An exploration of the use of technology in primary school physical education.

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Sharon MacKechnie

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Abstract

Technology is one of the fastest growing areas of the global economy and it is recognised as having a major influence on the world's health through its integration in education (Miniwatts Marketing Group, 2010). Technology too is at the heart of the Scottish Curriculum for Excellence and schools are expected to integrate it both to enhance learning and teaching across each subject area, and to further the technological development of today's young 'digital natives' (Prensky, 2001). This paper seeks to explore the effectiveness of current technology and current use of technology in a quality primary school physical education through the exploration of two main issues: (1) what constitutes a quality PE experience? (2) in what ways does the use of technology influence the quality of the physical education experience?

A study of the literature will identify the key features of a quality physical education and the key features will then be examined in context by conducting three case studies of the use of different technologies in Scottish primary school physical education.

Each case study is analysed individually; however there are three significant correlations that emerged across all studies:

- Technology increases intrinsic motivation
- Technology increases pupils' development of social and emotional skills
- The pedagogical approach to lessons using technology might be influenced by teacher confidence and competence

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Finally, thanks to my family for immense support throughout this process.

Author's Declaration

"I declare that, except where explicit reference is made to the contribution of others, this dissertation is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution."

Sharon MacKechnie
2/4/2013

Contents

Chapter 1:   Introduction

This thesis seeks to explore the use of three current technologies in primary school physical education (PE). These technologies are: digital video cameras; Cyber Coach; and Nintendo Wii Sports. The research aims to critically evaluate each one through individual case studies and reflect upon the impact of each technology on a quality PE experience. The studies will draw from three perspectives – the researcher, the class teacher and the pupils, and will explore issues such as pedagogical approaches, links to Health and Wellbeing within Curriculum for Excellence (CfE) and the structure and logistics of using technology in PE.

1.1   Rationale

I have been a teacher of PE for sixteen years and during this time I have taught across the full age range. I am passionate about technology and was involved with the original '*Masterclass'* initiative with Learning and Teaching Scotland at the inception of the massive drive towards ICT integration in education. Being part of *Masterclass* afforded me some invaluable opportunities, including presenting a workshop at SETT (now the Learning Festival), becoming a stakeholder on the BBC Digital Curriculum project and undertaking some preliminary research on behalf of the BBC for the same project.

As I have grown throughout my career, my beliefs have grown and changed too – I fervently hold that pupils should be active in their engagement with education; they need not only understand *what* and *why* they are learning, but they must also subscribe to the entire process and be active participants in the design and delivery of their education. Attempting to blend this philosophy with the global initiative for technology integration is challenging, not least because schools are hampered either because the infrastructure is not adequately efficient, or financial constraints limits the effectiveness of the ICT integration; and sometimes it can be something as simple as lack of appropriate pedagogy-based continuing professional development (CPD) that frightens teachers away from using technology (Scottish Executive, 2005).

There are two reasons that this, and future research in this area is important. The first is because of the changing perception of physical education as Scotland

moves forward into the twenty-first century with the Curriculum for Excellence. The Scottish curriculum now acknowledges the importance of Health and Wellbeing to enrich the lives of all young people and this is linked to the national drive to reduce mental health issues and physical health problems that detrimentally affects Scotland's economy, but which can be reversed in part by leading a healthy, active lifestyle (Scottish Government, 2010). PE has been firmly placed within the area of Health and Wellbeing and indeed is the only subject to be given a statutory time commitment of two hours per week in primary schools (Scottish Government, 2012). Further, there is an expectation for schools to deliver two hours/periods of *quality* PE and, whilst most secondary schools are comfortable and able to meet the demands of '*quality*', many primary schools face a challenge, which to some may be insurmountable. One of the barriers facing primary schools is the concept of *quality* PE – Education Scotland defines it as "an inclusive, structured, planned programme of study, delivered by teachers, which provides progressive learning for all children and young people" (Education Scotland, online); however Marsden and Weston (2007) argue that there does not appear to be an authoritative definition of what constitutes a quality PE experience, and perhaps the lack of detailed guidelines from the experts, and lack of understanding from primary schools and class teachers (Morgan & Hansen, 2007) appears to be weakening both the experiences for pupils and the status of the subject. Additionally, there is a national drive to increase the levels of daily physical activity amongst schoolchildren (Scottish Executive, 2003) and schools can be inadvertently influenced by agencies that offer activity coaches during curricular time – as a result many schools attribute these activity programmes towards their PE time (Morgan & Hansen, 2007). Through the literature review it is hoped to both clarify the definition of quality PE and explore its links to the principles of a Curriculum for Excellence, thus empowering primary schools to engage in developing a quality PE curriculum that best meets the needs of their pupils.

