledge, strongly influenced how ICT was used in practice. It was evident that ICT use had greater impact (or potential to impact) on what and how children were taught where subjects were perceived to be less 'fact based' and 'procedural', such as in history and music, compared with maths.

Much of the ICT use in English and Maths provided opportunities for 'drill and practice' types of learning, which supported the development of children's ability to meet national curriculum requirements.

Blabberize – animated picture with audio



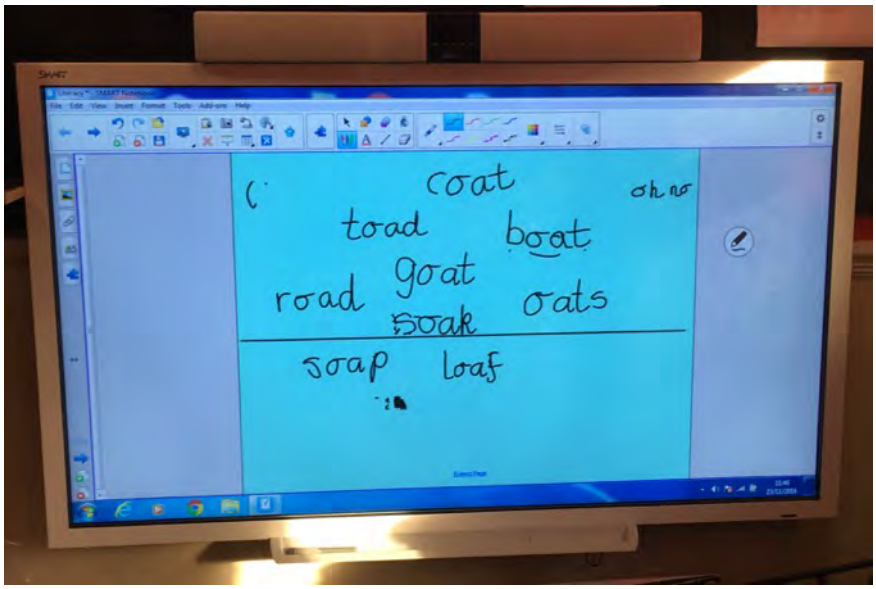
In English ICT was used in a variety of ways to enhance writing where the writing itself was or could have been changed by use of ICT.

Not only did ICT provide new forms of composition, but it also offered powerful opportunities to scaffold and stimulate writing. This included providing a real audience, for example through the use of blogs, and the use of rich immersive worlds that can elicit strong emotive engagement in children.

In maths, ICT provided the possibility for children to articulate, share and co-construct understandings of particular mathematical methods, for example using Explain Everything. There were examples in maths of teachers trying to increase children's independence through providing access to video clips that explain various aspects of mathematics.

Teachers need to be confident in the use of software and aware of the pedagogical reason for choosing to use ICT in a particular way with a particular group of children. It was apparent that teachers need to be alert to the possibility that the children's purposes do not align with their own, which could result in children's learning taking an unexpected direction or the children not learning what the teacher had hoped.

Not all of the study schools grouped children by 'ability'. Where this did happen the data suggested that there were differences in the both the amount and nature of ICT use for children depending upon which 'ability group' they were in. Children in 'lower ability' groups often seemed to have less opportunity to use ICT than children labelled as 'high ability'. Children in 'lower ability' groups also seemed to spend a higher proportion of their time using ICT doing 'drill and practice' activities. Those labelled 'more able' seemed more likely to be allowed to work more independently and on richer tasks that offered more scope for children to be agentive, collaborative, co-creators of knowledge. This provision of learning opportunities for more 'highly attaining' children was not only an issue in KS2, where practice might be expected to be most severely effected by Key Stage 2 SATs, but was also evident in Key Stage 1.



In relation to gender equity, it is important not to treat girls and boys in binary terms or as homogenous groups, and to recognise how gender is mediated by other factors such as ethnicity or social class. However, there were some patterns of ICT use at home in these data that teachers need to be aware of in order to consider ways in which their pedagogy can be inclusive and does not lead to or perpetuate gender-based inequities in children's use of ICT, development and learning. These patterns include:

- the ways in which children engage with games at home and the learning that accrues;
- the different patterns of communication on-line and the impact of this for children's language;
- and the platforms and apps which children become skilled at using.

ICT use within the classroom needs to take into account of whether or not certain software is of more interest to particular groups of children, and teachers also need to be aware of research into the impact of particular uses of ICT (e.g. IWBs) and gender-based patterns of interaction.

11.6 Outcomes related to RQ5

RQ5 was concerned with the extent to which teachers' pedagogic practices aligned with a sociocultural model.

The Innovative Practice Framework (IPF) was developed as a tool to analyse the teachers' pedagogic practices. The IPF defines five theoretically informed models of pedagogy in terms of their key features, and is presented in Figure 11.6.1 (replicated from Figure 4.8.1). The following pairs of schools/teachers were analysed using the IPF and compared. In each case the two members of a pair had very different quantities of ICT use (as defined by the ICT Innovation Framework (ICTIF)):

- Fairfield Lower (Quantity >40%) with Byrne Primary (Quantity <10%)
- Ms Harrison (Quantity <50%) with Ms Allen (Quantity <10%), both in Stepside Primary
- Mr Ryan (Quantity <40%) with Ms Peak (Quantity <20%), both in Riverview Prep

This analysis suggested that:

- the Innovative Practice Framework (IPF) is a useful tool for comparing pedagogy across classes/schools
- the data suggested a relationship between a school's over-arching pedagogical model and the Quantity and Mode of ICT use (as defined by the ICTIF) – specifically, a Traditional model having less ICT use and that use having less impact on what and/or how children are taught than a Constructivist or Innovative pedagogical model
- whilst the school arena is important, an individual teacher's identities and pedagogical stance may be more important:
    - a Constructivist or Innovative pedagogical stance being more likely to be associated with a higher quantity of ICT use and greater impact of that use on what and/or how the children are taught
    - irrespective of their pedagogical stance, teachers who position themselves as ICT users and see ICT as being an important part of their identity are more likely to make more use of ICT in their teaching, which may also involve using it in ways that change what and/or how the children are taught.

These findings are tentative and need further investigation.

See Section 11 for full details of these findings.

Figure 11.6.1 The Innovative Pedagogy Framework (IPF)