The second reason that this research is timely is because of the explosion in the use of technology throughout every facet of life (Tezcan, 2006). Global citizens use technology to communicate, to work, to learn and to play and, whilst it has been used quite extensively in Scottish schools for several years, only now is the

infrastructure and cost becoming more reasonable to allow its rapid expansion across all areas of learning. The CfE expects schools to use technology to enhance learning (Learning and Teaching Scotland, 2009i) and this has been given the status of being a *responsibility of all*. Therefore schools now need to explore ways of integrating technology across all subject areas, and this potentially causes conflict in PE because the environment and active nature of the subject appears to be at odds with the types of technology available in schools. This has had a limiting effect on ICT integration in PE to the point that these three case studies are almost unique in exemplifying the technology integration in primary schools across Scotland. It is intended that the implications from the research findings will help inform schools of the issues to be considered when integrating technology in PE to ensure that it is effective in its dual aim of enhancing learning and ensuring a quality physical education for all pupils.

1.2 Chapter introductions

This section will give an overview of the purpose and content of each chapter.

1.2.1 Chapter 2

Chapter 2 is the first section of the literature review and seeks to identify the effects that global growth of technology has had on its citizens. It will establish an understanding of how the demands of workers and learners have changed in the last decade, and it will explore the ways in which education has adapted and continues to evolve to meet the needs of twenty-first century learners.

1.2.2 Chapter 3

Curriculum for Excellence is Scotland's response to the global evolution of learning and learners and this chapter seeks to pinpoint the place and value of PE within CfE; and it explores in some depth the ways in which PE has adapted to meet the demands of twenty-first century living.

1.2.3 Chapter 4

The aim of chapter 4 is to develop a shared understanding of the concept of a *quality* PE experience. It uses literature to explore various viewpoints and to inform the researcher's opinion. The literature is then used to underpin the researcher's concept of quality PE.

1.2.4 Chapter 5

Chapter 5 seeks to develop an understanding of the global use of technology and its influence and impact on education. It discusses the 'digital divide' that is widening the gap of opportunity and skills, both across the world and within Scotland. It also explores the changing learning styles of pupils and the impact this has on our approaches to learning and teaching.

1.2.5 Chapter 6

The purpose of this chapter is to introduce and investigate the ways that technology is currently being used in PE. The chapter looks at various examples of technologies that have been applied in different settings, such as being used to increase an awareness of the health agenda; being used to organise tournaments; and being used to support cross-curricular learning.

1.2.6 Chapter 7

Chapter 7 takes the reader through the methodology of the research. It discusses the main paradigmatic influences that have informed the research protocol, and offers a theory-linked justification of the methods used in the data collection and subsequent analysis.

1.2.7 Chapter 8

This chapter presents, analyses and discusses each of the three case studies and summarizes the findings from each one. The studies are all considered individually because each one is unique in its purpose, although similarities and differences are discussed in the following chapter. The analyses are categorised to enable a simpler presentation of the findings and this also helps to draw general conclusions.

1.2.8 Chapter 9

The final chapter offers overall conclusions of the main findings of the research and discusses the implications of the findings for teachers and schools. It then reflects on the research experience and finishes by proposing areas for further research and development.

Chapter 2:   The effects of technology growth on the world's citizens, and the educational response to it

> We want young people to have the opportunity and encouragement
> to fulfil their potential, thereby becoming rational, thinking
> members of our society who can contribute to the common good in
> a number of ways, including demonstrating individual, cooperative
> and environmental responsibility.

(Laker, 2001, p. 8)

The purpose of the following five chapters is to explore in depth, the literature that examines the purpose of education, physical education and technology in equipping our pupils to become global citizens who can function effectively and contribute positively to the ever-changing demands of twenty-first century life. It will examine how the world and society has changed over a decade and how this affects the needs of our learners; it will then explore the ways in which education and physical education is adapting to meet learners' needs, in particular the Scottish response to these global changes.

2.1   How has the socioeconomic world changed in the last decade?

In order to best support young people in fulfilling their potential it is important to understand the societal shifts. Education does not exist in a vacuum, rather, instead it must both reflect the needs of society and its citizens, and also embed itself within society to influence it. Both the world and the world of education has changed quite dramatically over the course of one generation, and the recurring reason for this appears to be the rapid growth in technology. Tapia (2003) draws comparison between world societal changes and ICT, stating "Technology is culturally created and creates culture" (p. 485), acquiescing with modern theorists such as Bijker and others (1992, in Tapia, 2003) who have been informed by critical theory to suggest that the *relationship* between society and technology influences each, rather than one dictating the other.

Economically, in terms of employment growth and structure, emerging technologies complement professional posts and low-skilled positions, resulting in an increase in jobs at either end of the spectrum; but growth has declined in clerical, average-paid posts because technology is actually replacing them (Oesch & Rodriguez Menes, 2011). This has led to a polarisation of the employment

structure - as top earners remain so, those in low-paid posts now must compete ever more fiercely for these positions, resulting in a glut of over-qualified personnel performing low-skilled tasks, and unqualified workers becoming increasingly unemployable. The Leitch Review stated that in 2004 there were three million unqualified workers and comparative jobs in the UK, but predicts that these posts will reduce by 75% by 2020 (Leitch, 2006), because based on past trends, the report foresees there will be a growing need for a workforce that have high-level skills and knowledge and understanding, largely due to the advancement in technologies (Manning, 2004, in Oesch & Rodriguez Menes, 2011), as Longworth states "Mindpower is replacing manpower" (2003, p. xii). Further, Vockley proposes that the world now demands citizens who are:

> globally aware, civically engaged, and capable of managing their lives and careers, and for young people who are economically and financially literate and fluent in information, media and technology skills.
>
> (Vockley, 2007, p. 3)

This suggests that global citizens must be responsive to the changing needs of the workplace in order to continue to contribute effectively to the global society.