Categories	Behaviourism / information processing	Constructivism			Innovative - Sociocultural
		Cognitivist Piagetian	Radical	Social	
Purpose of schooling/ educational goals	Forming habits, or rules and procedure and associations between them.	Organised, abstract mental models and procedures for applying them. Transferable across situations.			Becoming competent in productive and valued social practices. Competence relies on developing the shared repertoire of communities (concepts, terms, tools including symbols, procedures, routines, stories and ways of doing things) and understanding their joint enterprise and how to deploy the tools in achieving these
View of learner and learning	Learners are **receivers** and processors of information and **passive** in the learning process.	Learners are **active** constructors of knowledge			Learners are **agentive** but agency is distributed across people and tools both physical and psychological. Learning is mediated by the tools available that enable learners to take particular actions. A dynamic affordance is what becomes possible when knowledge is used as a tool in interaction with the social and physical world. Agency is relational; learning relies on productive relationships with others it is **collaborative**. Learners belong to different communities and have multiple identities and associated competences within those communities in which they participate. Learners' histories of participation are diverse and mediate their learning in school. Children's multiple identities mediate how they are positioned and how they position themselves in schools and classrooms
	Motivation is extrinsic, learners	**Motivation** is intrinsic as learners seek to understand and make sense of the world and resolve cognitive		**Motivation** is intrinsic but it is to understand how others in society have constructed ways of	**Motivation** is intrinsic to engage with, and achieve stand-alone competence

	react to the environment Learning is by imitation or acquisition Learning is an individual activity	conflicts. Learners are self-directed and self-regulating Learning is a process of mutual adaptation and internalization and self organisation of knowledge to better fit reality **Reciprocity** is crucial and depends on equality in knowledge and power between learners in interaction. Cognitive conflict for older children is enabled through **co-operation** with other learners. Meaning making remains an individual activity		seeing and understanding the world that provide the learner with power to be self-determined, make informed and socially aware decisions and be socially responsible - a literate citizen. Learning occurs in dialogue with others in activity. It is through dialogue that meanings emerge between people. Dialogue relies on **collaboration** between learners and learners and teachers actively establish joint contingency	in socially valued activities and to belong to particular communities. Learning occurs in **participation** with others as children move through understanding as their competence evolves. Learning is not towards outcomes, it is ongoing and evolving. Participation relies on mutuality, the ability to negotiate meanings which emerge between people and are social through and through. Accountability to the shared endeavour is a responsibility of all participants, children and teachers. Learning is an **appropriation** of shared social understanding. What is appropriated depends on what is made available and for whom. Learning is a transformation of identity and is a process of **belonging** to the communities where the practices are situated and **becoming** part of that community as competence evolves.
Views of teachers and teaching	Teachers are the holders of knowledge – the authority. Teaching is by drill and practice in behaviourism. Metaphors for the teacher – lion tamer, sculptor or petrol pump attendant. In information processing the teacher sets pre-defined problems solved by	Learning occurs in activity. Younger children need concrete experiences older children can begin to abstract and create models grounded in practical problem-solving activity		Teachers are the authority in scaffolding learning to achieve established knowledge claims. Learners and teachers have responsibility for the reflexive co-creation of the classroom subject culture, the ground rules and ways of acting and problem solving. Both are reflexively agentive	Teachers construct learning opportunities from the perspective of the learner not the subject. Teachers connect classroom activities to mature practices in the world so children can bridge their understanding by recognising potential affordances between school activities and the lived world and vice versa. Teachers have to enable children to experience mutuality and recognise the identity work that entails. This involves recognising what children bring into the

	algorithms stored in the head. The teacher limits the information to be processed (stepwise pedagogy). Teachers use pace and competition often to maintain motivation **Metaphor** for teachers - **parent bird** regurgitating pre-processed information in sequenced blocks	Teachers **guide** learning they do not instruct, children direct their own learning **Metaphor** for the teacher – **gardener** providing the conditions for learning	Teachers **elicit** children's prior knowledge and **model** learners' knowledge through process of testing and retesting. They provide **contingent guidance** moving individual learning towards specified curriculum goals.	Teachers do not guide but actively direct experience through **scaffolding** and the dialogue between children until they achieve stand-alone competence in conceptual understanding and subject specific problem solving or ways of doing. Teachers direct learning through the zone of proximal development. **Metaphor** for the teacher – **tourist guide** or **Sherpa** negotiating learners' journeys across subject terrains	classroom from their histories of participation in multiple communities. Teachers practice is shaped by institutional practices and values. Within a setting teachers **reify** emergent individual and collective meanings for all to use and make sense of within the context of the activity. The teacher with learners **orchestrates** support for different learning trajectories within the shared endeavor of the subject classroom. **Metaphor** for the teacher - expert in socially valued practices and activities and reifier of collective and individual meanings.
View of knowledge	Knowledge represents how the world really is. The world is given not constructed	Knowledge is constructed it doesn't represent an objective external reality			Knowledge is used in action and knowing is part of action. Knowledge is a tool of knowing within situated action.
	Symbols like words and numbers carry meanings which are stable across all learners	Knowledge is **viable** if it fits experience		Symbols and words do not carry meaning. Meaning comes into existence between people in dialogue	Knowledge is possessed by individuals and groups in both explicit and tacit form. Each does different epistemic work. Knowing emerges in action and is part of it
	Knowledge is independent of context i.e. the situations in which it is acquired and is transferable	Knowledge is abstracted and available for transfer across situations		Knowledge emerges in social communities and is collectively verified and individually acquired	Learner competence is what they 'do' well not just how much they know
	Knowledge is explicit and a property of the individual				

11.7 Recommendations

11.7.2 For parents and carers

The data indicate that a large proportion of children in primary school have access to the internet outside school, and that their use of the internet increases with age. Many of the children in the study schools were already using social media tools, including uploading videos to YouTube. Whilst blocking their access to the Internet may 'keep them safe' in the short term, it would be much more sensible in the long term to educate them from a young age to safely and effectively manage their online presence.

Given the constraints on schools, related for example to e-safety and perceiving that they need to be seen not to condone under-age use of social media tools and games, parents should not assume that their children will be effectively taught how to manage their online presence by schools.

Parents should not assume that teachers know about or build upon children's out of school digital practices.

The data indicate a vast array of ways in which children use ICT, and different strategies that parents use to manage that use. All three children whose ICT use was categorised as Core on the Digital Practice Framework came from homes in which their parents supported the child's ICT use. In two of these cases (Latifah and Ashish) family members were themselves competent users of ICT and engaged in discussion about and/or active participation in the child's ICT use. In the third case (Rory), his mother was a less sophisticated user of ICT, but had actively engaged with him about his ICT use from when Rory was quite young. She inducted him into playing Minecraft, with the help of books which they worked through together, and once he had progressed beyond her level of competence she enabled him to connect up with more experienced others. All the time Rory's mother maintained open communication about his ICT use, built upon trust. The level of support, engagement, and access to expertise that these families provided seemed to be more important than the amount of time the children spent using ICT, though all three children spent at least five hours per week using ICT for non-school purposes.

If parents want their child to move from being Marginal to Engaged, or Engaged to Core users of ICT (as defined by the Digital Practice Framework) and to learn how to manage their online presence effectively then parents should, from a young age:

- induct their child into using games or other ICT apps that the child is interested in
- progressively support their child in connecting up with trusted others who have a shared interest
- maintain regular open communication with their child about their ICT use

11.7.3 For policy makers

Policy makers need to be clear about what they see the purpose(s) of school to be, and what outcomes they want children in schools to achieve. They then need to align their policies and regulations, including curriculum, assessment and accountability requirements, with those purposes and desired outcomes.

The data suggest that developing advanced ICT competence requires sustained engagement over a prolonged period of time. It seems highly unlikely that this could be achieved through one computing lesson per week. Embedding ICT across the curriculum is essential.

The data from this study supports the findings of the Educational Technology Action Group (ETAG) that was set up by Ministers from the DfE and BIS (including Michael Gove). Thus we recommend that ETAG's recommendations be implemented, which are available from http://etag.report.

11.7.4 For senior leaders in schools

The data clearly indicate that there is a gulf between children's digital practices outside school and teachers' pedagogical practices inside school. Whilst schools are constrained by the constitutive order, and in particular by curriculum, assessment and accountability regimes, the data suggest that:

- there is often a conflict between what schools are required to do and what staff believe is educationally and/or morally the appropriate thing to do
- some schools are better at maintaining their principles than others, and demonstrate that it is possible to 'do the right thing by the children' and still be rated Good or Outstanding by Ofsted
- where schools/teachers adopt a Constructivist or Innovative pedagogical approach (as defined within the Innovative Practice Framework (see Section 4.8) they are more likely to capitalise on investments in mobile devices

Schools need to be clear about their educational priorities and should use the Innovative Pedagogy Framework (IPF) to help them clarify their pedagogical beliefs. They should ensure that their ICT strategy aligns with those priorities and their pedagogical model.

Whilst it is beyond the scope of this study to provide guidance on the implementation of ICT startegies, it is clear that there is little point in investing in mobile devices (or other ICT resources) if staff are not going to use them effectively.

Senior leaders should carefully plan the roll out of their ICT strategy, taking heed of the plentiful advice that is available, including, for example about the implementation of mobile devices (e.g. see http://edfutures.net/Digital_technology_strategies), and effective professional development (e.g. Twining & Henry, 2014; Twining, Raffaghelli, Albion & Knezek, 2013).

The data clearly showed that where schools tried to prevent children using the internet outside school in ways the school deemed inappropriate children simply concealed their out of school online activities from their teachers. If schools wish to educate children so that they remain safe online then it is counterproductive to ignore the realities of what children are doing outside school, or to try to prevent such ICT use.

Schools should more proactively seek out information about digital practices 'in the home'. However, schools should avoid trying to manage or formalise children's out of school digital practices. Imposing a school model of 'appropriate practice' would undermine children's development as users of ICT, as defined by the Digital Practice Framework.

11.7.5 For teachers

Whilst the data clearly show that teachers perceive that the constitutive order and their school arena often constrain their pedagogy, it is clear that teacher agency is one of the most important determinants of what happens in classrooms.

Teachers should use the Innovative Practice Framework (IPF) to clarify their pedagogical beliefs. They should have more confidence to share those beliefs with colleagues and implement them within their practice.

In contexts in which children have access to a high level of ICT resourcing, and in particular 1 to 1 mobile device provision, teachers should give children much greater freedom to decide when and how to use ICT in order to achieve desired outcomes.

Teachers should ensure equal access, both in terms of time and types of use, for all children to ensure ICT use is inclusive and does not perpetuate the disadvantages experienced by various groups of children based on factors such as gender and perceptions of 'ability'.

Teachers should provide opportunities for discussion of the children's out of school digital practices. However, they should be aware that where these practices are in breach of school rules or expectations then children will manage what they share in school.

11.8 The significance of this research

This research is significant because it:

- provides the Digital Practice Framework (DPF), a new tool for analysing children's digital practices outside school
- provides a rich insight into children's digital practices outside school, and some of the ways in which these are constrained or enabled
- raises questions about the simplistic assumption that children from higher socio-economic backgrounds will have better access to ICT outside school than those from lower socio-economic backgrounds
- exemplifies some of the differences in ICT practices between boys and girls outside school
- raises questions about common assumptions about the extent to which children engage with ICT outside school
- indicates ways in which the home arena and parents (or other people in action) often constrain children's ICT use and prevent them from extending their participation by placing significant limits on the time children can spend using ICT and/or on their ability to engage with others through or about their ICT use
- provides evidence that there is a lack of alignment between teachers' pedagogic practices in primary schools and children's digital practices outside school
- provides strong evidence that the curriculum, assessment and accountability regime in England constrains what many teachers believe is effective educational practice
- provides the ICT Innovation Framework (ICTIF), an updated tool for analysing the impact of ICT use in schools,
- exemplifies ways in which ICT can be used to enhance learning, including a range of examples of ICT use that could change what and/or how children are taught and could not be achieved without ICT
- demonstrates some of the differences in how ICT is used across subject domains, which appear to be linked with perceptions of the nature of knowledge in different domains
- illustrates ways in which 'ability grouping', as implemented in some of the study schools, results in children labelled as 'lower ability' having fewer opportunities to use ICT and less rich experiences when they are using ICT
- provides the Innovative Pedagogy Framework (IPF), a new tool for analysing pedagogical practice, with strong theoretical underpinnings
- provides evidence to indicate that despite the constraints imposed by the curriculum, assessment and accountability regimes teachers can implement Constructivist or Innovative pedagogic practices

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13 References

(Authors in **bold** are members of the project team)

Abbott, R. C. (2016). Embracing Digital Technologies in Classroom Practice: The Impact of Teacher Identity. *Australian Educational Computing*, *31*(2).

Alexander, R. (2000) Culture and pedagogy: international comparisons in primary education. Oxford: Blackwell.

American Academy of Pedriatrics (AAP) 2016 - 2017. American Academy of Pediatrics Announces New Recommendations for Children's Media Use. *American Academy of Pediatrics*. https://www.aap.org/en-us/about-the-aap/aap-press-room/Pages/American-Academy-of-Pediatrics-Announces-New-Recommendations-for-Childrens-Media-Use.aspx

Armstrong, V. (2008) Hard bargaining on the hard drive: gender bias in the music technology classroom, Gender and Education, 20:4, 375-386

Barrow, W. (2015) 'I think she's learnt to sort of let the class speak': Children's perspectives on Philosophy for Children as participatory pedagogy. *Thinking Skills and Creativity*, 17, 76-87

Becta (2008) How do boys and girls differ in their use of ICT? Becta

Bennett, S., Maton K., & Kervin L. (2008). The Digital Natives' debate: A critical review of the evidence. *British Journal of Educational Technology, 39*(5), 775-768.

BERA (2011) *Ethical Guidelines for Educational Research*. London: BERA. https://www.bera.ac.uk/researchers-resources/publications/ethical-guidelines-for-educational-research-2011 (accessed 2-Apr-2015)

Bertozzi, E. & Lee, S. (2007) Not Just Fun and Games: Digital Play, Gender and attitudes Towards Technology. *Women's Studies in Communication*, 30(2), 179-204

Bolden, D.S. and Harries, A.V. and Newton, D.P. (2010) Pre-service primary teachers' conceptions of creativity in mathematics. *Educational Studies in Mathematics*, 73 (2) 143-157.

Boreham, N. & Morgan, C. (2008) A Sociocultural Analysis of Organisational Learning, in **Murphy, P**. & Hall, K. (Eds.) *Learning and Practice Agency and Identities* pp. 71 -86, London, SAGE

Boyles, D., Carusi, T., & Attick, D. (2009) Historical and critical interpretations of social justice. In Ayers, W., Quinn, T., & Stovall, D. (Eds.) *Handbook of social justice in education*, pp.30-42. http://cli.gs/BoylesCarusi&Attick2009 (accessed 12-Mar-2015)

Broadbent, H., Fell, L., Green,P. and Gardner, W. (2013) Have your say: Listening to young people about their online rights and responsibilities , Plymouth; Childnet International and UK Safer Internet Centre https://goo.gl/fzGTzR (accessed 22- May- 2017)

Bruner, J. (1990) Acts of meaning. Cambridge (MA): Harvard College.

Bruner, J. (1996) The Culture of Education. Cambridge (USA): Harvard University Press.

Burnett, C. (2016) The Digital Age and its Implications for Learning and Teaching in the Primary School. York: Cambridge Primary Review Trust.