2.2   How are we as world citizens changing to reflect the socioeconomic shift? What kind of people do we need to be to function?

Because emerging technologies allows us to cooperate and compete efficiently and much more equitably than ever before (Friedman, 2005, in Chapman & Hadfield, 2010), globalisation is becoming inherent in almost every aspect of life, including consumerism, education, culture and business. The 'Ambitious, Excellent Schools' initiative set up by the Scottish Executive in 2004 was the response to the effects of globalisation "by encouraging enterprise, innovation and creativity" (Reeves, 2008, p. 10), as the paper states: "we know that our young people will need to be increasingly highly skilled and high achieving to respond to future demographic and economic challenges" (Scottish Executive, 2004, p. 10). According to Longworth (2003), current school pupils will pursue several careers throughout their working life, and most of these jobs will be in constant flux, requiring higher-order thinking skills, creativity and innovative practices, and will almost certainly involve interactions with advanced technologies. This is altering the landscape of the formal workplace – employees

are required to respond quickly to ever-changing demands and as technology streamlines the employment structure, workers have to adapt to collaborative but yet highly competitive strategies to survive and flourish, displaying their emotional intelligence through charismatic interactions and cognitive intelligence through creative, multi-tasking endeavors (Couldry & Littler, 2011).

2.3 How is education at global level changing to meet the needs of twenty-first century learners?

> The vision of learning we embrace focuses on teaching students to become critical thinkers, problem solvers and innovators; effective communicators and collaborators; and self-directed learners.
>
> <div align="right">(Vockley, 2007, p. 3)</div>

Cramer (2007) cites Lemke's list of the skills needed by twenty-first century learners, including:

- Digital-age literacy
- Multi-cultural and global awareness literacies
- Economic literacy
- Inventive/creative/adaptive/curiosity/risk-taking/higher-order thinking skills
- Collaboration/interpersonal/personal/social/civic responsibility

The author believes that pupils must be taught how to collect and evaluate sources of information critically (2007), and contends that pupils also need to be able to think outside of themselves and their communities, to better understand the world and how it is interconnected (ibid.). Schneckenberg (2009) holds that new technologies and new uses of technology are altering the ways in which we gather, understand and disseminate information, and this understandably has enormous pedagogical implications - "Technology can empower or enslave, and learning is the key to its benevolent use" (Longworth, 2003, p. 5). ICT has the potential to support this global network to construct and "transfer knowledge at a faster rate than has previously been experienced" (Chapman & Hadfield, 2010, p. 309) and this is already being harnessed by schools throughout the world, "as teachers have begun to look beyond their own organisations for fresh perspectives and new ideas to enhance their practice and tackle the challenges they face" (ibid., p. 309). This corresponds with Priestley's (2010) observation

that there are major curriculum developments taking place throughout the world, promoting a social contructivist approach to pedagogy and a "renewed emphasis on teachers as agents of change" (p. 24). Further, Reeves (2008) contends that teachers should be ever more pro-active in school improvement processes, which correlates with Fullan's theory that teachers must have personal and shared vision, inquiry, mastery and collaboration to influence change within educational settings (Fullan, 1993, in Thorburn, Jess, & Atencio, 2011).

It is also recognized that the social nature of learning parallels the information exchange that occurs within social networking sites (SNS), and this phenomenon is now being tested within education; a recent research at one university indicated that SNS information-sharing was the most valuable pedagogical benefit experienced by the student participants (Hsiu-Ting & Yuen, 2010). Further, Grimley et al. (Grimley, Green, Nilsen, Thompson, & Tomes, 2011) report that interactive approaches to student learning are more effective than lectures, and many researchers believe this is because of the '*Net Generation*' of students (also known as '*millennials''*) who have grown up with technology and therefore have naturally different styles of learning than previous generations (Oblinger and Oblinger, 2005; Prensky, 2001; Tapscott, 1998, in Grimley, et al., 2011). However, contrary to this, Schneckenberg found that the learning and teaching relationship between staff and technology-savvy students in higher education is weakening because technological advancements are outpacing pedagogical changes (2009). Hargis (Hargis & Marotta, 2011) concludes that educational practitioners need to embrace critically and reflectively, the pedagogical opportunities and challenges that technology creates.

> It is more important than ever that our education system equips young people with a broader set of personal, learning and thinking skills, including resilience, confidence, and the abilities to think analytically and creatively; to learn and research in depth; to be active citizens and agents of change; to work with others and in teams; and to manage themselves.