CEDEFOP (2008) Validation of non-formal and informal learning in Europe: A snapshot 2007. Luxembourg: EU Publications Office.

Chalkey, T.W. and Nicholas, D. (1997) "Teachers' use of information technology: observations of primary school practice", *Aslib Proceedings* 49(4): pp.97-107.

Charlot, B. (2009) School and the pupils' work. *Educational Sciences Journal*, 10, 87–94

Chaudron, S., Beutel, M. E., Donoso Navarrete, V., Dreier, M., Fletcher-Watson, B., Heikkilä, A. S. & Mascheroni, G. (2015). Young Children (0-8) and digital technology: A qualitative exploratory study across seven countries, JRC, European Commission.

Chief Executive of Education Scotland (June 2016) Letter to directors of education, head teachers and managers of schools, nurseries and early learning settings. Edinburgh: Education Scotland. https://education.gov.scot/Documents/LettertoDirectorsofEducation-Ins.pdf (accessed 19-May-2017)

Chiu, M.M. (2013) Social Metacognition and Micro-creativity. *Encyclopedia of Creativity, Invention, Innovation and Entrepreneurship,* 1687-1692

Christensen, P. & Prout, A. (2005). 'Anthropological and sociological perspectives on the study of children'. In S. Greene and D. Hogan (Eds.), Researching children's experiences: methods and approaches. London: Sage.

Clark, T., **Twining, P.** & Chambers, D. (2014) Redefining education: 1 to 1 computing strategies in Victorian schools. In Sweeney, T. & Urban, S. (Eds.) *Now IT's Personal: Proceedings of the Australian Computers in Education Conference 2014*, pp.87-97. ACEC: Adelaide, Australia.

Clarke, B. & Svanaes, S. (2014) *An updated literature review on the use of tablets in education*. Tablets for Schools http://tabletsforschools.co.uk/.

Clarke, B., Svanaes, S. & Zimmermann, S. (2013) *One-to-one Tablets in Secondary Schools: An evaluation study. Stage 2: January to April 2013*. Tablets for Schools http://tabletsforschools.co.uk/.

Cook, S. & Brown, J. (1999) Bridging Epistemologies: The Generative Dance Between Organizational Knowledge and Organizational Knowing. *Organisation Science*, 10, 381-400.

Coughlan, S. (2015) Computers 'do not improve' pupil results says OECD. BBC Education website. http://www.bbc.co.uk/news/business-34174796 (accessed 25-May-2017)

Cox, M., Webb,M., Abbott, C., Blakeley, B., Beauchamp, T. and Rhodes, V. (2003), ICT and pedagogy. A review of research literature. ICT in Schools Research And Evaluation Series, No.18, BECTA/DfES

Cuban, L. (2001) *Oversold and Underused: Computers in the Classroom* London: Harvard University Press

Department for Children, Schools and Families (DCSF) (2008) Guidance for Practitioners and Teachers on Progression and Pace in the teaching of Phonics, Primary Framework for Literacy and Mathematics, The Standards Site, DCFS: http://www.standards.dfes

Department for Children, Schools and Families (DCSF) (2009*)* Independent Review of the Primary Curriculum: Final Report, London, HMSO (Rose Report)

Department for Education (January 2011) National curriculum review launched. Paragraph 10. December 2014, https://www.gov.uk/government/news/national-curriculum-review-launched (accessed 25-May2017)

Department for Education (December 2014) The National Curriculum in England Framework document, https://www.gov.uk/government/publications/national-curriculum-in-england-framework-for-key-stages-1-to-4 (accessed 25-May-2017)

DfE (2016) Keeping children safe in education: statutory guidance for schools and colleges. London: DfE. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/550511/Keeping_children_safe_in_education.pdf (accessed 21-May-2017)

DfES, (2004) Pedagogy and Practice: Teaching and learning in secondary schools, London DfES

DfES/QCA (2004) National Curriculum: Handbook for secondary teachers in England, Key stages 3 and 4, London: QCA

Dias, P. Brito, R., Ribbens, W., Daniela., L, Ruben, Z., Dreier, M., Gemo, M., Di Gioia, R. and Chaudron, S. (2016) The role of parents in the engagement of young children with digital technologies: Exploring tensions between rights of access and protection, from 'Gatekeepers' to 'Scaffolders' *Global Studies of Childhood*, 6(4), pp.414-427

Education Scotland (2016a) What is Curriculum for Excellence? https://education.gov.scot/scottish-education-system/policy-for-scottish-education/policy-drivers/cfe-(building-from-the-statement-appendix-incl-btc1-5)/What%20is%20Curriculum%20for%20Excellence? (accessed 19-May-2017)

Education Scotland (2016b) Curriculum for Excellence: literacy and English – principles and practices. Edinburgh: Education Scotland. https://education.gov.scot/Documents/literacy-english-pp.pdf (accessed 19-May-2017)

Edwards, S., (2014) Towards contemporary play: Socio-cultural theory and the digital consumerist context. *Journal of Early Childhood Research*, 12, 3, 219-233

Einarsdóttir, J. (2007). Research with children: Methodological and ethical challenges. *European Early Childhood Education Research Journal*, 15(2), 197-211.

Ellis, S. & Moss, G. (2014) Ethics, education policy and research: the phonics question reconsidered. *British Educational Research Journal*, 40 (2) pp. 241 -60.

Elwood, J. & **Murphy, P.** (2015) Assessment systems as cultural scripts: a sociocultural theoretical lens on assessment practice and products. *Assessment in Education Principles, Policy & Practice*, 22 (2) 182 -192

ETAG (2015) *Educational Technology Action Group: Our reflections*. London: ETAG. http://etag.report/ (accessed 15-Apr-2015)

Falloon, G. (2015) What's the difference? Learning collaboratively using iPads in conventional classrooms. *Computers & Education*, 84, 62–77.

Ferrari, A. (2012) *Digital Competence in Practice: An Analysis of Frameworks*. Institute for Prospective Technological Studies, Seville, Spain [Retrieved August 30, 2014, from http://ftp.jrc.es/EURdoc/JRC68116.pdf]

Findahl, O. (2013) Swedes and the Internet: Stockholm, The Internet Infrastructure Foundation

Flewitt, R., **Messer, D., & Kucirkova, N.** (2014) New directions for early literacy in a digital age: the iPad. *Journal of Early Childhood Literacy*, 1468798414533560.

Fluck, A. & **Twining, P.** (2014) Redefining education: 1 to 1 computing strategies in Tasmanian schools. In Sweeney, T. & Urban, S. (Eds.) *Now IT's Personal: Proceedings of the Australian Computers in Education Conference 2014*, pp.166-174. ACEC: Adelaide, Australia.

Fosnot, C. T. (2013). Constructivism: Theory, perspectives, and practice. New York: Teachers College Press.

Francis, B. & Mills, M. (2012) Schools as damaging organisations: initiating a dialogue concerning alternative models of schooling. *Pedagogy, Culture & Society*, 20:2, 251-271.

Francis, B., Christine, S. & Read, B. (2013) *Identities and practices of high achieving pupils: negotiating achievement and peer cultures*. London: Continuum Books.

Francis, B., et al. Exploring the relative lack of impact of research on 'ability grouping' in England: A discourse analytic account. *Cambridge Journal of Education* 47.1 (2017): 1-17.

Freedman, T. (2013) Vital Case Study: Harrogate Grammar School. Milton Keynes: Open University.