> (Department for Children Schools and Families, 2009, p. 16)

Therefore not just what young people are learning but how they are learning to learn.

2.4   What is the Scottish response to the changing needs?

Scotland has historically been at the forefront of educational developments and indeed regards its education system as an important feature of Scottish identity (Paterson, 1998). Upon review of the curriculum, it was felt that the 5-14 Guidelines were not "sufficiently radical" (Allan, 2003, in Kennedy, et al., 2007), and so with the advent of *millennials* as learners, the government "anticipated future needs deriving from economic, technological and social changes" (Priestly & Humes, 2010) in the development of CfE. Indeed, the Scottish Government has interwoven its Lifelong Skills Strategy policy document with the four capacities of CfE because it believes that "the years we spend in education generate a form of capital that has the potential to produce a long-term return" (Scottish Government, 2007). Whilst Priestly (2010) is not a strong supporter of the new curriculum he highlights a strength of it as having a 'top-down and bottom-up' approach that provides suitable policy governance and at the same time granting absolute flexibility for schools to design a programme best suited to their learners' needs; promoting egalitarian values (McCrone, 2003, in Kennedy, et al., 2007) and ensuring that pupils are at the heart of all learning (Priestley, 2010).

Another feature of CfE is its continuity and progression for all learners throughout their primary and secondary education; this is a step forward from the previous 5-14 Guidelines and Munn's Standard Grade/Higher Grade programmes that did not share with each other visions of either content or assessment (Carr, Allison, & Meldrum, 2006). Carr et al. reports that while 5-14 was certainly influenced by the theories of Piaget and Dewey and advocated a broad, integrated curriculum, Munn was of the opinion that secondary education required a greater depth of subject-specific content, hence the resulting discontinuity from 5-14 into Standard Grade (ibid.).

Whilst changes to the curriculum were being designed and implemented, so too were changes to the teaching profession. The McCrone Agreement both modernised and professionalised teaching and teachers by implementing an incremental pay-rise; setting a clear structure and expectation for continued professional development (CPD), including the Chartered Teacher scheme to encourage and reward those teachers who wanted to remain in the classroom and enhance their teaching skills rather than progress up the management

ladder; create a world-leading teacher induction scheme; and raise the esteem of teachers by amalgamating all teacher training colleges with universities (Kennedy, et al., 2007). The purpose of this rather radical agreement was primarily to raise the standards of learning and teaching for pupils by professionalising the occupation. Kennedy et al. however, considered that this modernisation was also influenced by a political agenda which sought to "control teachers and the education system in an attempt to promote particular agendas" (ibid, 2007, p. 64). Regardless of the reasons for change, it has certainly professionalized the occupation and the implementation of CfE has given schools and teachers the autonomy that is required to meet the needs of today's young learners.

Chapter 3:   How is PE evolving?

3.1   What are the influences that are effecting change within physical education?

As society and its learners have changed, so has PE – curricular content, pedagogy and resources have been able to adapt not only to respond to societal changes but also to help influence change. Learning to win and lose at games within PE mirrors the "hierarchical rules of wider life and how to compete in the economic market place" (O'Connor & MacDonald, 2002, p. 38). It is therefore important to re-establish an understanding of the contribution that the subject makes to the philosophies of a Curriculum for Excellence and the needs of a wider society; only then can the true value of PE be celebrated.

The subject is currently in a transformative phase, with influences coming from CfE, Active Schools, Health Scotland, Private and Public Partnership building programmes and a plethora of other initiatives and stakeholders. For the most part, increased awareness of the continuing and increasing need for PE is welcome; however it is crucial to remember the distinctness of the subject, and defend its place in the curriculum, rather than allow its value to be diluted by the definition of physical activity. As Thorburn et al. state, policy-makers must:

> recognise instead that to be properly physically-educated involves being experienced in practical learning, which is filled with personal meaning and clear educational relevance rather than … merely improving physical fitness and reducing obesity rates.

(Thorburn, Jess, & Atencio, 2009, p. 212)

It could be suggested that the might of the Scottish Government, in its high-profile battle to increase uptake in physical activity and reduce levels of obesity, has used a double-edged sword on the subject – the profession has accepted and revelled in the apparent shift in perception of PE, but in actual fact has sold itself short:

> It is as if we have become afraid to reaffirm education as the essence and indisputable 'core business' of [PE]. Education, that is, which develops and celebrates embodied knowledge, that … young people can draw upon and relate to, and that develops learning and literacies that can serve them for life.

(Penney, 2008, p. 36)

Thorburn et al. refer to CfE policy that requires PE to be more contextualised within the wider area of Health and Wellbeing, thus focusing on holistic development to augment the lifelong learning agenda (Learning and Teaching Scotland, 2009, in Thorburn, et al., 2011). Considering the Four Capacities of CfE and the overarching experiences and outcomes of Health and Wellbeing within the document, Lavery (2010) proposed that a quality physical education holistically develops all pupils to become Successful Learners, which then creat es a path for them to become Confident Individuals, Effective Contributors and R esponsible Citizens, as outlined below:
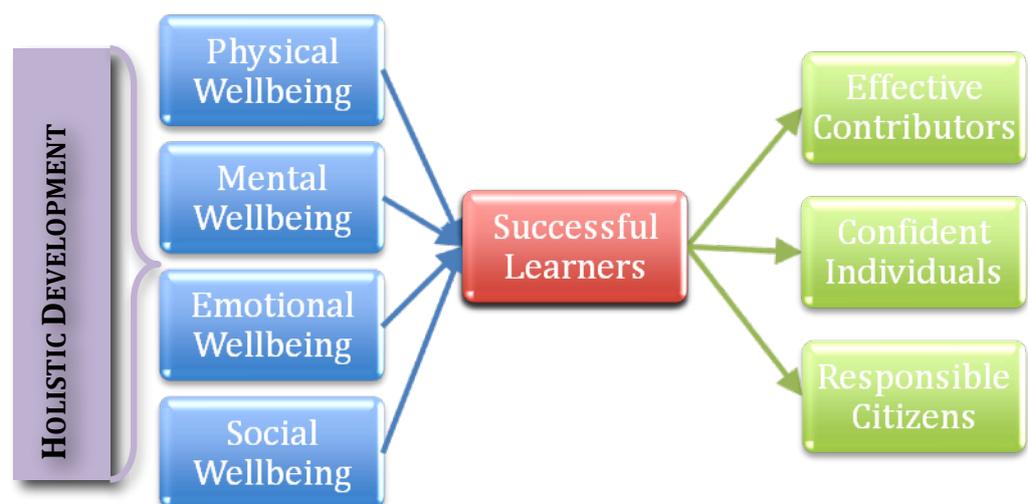
Figure 1

3.2   How does PE contribute to holistic development within CfE?

A comparison can be drawn between Miller's stance and that of Grimley et al. (2011), who believe that the current generation of learners (*'millennials'*) are more intrinsically motivated to learn, with a 'work hard play hard' attitude to life; counter to the previous '*Generation X*' pupils who thought it un-cool to be smart or to try hard in school. Within Scotland, Generation X pupils were schooled through 5-14 and O'Grades/Standard Grades – millennials, however have experienced and are currently experiencing the shift into CfE which has holistic development at the heart of its philosophy. So perhaps rather than education changing to meet the needs of modern learners, it should acknowledge and celebrate its involvement in changing the attitudes towards the work ethos and learning of today's pupils.

Dewey discussed that education as a purpose and as an establishment was based on socialization (1897) and the role of the teacher is to create a positive environment in which to nurture holistic development (Ozmon & Craver, 2003). Hopkins reflects this:

> The teacher's concern [is] to touch hearts as well as minds, to nourish a hunger for learning and help equip the learner with a proficiency and confidence to pursue understanding for themselves.
>
>   (Hopkins, 2007, p. 53)

Additionally, Alcott and Montessori (cited in Ozmon & Craver, 2003) argue that a holistic education seeks to unwrap the many layers of a pupil's intelligences and soul to realize his or her potential.   As Miller points out, "Holistic education nurtures a sense of wonder… [and] aims to call forth from young people an intrinsic reverence for life and a passionate love of learning" (2000, online). Crucially, HMIE note that "Mental, physical and emotional well-being of young people are essential pre-conditions for successful learning" (2007b, online).

Within the context of PE, a quality physical education not only develops the whole child through *active learning*, it can augment the entire curriculum through the educational benefits associated with *active living.* Dewey examined the role that physical education can play, both in developing the whole child and as a motivational tool for learning: "when children have a chance at physical activities

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which bring their natural impulses into play, going to school is a joy... and learning is easier" (Dewey, 1916, online). Eldar (2008) goes even further to suggest that PE settings can be contrived to nurture positive emotions in pupils, thus acting as a motivator prior to classroom-based work. Linking this to a modern, scientific perspective, it is accepted that exercise releases endorphins – the natural high that gives us a feel-good factor; combine this with emerging research that shows that exercise "increases the chemical BDNF... in the hippocampus, a... ridge in the brain that controls learning and memory" (Modie, 2003, online), and the result is an increased ability to concentrate more fully on cognitive tasks; hence we finally have an appropriate use for the saying 'healthy body, healthy mind'.

However, this pragmatic view of education is removed somewhat from the thoughts of early idealists, who believed that the development of the cognitive domain was paramount to the educative process. But Ozmon & Craver however deem this was frequently at the expense of their emotional and social needs, and such a narrow focus on education failed to develop the whole child (2003).