Freire, P. & Macedo, D.P. (1999) Pedagogy, Culture, Language and Race : a Dialogue in Leach, J. & Moon, B. (Eds.) *Learners and Pedagogy* pp. 46 -58, London, SAGE.

Genc Z. (2014) 'Parents' perceptions about the mobile technology use of preschool aged children. *Procedia– Social and Behavioural Sciences* 146: 55–60.

Gipps, C. and **Murphy, P.** (1994) *A Fair Test? Assessment, Achievement, and Equity,* Buckingham, Open University Press.

Grant, L. (2010) Connecting Digital Literacy Between Home and School, Futurelab, BECTA

Greene, S. and Hill, M. (2005). 'Researching 'the child' in developmental psychology'. In S. Greene and D. Hogan (Eds), Researching children's experience: methods and approaches. London: Sage.

Gurung, B. & Rutledge, D. (2014) Digital learners and the overlapping of their personal and educational digital engagement. *Computers & Education*, 77, 91-100.

Haberman, M (1991) The pedagogy of poverty vs good teaching. *Phi Delta Kappan*. 73:4, 290-94.

Haddon, L.and Vincent, J. (Eds.) (2014) European children and their carers' understanding of use, risk and safety issues relating to convergent mobile media, Report D4.1 Milano :Unicatt

Hague, C., & Payton, S. (2010) *Digital literacy across the curriculum*. Futurelab, Bristol Retrieved August 30, 2014, from http://www2.futurelab.org.uk/resources/documents/handbooks/digital_literacy.pdf

Hallam, S., Ireson, J., Lister, V., Chaudhury, I.A. and Davies, J., (2003) Ability grouping practices in the primary school: A survey. *Educational Studies*, 29(1), pp.69-83.

Hallam, S., & Parsons, S. (2013) The incidence and make up of ability grouped sets in the UK primary school. *Research Papers in Education* 28.4 (2013): 393-420.

Hatlevik, O. E. (2016). Examining the Relationship between Teachers' Self-Efficacy, their Digital Competence, Strategies to Evaluate Information, and use of ICT at School. *Scandinavian Journal of Educational Research*, 1-13.

Haughton, C., Aiken,M/, Cheevers, C. (2015) Cyber Babies: The Impact of Emerging Technology on the Developing Infant. *Pyschology Research*, 5 (9) 504-518

Hayes, D., Johnston, K. & King, A. (2009) Creating enabling classroom practices in high poverty contexts: the disruptive possibilities of looking in classrooms. *Pedagogy, Culture and Society*, 17:3, 251-264.

Helsper, E..J and Eynon, R., (2010) Digital natives: where is the evidence? *British Educational Research Journal*, 36 (3) 503-520

Hempel-Jorgensen, A. (2009) The construction of the 'ideal pupil' and pupils' perceptions of 'misbehaviour' and discipline: contrasting experiences from a low-socio-economic and a high-socio-economic primary school. *British Journal of Sociology of Education*. 30:4.

Hempel-Jorgensen, A. (2015) Learner agency in disadvantaged urban primary schools. Project report. Milton Keynes: The Open University.

Hempel-Jorgensen, A. (2015). Learner agency and social justice: what can creative pedagogy contribute to socially just pedagogies? *Pedagogy, Culture & Society*, *23*(4), 531-554.

Hennessy, E. and Heary, C. (2005). 'Exploring Children's views through focus groups'. In D. Hogan and S. Greene (Eds.), Researching children's experience: approaches and methods. London: Sage.

Higgins, S., Xiao, Z-M. & Katsipataki, M. (2012) *The Impact of Digital Technology on Learning: A Summary for the Education Endowment Foundation*. Durham: Durham University and the Education Endowment Foundation.

Hill, M. (2005). 'Ethical considerations in researching children's experiences'. In S. Greene & D. Hogan (Eds.), Researching children's experiences: methods and approaches. London: Sage.

Hinrichsen, J. & Coombs, A. (2013) The five resources of critical digital literacy: a framework for curriculum integration. *Research in Learning Technology* 2013, 21: 21334 - http://dx.doi.org/10.3402/rlt.v21.21334

Holland, D.,Lachicotte Jr, W. Skinner,D. & Cain, C. (1998) *Identity and Agency in Cultural Worlds*, Cambridge Massachusetts, Haravrd University Press.

Hudson, B., Henderson, S. and Hudson, A. (2015) Developing mathematical thinking in the primary classroom: liberating students and teachers as learners of mathematics. *Journal of Curriculum Studies*, 47(3) 374-398

Ireson, J. & Hallam, S. (2001) Ability grouping in education. London:Sage, 2001.

Ivinson, G. & **Murphy, P.** (2007) *Rethinking Single-Sex Teaching: gender, school subjects and learning*, Buckingham: Open University Press

Jamieson-Proctor, R., Redmond, P., Zagami, J., Albion, P. & **Twining, P.** (2014) Redefining education for the digital age: a snapshot of the state of play in three Queensland schools. In Sweeney, T. & Urban, S. (Eds) *Now IT's Personal: Proceedings of the Australian Computers in Education Conference*, pp.294-301. Adelaide (Australia): ACEC.

Johnson, G.M (2010) Young Children's Internet use at home and school: Patterns and profiles *Journal of Early Childhood Research* 8 (3) , 282-293

Keating, A., Gardiner, C., & Rudd, P. (2009). E-access, E-maturity, E-safety: a learner survey. Slough: NFER.

Kozma, R. B. (2005). National policies that connect ICT-based education reform to economic and social development. *Human Technology: An interdisciplinary journal on humans in ICT environments*.

Kucirkova, N. (2014) iPads in early education: separating assumptions and evidence, *Frontiers in Psychology*, (5), 1-3. doi: 10.3389/fpsyg.2014.00715

Kucirkova, N., Messer, D., Critten, V. And Harwood, J. (2014) Story-making on the iPad when children have complex needs: two case studies, *Communication Disorders Quarterly*, Published online before print March 6, 2014, doi: 10.1177/1525740114525226

Kucirkova, N., Messer, D., Sheehy, K., & Fernández Panadero, C. (2014) Children's engagement with educational iPad apps: Insights from a Spanish classroom. *Computers & Education*, 71, 175–184.

Kutnick, P., Sebba, J., Blatchford, P., Galton, M., Thorpe, J., MacIntyre, H., & Berdondini, L. (2005). The effects of pupil grouping: Literature review. Research Report 688. London: DfES

Lakatos, I. (1976) *Proofs and Refutations,* Cambridge, Cambridge University Press.

Langley,P., Simon, H. A., Bradshaw, G. L. And Zytkow, J. M. (1987) *Scientific discovery: Computational explorations of the creative process*. Cambridge, MA: MIT Press

Lave J. & Wenger, E. (1991) *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press.

Lave, J. (1988). Cognition in practice: Mind, mathematics and culture in everyday life. Cambridge University Press.

Lave, J. (2008) Everyday Life and Learning. In **Murphy, P.** and McCormick, R. (Eds.), *Knowledge and Practice Representations and Identities*, pp. 3 – 14. London: SAGE.

Law, N. (2008) Teacher Learning Beyond Knowledge for Pedagogical Innovations with ICT.*International Handbook of Information technology in Primary and Secondary Education, 20* , 425-434

Littleton, K. (1996) Girls and Information Technology, in **Murphy, P.** & Gipps, C.V. (Eds) *Equity in the Classroom Towards Effective Pedagogy for Girls and Boys* pp 81 -96, London, Falmer Press/UNESCO Publishing.