It is encouraging that Her Majesty's Inspectorate for Education (HMIe) has identified holistic development as a feature that underpins Health and Wellbeing across the curriculum:

> Learning in health and wellbeing ensures that children and
> young people develop the knowledge and understanding, skills,
> capabilities and attributes, which they need for mental,
> emotional, social and physical wellbeing now and in the future.
>
> (Learning and Teaching Scotland, 2009e, online)

3.3   What pedagogies within PE support holistic development?

Within CfE, teachers should be challenged to nurture holistic development by reflecting on their teaching methods in class to create situations where pupils work cooperatively to engage in problem-oriented, contextualised learning activities, and this is also applicable to PE, as Bailey (2007) stated that 'good physical education is about problem solving'. Piaget held that children learn best when given problem-solving activities that require them to actively participate, reflect and apply their experiences across a range of contexts (Rovegno & Dolly,

2006), and many others agree that in order for learning to be meaningful, pupils must see it within the context of their own personal, social and physical lives (Brown, Collins and Duguid, 1989, cited in Moreno, Lopez, Diaz, & Martinez, 2011; Fernandez-Balboa, 1997, cited in Thorburn, et al., 2009). It is also widely supposed that children develop understanding of new knowledge by linking it to previous experience (National Sciences Resources Centre, 2002, p. 20); furthermore, Vygotsky's social constructivist theory built upon Piaget's thinking to assert that cognitive development flourished when pupils are given opportunities to work collaboratively, sharing and bringing together different perspectives that help them construct more informed views (ibid).

Garn et al. (2011) highlighted research that shows links between setting challenging and creative tasks within non-traditional PE curricula, with increased levels of interest and enjoyment amongst pupils. A particular approach to this is Sport Education (SE), which aims to create an authentic sport experience that is developmentally appropriate and inclusive (Siedentop, Hastie, & Van der Mars, 2004, p. 4). Wallhead & O'Sulliven (2005) hold that "Sport Education promotes personal and social development in the form of student responsibility, cooperation, and trust skills" (cited in Sinelnikov & Hastie, 2010, p. 56). This is clearly seen as an integral part of the modern curriculum, as HMIE, in *Journey to Excellence* offer an example as to what makes an excellent school:

> It stresses the importance of putting values into action. Staff and pupils demonstrate personal responsibility, compassion and support for others, and actively promote fairness and justice in their dealings with each other.
>
> (Her Majesty's Inspectorate for Education, 2007c, online).

The wording of *'demonstrate…support for others'* conjures up an image of learning as a collaborative activity; this requires the development of critical thinking skills which are vital for successful learners in PE, as they help pupils "identify and understand problems, decide how to act on them, and then evaluate … sources of feedback" (Lodewyk, 2009, online). Within the context of SE, the pupils themselves are responsible for theirs' and others' learning in, amongst other duties, the role of coach. Gillies (2003) holds that cooperative learning situations promotes a more positive attitude towards learning by increasing the willingness

and motivation to engage with other pupils and promote each other's learning. Further, Johnson and Johnson believe that "motivation is inherently social" (2003, p. 140) and success in the achievement of goals/aims depends on interpersonal relationships (ibid) between pupils and pupils, and teachers and pupils. Crucially then, for this to work, Sport Education requires a shift in teacher/pupil role from one of authoritative/passive to that of facilitative/assertive. Both Piaget and Vygotsky's theories of learning assert that the role of the teacher is that of facilitator, taking each child's prior knowledge and experiences into account to extend and develop their understanding (Rovegno & Dolly, 2006), and Williamson & Payton succinctly define the role of a modern school pupil:

> The idea of the schoolchild as a passive recipient of school knowledge is increasingly being rejected in favour of a view of children as socially active and participative, democratically bringing existing knowledge and ideas into the classroom.
>
> (2009, p. 5)

However, it could be suggested that by placing too much control of teaching/coaching onto the pupils themselves, they actually miss out on the experience of the teacher, as Alexander & Penney state: "the [teachers'] perceived denial of significant opportunities to inject their own expertise was being compounded by student coaches' inability to offer any of their own" (2005, p. 289). There is a need, then, for teachers to develop the movement literacy of pupils prior to engaging in task-work of this nature (Lodewyk, 2009). Rovegno and Dolly (2006) suggest that "teachers' goals should be to develop a deep, meaningful grasp of concepts that thereby enable students to ... effectively apply knowledge to new settings and situations" (cited in Lopez, Jordan, Penney, & Chandler, 2009, p. 51).

In applying this thought to SE, it is imperative for the pupils to be equipped with the tools and understanding to evaluate their (team's) performance in order to identify needs and set targets for development. It is important, however, to consider pupil/teacher *perceptions* of need when identifying targets, to ensure that the pupils, rather than the teacher, identify problems and solutions. This is reflected by Ross et al. who found "that pupil participation was deployed in support of ... pre-existing objectives rather than being understood as having

alternative, emancipatory, or any inherent, goals" (Ross, Munn, & Brown, 2007, p. 238).