Livingstone, S. (2006) Drawing conclusions from new media research: Reflections and puzzles regarding children's experience of the internet. *The Information Society*, 22(4), 219; 230.

Livingstone, S., Davidson, J., Bryce, J., Millwood Hargrave, A., Grove-Hills, J. (2012) Children's Online Activities: Risks and Safety, the UK Evidence Base. A report prepared for the UK Council for Child Internet Safety by the UKCCIS Evidence Group. Available at: http://www.saferinternet.org.uk/downloads/ Research Highlights/UKCCIS_Report_2012.pdf

Livingstone, S., Haddon, L., Görzig, A. and Ólafsson, K (2011) Risks and safety on the internet: the perspective of European children: full findings and policy implications from the EU Kids Online survey of 9-16 year olds and their parents in 25 countries. Deliverable D4. EU Kids Online, London, UK.

Livingstone, S., Haddon, L., Görzig, A., & Ólafsson, K. (2010). Risks and safety on the internet: the perspective of European children: key findings from the EU Kids Online survey of 9-16 year olds and their parents in 25 countries. EU Kids Online, London, UK

Livingstone, S., Mascheroni, G., Ólafsson, K. and Haddon, L. (2014) Children's online risks and opportunities: Comparative findings from EU Kids Online and Net Children Go Mobile. http://eprints.lse.ac.uk/60513/

Livingstone, S. and O'Neill, B. (2014) Children's rights online: challenges, dilemmas and emerging directions. In van der Hof, Simone, van den Berg, Bibi and Schermer, Bart, (Eds.) Minding Minors Wandering the Web: Regulating Online Child Safety. Information technology and law series (24) pp. 19-38 Springer with T. M. C. Asser Press, The Hague, The Netherlands , pp. 19-38

Luckin, R., Bligh, B., Manches, A., Ainsworth, S., Crook, C., & Noss, R. (2012) Decoding Learning: the proof, promise and potential of digital education. London: Nesta. http://www.nesta.org.uk/areas_of_work/public_services_lab/digital_education/assets/features/decoding_learning_report (accessed 15-Mar-2015)

Lupton, R, & Thrupp, M. (2013) Headteachers' readings of and responses to disadvantaged contexts: evidence from English primary schools. *British Educational Research Journal* 39:4.

Lupton, R. and **Hempel-Jorgensen, A.** (2012) The importance of teaching: pedagogical constraints and possibilities in working class schools. *Journal of Education Policy* 27:5: 601-620.

Maher, D. & **Twining, P.** (2014) *Snapshot Study 8: BYO iPads in another state primary school*. Milton Keynes: Open University.

Maher, D. & **Twining, P.** (2017) Bring Your Own Device – a snapshot of two Australian primary schools. Educational Research, 59:1, pp.73-88 http://dx.doi.org/10.1080/00131881.2016.1239509 (Accessed 5-Oct-2016).

Mama & Hennessy 2013 Developing a typology of teacher beliefs and practices concerning classroom use of ICT CAE 68, pp380-387

Marsh, J., et al (2015) Exploring Play and Creativity in the Preschoolers' Use of Apps, Final Project Report accessed at www.techandplay.org 20th May

Marsh, J., Hannon, P., Lewis, L. and Ritchie, L., (2017) Young children's initiation into family literacy practices in the digital age. *Journal of Early Childhood Research*, 15 (1) 46-60

Mascheroni,G., Livingstone, S., Dreir, M. and Chaudron, S., (2016) Learning versus play or learning through play? How parents' imaginaries, discourses and practices around ICT shape childrens' (digital) literacy practices. *Media Education*,7 (2) 261-280,

Mayall, B. (2010) Children's lives outside school and their educational impact, in Alexander, R., Doddington, C., Gray, J., Hargreaves, L., and Kershner, R. (eds) *The Cambridge Primary Review Research Surveys*. London: Routledge, 49-82.

McPake, J., Plowman, L., & Stephen, C. (2013). Pre-school children creating and communicating with digital technologies in the home. *British Journal of Educational Technology*, *44*(3), 421-431.

McPhail, G. (2015). The fault lines of recontextualisation: the limits of constructivism in education. *British Educational Research Journal*, 42 (2) 294-313.

McQuillan, H. and O'Neill, B. (2009) Gender Differences in Children's Internet Use. Key Findings from Europe. *Journal of Children and Media*, 3 (4), 366-378

Mercer, N., & Littleton, K. (2007) Dialogue and the development of children's thinking: A sociocultural approach. London, Routledge.

Mertala, P. (2017). Wag the dog–The nature and foundations of preschool educators' positive ICT pedagogical beliefs. *Computers in Human Behavior*, *69*, 197-206.

Meyers, E. M., Erickson, I. & Small, R. V. (2014) Digital literacy and informal learning environments: an introduction. *Learning, Media and Technology, 38* (4), 355-367.

Munns, G., Sawyer, W. & Cole, B., Eds. (2013) *Exemplary teachers of students in poverty*. Oxon: Routledge.

Murphy, P. (2000) Understanding the Process of Negotiation in Social Interaction in Joiner, R., Littleton, K., Faulkner, D. and Miel, D.(eds) *Rethinking Collaborative Learning* pp139 - 160, London , Routledge.

Murphy, P. and Wolfenden, F. (2013) Developing a pedagogy of mutuality in a capability approach - teachers' experiences of using the open educational resources (OER) of the teacher education in sub-Saharan Africa (TESSA) programme. *International Journal of Educational Development*, 33(3) pp. 263–271.

Murphy, P., Davidson, M., Qualter, A., Simon, S. and Watt, D. (2001a) *Effective Practice in Primary Science*, Open University (Unpublished research report Nuffield Foundation, pp 152.

Murphy, P., Lunn, S., Davidson, M. & Issitt, J.(2001b) *Young Foresight Summary Evaluation Report,* Open University(Unpublished report Nuffield Foundation, pp 120).

Murphy, P. & Ivinson, G. (2004) Gender differences and Educational Attainment understanding the relationship: a Socio-cultural Perspective in Olsen, M. (Ed) *Culture and Learning: Access and Opportunity in the Curriculum* pp.365 -386 Westport Connecticut, The Greenwood Press.

Murray, D. (2013) Vital Case Study: Digital Leaders at Long Lee Primary School. Milton Keynes: Open University.

Murray, J. & Passy, R. (2014) Primary teacher education in England: 40 years on. *Journal of Education for Teaching*, 40:5, 492-506

NAEYC (2012). "Technology and interactive media as tools in early childhood programs serving children from birth through age 8". *National Association for the Education of Young Children*. Available from: http://www.naeyc.org/files/naeyc/file/positions/PS_technology_WEB2.pdf.

National Sleep Foundation (2014). "Electronics In The Bedroom: Why It's Necessary To Turn Off Before You Tuck In". https://sleepfoundation.org/ask-the-expert/electronics-the-bedroom

Naylor, S. & Alvarez-Hevia, D.M. (2013) *Vital Case Study: 1 to 1 computing with iPads at ESSA Academy (Bolton).* Milton Keynes: Open University.

Newhouse, P., Lane, J., Cooper, M. & **Twining, P.** (2014) Redefining education: sustaining 1 to 1 computing strategies in Western Australian schools. In Sweeney, T. & Urban, S. (Eds.) *Now IT's Personal: Proceedings of the Australian Computers in Education Conference*, pp.345-351. Adelaide (Australia): ACEC.

Nikken P and Schols M (2015) How and why parents guide the media use of young children. *Journal of Child and Family Studies* 24(11): 3423–3435.

Nikken, P. and Jansz, J. (2014), les to measure parental mediation of young children's internet use. *Learning, Media and Technology*, 39 (1) 250-266

OECD (2015) Students, Computers and Learning: making the connection. Paris: OECD. http://www.oecd.org/education/students-computers-and-learning-9789264239555-en.htm (accessed 25-May-2017)

O'Hara, (2011) Young children's ICT experiences in the home*, Journal of Early Childhood Research, 9 (3) 220-231*

Ofcom (2016) Children and parents: media use and attitudes report. Ofcom

Ólafsson, K., Livingstone, S. and Haddon, L. (2014) Children's Use of Online Technologies in Europe: A review of the European evidence base, LSE, London: EU Kids Online.

Orlando, J. (2013) Engaging teaching practices with ICT in low SES schools. In Munns, G., W. Sawyer and B. Cole, (Eds.) *Exemplary teachers of students in poverty*. Oxon: Routledge.

Paddict, R (2015) "ICT use of Schools on the Rise". Educational Technology http://edtechnology.co.uk/Article/ict-use-in-schools-on-the-rise

Palaiologou, I. (2016). Children under five and digital technologies: implications for early years pedagogy. *European Early Childhood Education Research Journal*, *24*(1), 5-24.

Palmer, S. (2013) Digital Wisdom: Thought leadership for a connected world. Stamford: York House Press,

Parmar, N. (2014). "New Learning Pedagogy A Study In Determining An Appropriate Pedagogy And Pedagogical Strategies To Support Phonetic Awareness, Whilst Using New Technology With Young Children.". *PhD*. The Bournemouth University, 2016.

Parmar, N. (2017). "Digital Parenting". United Learning Schools, Ashford, Kent

Passey, D. (2010) Mobile learning in school contexts: Can teachers alone make it happen? *IEEE Transactions on Learning Technologies*: Special issue on mobile and ubiquitous technologies for learning, 3, 1, 68-81.

Passey, D. (2010) Mobile learning in school contexts: Can teachers alone make it happen? IEEE Transactions on Learning Technologies: Special issue on mobile and ubiquitous technologies for learning, 3, 1, 68-81.

Passey, D. (2013) Educational transformation with open and social technologies in the non-formal school curriculum: An analysis of three case studies in the United Kingdom. In T. Ley, M. Ruohonen, M. Laanpere and A. Tatnall (eds.). *Open and Social Technologies for Networked Learning*. Heidelberg, Germany: Springer.

Passey, D. (2014a) Inclusive Technology Enhanced Learning: Overcoming Cognitive, Physical, Emotional and Geographic Challenges. New York, NY: Routledge.

Passey, D. (2014b) Intergenerational Learning Practices – Digital Leaders in Schools. *Education and Information Technologies, 19,* 3, 473-494.

Passey, D. and Zozimo, J. (2015) Mobile learning and teacher training: researching MLEARN pilot development. In I.A. Sánchez and P. Isaís (eds.). *11th International Conference Mobile Learning 2015*, Madeira, Portugal, 14-16 March: Proceedings. IADIS Press.

Passey, D., Steadman, S., Hutchison, D., Scott, A. and Forsyth, K. (1999) Synopsis, Overview, and Summary Reports: Microsoft UK Supported Anytime Anywhere Learning Pilot Programme in 28 schools. Reading: Microsoft.

Paton, G. (2010) Flagship diploma subjects will be scrapped, the Government said today, Telegraph 7 June, 2010, www.telegraph.co.uk/education/educationews/7809282

Plowman L (2015) Researching young children's everyday uses of technology in the family home. *Interacting with Computers* 27(1): 36–46.

Plowman L and Hancock J (2014) Six questions that parents ask about children's use of digital media:A review. London: The Children's Media Foundation.

Princes Trust (2013) *Digital Literacy Survey*. Retrieved August 30, 2014, from http://www.princes-trust.org.uk/pdf/DIGITAL_LITERACY_2013B.pdf

Project Tomorrow (2016) http://www.tomorrow.org/speakup/speak-up-2016-first-year-in-the-classroom-april-2017.html (accessed 21-May-2017)

Qualifications and Curriculum Authority (QCA) (2010), The National Curriculum Level Descriptions, London: DCSF/QCA

Radović, S. & **Passey, D.** (2016): Digital resource developments for mathematics education involving homework across formal, non-formal and informal settings. *The Curriculum Journal*, DOI: 10.1080/09585176.2016.1158726

Rata, E. (2016) A pedagogy of conceptual progression and the case for academic knowledge, *British Educational Research Journal*, 42(1), 168 -184.

Reeve, J. (2014) How do pupils use ICT devices to support and enhance their learning? *International Journal for Lesson and Learning Studies*, 3 (2) 150 – 151.

Richardson, K. (1998) *Models of Cognitive Development*, London: Psychology Press Ltd

Richardson, V. (1997). Constructivist teaching and teacher education: Theory and practice. *Constructivist teacher education: Building a world of new understandings*, 3-14.

Robson, C., Wagstaff, A., & Watson, L. (1990) *CLIPS (Cheltenham Laptops in Primary Schools) first report*. Cheltenham: Cheltenham & Gloucester College of H.E.

Rogoff, B. (2003) *The Cultural Nature of Human Development*, Oxford, Oxford University Press

Rogoff, B. (1995) Observing sociocultural activity on three planes: participatory appropriation, guided appropriation and apprenticeship. In J. V. Wertsch, P. Del Rio and A. Alvarez (Eds.) *Sociocultural studies of mind* pp139 - 164. Cambridge: Cambridge University Press.

Rollock, N., Gillborn, D., Vincent, C. & Ball, S. (2015) *The Colour of Class: the educational strategies of the Black middle classes.* Abingdon, Oxon & New York: Routledge.

Roseberry, S., Hirsh-Pasek, K. and Golinkoff, R. M. (2014). "Skype Me! Socially Contingent Interactions Help Toddlers Learn Language". *Child Development*. Volume 85: 956–970.

Roth, W. M. & Radford, L. (2011) A Cultural-Historical Perspective on Mathematics Teaching and Learning. Rotterdam: Sense Publishing.

Royal Society (2012) *Shut down or restart? The way forward for computing in UK schools*. London: Royal Society. https://royalsociety.org/~/media/education/computing-in-schools/2012-01-12-computing-in-schools.pdf (accessed 27-Apr-2015)

Scottish Government (2012) Scottish Survey of Literacy and Numeracy 2011 (Numeracy) Highlights from Scotland's Results 28th March http://www.gov.scot/Resource/0039/00390565.pdf

Scottish Government (2017) Assessment, http://www.gov.scot/Topics/Education/Schools/curriculum/assessment (accessed 19-May-2017

Select Committee on Communications, *Growing up with the internet,* House of Lords, 2nd Report of Session 2016-17, HL Paper 130

Selwyn, N. (2009). The digital native – myth and reality. Aslib Proceedings: New Information Perspectives, 61(4), 364–379.