The pedagogical model 'Teaching Games for Understanding' (TGfU) (Bunker & Thorpe, 1982) goes some way to helping pupils and teachers with this; the aim being to "produce *thinking* players" (Alexander & Penney, 2005, p. 290) through development of tactical awareness and context-performance improvement (ibid). Penney et al. deem that the components and requirements of TGfU, such as positive interdependence, active learning and a pupil-centred approach correspond with their requisites for a 'quality' physical education (Penney, Brooker, Hay, & Gillespie, 2009). Lopez et al. consider the characteristics of TGfU as:

> Learners interacting within groups to solve problems; the use of an action-discussion reflective cycle with cognitive challenges posed in group discussions; and a focus upon the meaning of skills in the context of their use.

<div align="right">(Lopez, et al., 2009, p. 48)</div>

This is comparable to Honey and Mumford's (1982) learning cycle, in which there are four stages one must go through when learning new skills/concepts:
1. Having an experience
2. Reviewing the experience
3. Concluding from the experience
4. Planning the next steps

<div align="right">(Beard & Wilson, 2006, p. 34)</div>

Several theorists have developed similar cycles, all of which have in common the need to experience, reflect, adapt and move forward, as "we need to combine thinking with doing or applying in order to create an effective learning process" (ibid, p. 35).

This notion of empowering pupils to be reflective in order to be open to new learning is one that Dewey considered: "Thinking is the method of intelligent learning, of learning that employs and rewards mind" (Dewey, 1916b, online); and Meadows (2001) concludes that "good thinkers will have a confident attitude to cognitive tasks…be willing to take risks…to make mistakes and learn from them"(p. 333).

3.4   In what ways does PE within CfE contribute to Lemke's list of the skills needed by twenty-first century learners?

Lemke's skills list reflects the demands of a modern, global society. It requires citizens to be accountable for each other and ourselves; we must be adaptable, digitally literate and creative, with an aptitude for problem solving and risk-taking. In order to achieve these life-skills we must develop our curiosity and higher-order thinking skills i.e. be active rather than passive in our living and learning (Cramer, 2007).

Compton (2005) drew on previous opinions to assert that reflective thinking, applied with imagination and knowledge/skill, developed creativity (cited in:Johnston, Halocha, & Chater, 2007). Schmid emphasised that "creativity is a special kind of thinking process" (2006, p. 28) and held strongly that creative activities improves health and wellbeing – for example, creativity increases self-esteem, and being in creative situations with other members of a group fosters a sense of belonging (Wilcock, 1998, cited in Schmid, 2006). Further, Ozmon & Craver believe that creativity incites democracy, and that schools should be encouraged to "foster habits of thought, invention, and initiative" (2003, p. 147). This is a view shared by Longworth:

> … an image of a glorious future through lifelong learning; a rebirth of creativity, of culture, of imagination, of invention, of partnership; the notion that finally we have the tools and the vision to enable human beings to realise their own enormous potential for good.

<div align="right">(2003, p. 3)</div>

Important, then, that creativity is one of the five themes of CfE alongside enterprise, citizenship, sustainable development and international education (Learning and Teaching Scotland, 2009h, online), and is particularly highlighted in the principle of challenge and enjoyment: "[Pupils] should be active in their learning and have opportunities to develop and demonstrate their creativity" (Learning and Teaching Scotland, 2007b). Sefton-Green believes that creative learning can be defined from two perspectives: "learning that allows creativity to be expressed" (Sefton-Green, 2008, p. 63); and "imaginative activity supporting intellectual inquiry" (ibid). So important is creativity, that CfE demands that it and the other four themes are built into the experiences and outcomes across all

curriculum areas, and taught through a range of contexts that are meaningful to pupils' lives (Scottish Government, 2008).

The English National Curriculum document (2004) too, encourages schools to develop creativity in its pupils, as it is recognized that this develops motivation, self-esteem and achievement in the following ways:

> Pupils become more interested in discovering things for themselves;
> Pupils become more open to new ideas;
> Pupils become keen to work with others to explore ideas
>
> (cited in Lavin, 2008a, p. 3).

So how is creativity developed in pupils? Is this something that is innate, or must it be learned? According to Lavin, "every child is capable of being creative" (Lavin, 2008b, p. 5) and the unique nature of PE enables staff to tap into the creativity of pupils in every lesson (ibid); However, the author also makes clear his opinion that creativity can only occur when pupils have an understanding of the skills/knowledge of the subject at hand; this requires dedication and skill from the teacher to prepare pupils for learning through innovative approaches to teaching, a view shared by HMIE: "Staff recognise that ability and achievement are not pre-determined" (2007a, online). This notion concurs with Locke, who theorised that "all of the 'materials' of human knowledge – all of our ideas – arise from experience" (Lowe, 2005, p. 52). He believed that the mind is essentially a blank canvas awaiting influence through nurturing and experiences; which is counter to the views of Kant, who, like Plato, thought that latent ideas exist in the mind prior to experience (Gutek, 2009, p. 25), and it is the occupation of a teacher to find a way to extract these ideas and make the pupil conscious of them. Moreno et al. concurs with the latter theory, contending that learning is a social enterprise and through interactions and verbalisations, pupils use existing knowledge to construct new knowledge (Moreno, et al., 2011). The common denominator in both theories however, is the crucial role of the teacher and a two-way relationship based on respect between the teacher and pupils.