Sen, A. (1993) Capability and well-being in M. Nussbaum and A.Sen (Eds) *The Quality of Life*, Clarendon Press, Oxford.

Sigman, A., (2011). "Does not compute, revisited: Screen technology in early years education. In: Too much, too soon?" *Early learning and the erosion of childhood*. Stroud: Hawthorn Press, 1 - 30.

Smith,F., Hardman, F., and Higgins. S (2007) Gender inequality in the primary classroom: will interactive whiteboards help? *Gender and Education*, 19:4, 455-469

Somekh, B (2008) Factors Affecting Teacher's Pedagogical Adoption of ICT. International Handbook of Information Technology in Primary and Secondary Education, 20, 449-460

Sonck N. and de Haan, J. 2013, Determinants of Internet Mediation, *Journal of Children and Media* 7 (1) 96-113

Sonck, N., Livingstone, S., Kuiper, E., & de Haan, J. (2011) *Digital literacy and safety skills*. EU Kids Online, London School of Economics & Political Science, London. Retrieved August 30, 2014, from http://eprints.lse.ac.uk/33733/1/Digital%20literacy%20and%20safety%20skills%20(lsero).pdf

Stephen, C., Stevenson, O. and Adey, C. (2013) Young children engaging with technologies at home: The influence of family context. *Journal of Early Childhood Research* 11:2, 149-164.

Storm-Mathisen, A. (2016) Grasping children's media practices- theoretical and methodological challenges. *Journal of Children and Media*10 (1) 81-89

Sweetser, P., Johnson, D., Ozdowska, A., Wyeth, P. (2012). Active versus passive screen time for young children. *Australasian Journal of Early Childhood*, *37*, 94-98.

Thomson, Pat. (2002) Schooling the rust-belt kids: Making the difference in changing times. Stoke-on-Trent: Trentham Books.

Twining, P. (2002a) *Enhancing the impact of investments in 'educational' ICT*. PhD Thesis. Milton Keynes: The Open University http://is.gd/eFyWpy (accessed 2-May-03)

Twining, P. (2002b) Conceptualising computer use in education: introducing the Computer Practice Framework. *British Educational Research Journal*, Vol.28, No.1, pp.95-110. ISSN: 0141-1926

Twining, P. (2004) 'The Computer Practice Framework: a tool to enhance curriculum development relating to ICT' in Monteith, M. (Ed.) *ICT for Curriculum Enhancement*. pp.41-56. Exeter: Intellect. ISBN: 1841500615

Twining, P. (2008) Framing IT use to enhance educational impact on a school-wide basis. In Voogt, J & Knezek, G. (Eds.) *International Handbook of Information Technology in Primary and Secondary Education*. pp.555-579. New York, Springer. ISBN: 978-0-387-73314-2 (August 2008) http://is.gd/CVIpdL (accessed 6-May-2011)

Twining, P. (2013a, November) *Digital technology strategies*. Retrieved from http://edfutures.net/Digital_technology_strategies

Twining, P. (2013b, November) *The (Australian) Snapshot Studies Methodology*. Retrieved from http://edfutures.net/Research_Strategy#The_.28Australian.29_Snapshot_Studies_Methodology

Twining, P. (2013c, August) *The Digital Technology Impact Framework (DTIF).* Retrieved from http://edfutures.net/DTIF

Twining, P. (2014a) Unpacking ICT. In: Cremin, T. & Arthur, J. (Eds.) *The handbook of teaching in the primary school*. 3rd Edition. pp.514-526. London: Routledge.

Twining, P. (2014b) *What does it mean for schools? New pedagogy in classrooms*. Keynote at the New Technologies in Education Conference, February 2014, Belgrade, Serbia.

Twining, P. (2014c) Redefining Education: 1:1 computing strategies in English schools. In T. Sweeney & S. Urban (Eds.), *Now IT's Personal: Proceedings of the Australian Computers in Education Conference 2014* (pp. 428–437). Adelaide, Australia: ACEC.

Twining, P. (2014d) *Digital technology trends*. Retrieved from http://edfutures.net/Digital_technology_trends

Twining, P. (2015) *ICT in Schools: Why does it matter and what is possible?* Invited presentation, British Council BETT 2015 Study Tour, January 2015, London, UK.

Twining, P., Broadie, R., Cook, D., Ford, K., Morris, D., Twiner, A., and Underwood, J. (2006) *Educational change and ICT: an exploration of priorities 2 & 3 of the DfES eStrategy in schools and colleges*. Becta, Coventry, UK.

Twining, P; Davis, N. & Charania, A. with Chowfin, A; Henry, F; Nordin, H. & Woodward, C. (2015) *The evolving nature of digital technology and related infrastructure for the school sector*. Montreal: UNESCO Institute of Statistics. http://is.gd/jnUSwI (accessed 26-Mar-2015)

Twining, P. & Evans, D. (2005) Should there be a future for Tablet PCs in schools? *Journal of Interactive Media in Education*, Special Issue: Portable Learning - Experiences with Mobile Devices, December 2005. http://jime.open.ac.uk/ (accessed 6-Mar-2005)

Twining, P; Evans, D; Cook, D; Ralston, J; Selwood, I; Jones, A; Underwood, J; Dillon, G and Scanlon, E with Heppell, S; Kukulska-Hulme, A; McAndrew, P and Sheehy, K. (2005) *Tablet PCs in schools: Case study report*. Coventry: Becta. Retrieved from http://oro.open.ac.uk/6407/1/BTE_case_study_print.pdf

Twining, P., Heller, R., Nussbaum, M. & Tsai, CC. (2017) Some guidance on conducting and reporting qualitative studies. Computers & Education, Vol.106, pp.A1-A9. http://www.sciencedirect.com/science/article/pii/S0360131516302445 (accessed 25-May-2017)

Twining, P. & **Henry, F.** (2014) Enhancing 'ICT teaching' in English schools: Vital lessons. *World Journal of Education*, Vol.4, No.2, pp.12-36. ISSN 1925-0746(Print), ISSN 1925-0754(Online). doi:10.5430/wje.v4n2p12 http://www.sciedu.ca/journal/index.php/wje/article/view/4092 (accessed 31-Mar-2014)

United Nations (1989) United Nations Convention on the Rights of the Child www.unicef.org.uk

United Nations Children's Fund (2014). Children, ICT and Development: Capturing the potential, meeting the challenges (No. innins715).

Vittrup, B. Snider, S. Roe, K.K., Rippy, J (2014) Parental perceptions of the role of mediation and technology in their young children's lives, *Journal of Early Childhood Research,* Vol 14 (1) 43-54

Wenger, E. (1998) *Communities of Practice: Learning, Meaning, and Identity*. Cambridge: Cambridge University Press.

Wong, B.L. and Blandford, A. (2002) Analysing Ambulance Dispatcher Decision Making: Trialing Emergent Themes Analysis. London. http://eprints.ucl.ac.uk/16628/1/16628.pdf (accessed 19-May-2017)

Wood, D. (1998) *How Children Think and Learn* Second Edition, London: Blackwell Publishers

World Economic Forum (2016) 'The Global Information Technology Report 2016 Innovating in the Digital Economy', INSEAD.

Young, M. (2011) The return to subjects: a sociological perspective on the UK coalition government's approach to the 14 – 19 curriculum. *Curriculum Journal*,22 (2), 265 – 278.