The document '*Journey to Excellence'* identifies that respect of oneself and others', and active citizenship, should be embedded within the ethos of the school community (Her Majesty's Inspectorate for Education, 2007b). Citizenship education is increasingly being recognized for inspiring change in communities –

be it at school, community or global level – and at the heart of this is the understanding that pupils learn about citizenship through many different experiences that make up their lives (Biesta, Lawy, & Kelly, 2009). This view is shared by Learning and Teaching Scotland in their discussion paper, in which they make clear the school's responsibility to provide opportunities for pupils to be *active citizens* - being able to "take action and make things happen …with respect and care for people and a sense of social and environmental responsibility" (2002, p. 11).

With citizenship in mind, schools must seek new approaches to learning and teaching, as "innovative learning results in changes in the way individuals act and ultimately change in culture" (Jarvis, 2008, p. 20). Within a PE context, Hellison's model '*Teaching for Personal and Social Responsibility*' (TPSR) (Hellison, 2003, in P. M. Wright, Li, Ding, & Pickering, 2010) aims to develop pupils' abilities for creating positive learning environments – including respecting and helping oneself and others – and taking this into other aspects of their lives; and this model is viewed by many as one of the most influential developments in PE pedagogy (Metzler, 2005; Parker & Steihl, 2005; Kirk et al., 2006, in Wright, et al., 2010). Penney (2008) concurs with this paradigm and suggests that PE could and should contribute "to more young people having skills, knowledge and understanding to shape for the better the communities and societies that they are a part of" (ibid, p. 38). Laker, however has a much more cynical view of the current nature of PE - he believes that the subject is still too performance-based, placing more value on competition, rather than participation, and that "physical education is not taught with social development in mind" (Laker, 2000, p. 41).

3.5 What is the value of physical education to other curricular areas?

Physical education has the unique status in primary education of being overwhelmingly enjoyed by the vast majority of pupils. Therefore, surely the medium of PE is best placed to develop learning across subjects in primary school? Every activity that is included in typical PE curricula requires both numeracy and literacy, so why do we not put more emphasis on learning these skills through PE? For example, at Early Level, using a Basic Moves (Jess, 2004) approach, we ask pupils to '*describe with words, how to hop*'; '*jump from one foot*

to two feet'. At First Level we place responsibility for refereeing and scorekeeping onto the pupils; we also give them problem-oriented tasks such as '*make up a warm up to music using four moves, each with eight beats, then repeat four times'*. At Second Level the pupils organise mini-tournaments, working together to ensure that each team has equal number of games and record the results onto round-robin tables; we also challenge them to accurately record throwing, running and jumping events in athletics and take on the role of peer-coaching in small groups.

There is a huge amount of evidence to suggest that increasing PE time does not reduce literacy and numeracy levels (Dollman, Boshoff, & Dodd, 2006) and, in fact, because of its ability to energise and focus the mind, PE can help increase competency in these areas. And of course we must too, consider the value of using more language and numeracy skills to enhance understanding of PE concepts (Medwell, 2001, cited in McGuire, Parker, & Cooper, 2001). This evidence is compelling; however it is worrying to also consider that in England, since the introduction of statutory time allocation for numeracy and literacy activities, PE time has been decimated (Wright, 2004), with approximately half a million lost PE hours in primary schools (Speednet, 2000, cited in Wright, 2004).

PE has enormous potential for enhancing the wider curriculum, not only through the development of the core outcomes in numeracy, literacy, health & wellbeing and technologies, but it can engage pupils in activity-based learning to increase their understanding of many other subjects. For example, orienteering, cycling and running can help develop pupils' understanding of their local environment, thus meeting several outcomes of Social Studies. Challenging children to measure and record a variety of results onto graphs – this at First Level meets a non-core numeracy and mathematics outcome: "*Using technology and other methods, I can display data simply, clearly and accurately by creating tables, charts and diagrams, using simple labelling and scale.* MNU 1-21a" (Learning and Teaching Scotland, 2007a, online).

Primary schools and their teachers are experts in the field of project or topic work, and CfE specifically demands that children become engaged in deeper

interdisciplinary work, or 'rich tasks' as they are commonly known. These are one step beyond class topics, in that they ensure learning *in* each subject and not just *through* each subject. Campbell (2011) has developed a model which reflects this extension: the Petal Model takes the core subject and places it at the heart of all learning, ensuring that immersion and learning in other subject areas always returns to increase pupils' applied understanding of the core subject. Placek contends that this constructivist approach enables children to make connections across many facets of their learning and lives: "Not only are children better able to understand basic concepts when embedded in a variety of contexts, but they learn about topics in holistic ways, better reflecting everyday life" (Placek, 2003, cited in Rovegno & Gregg, 2007, p206). An example of the Petal Model with a PE activity at the core is shown below:
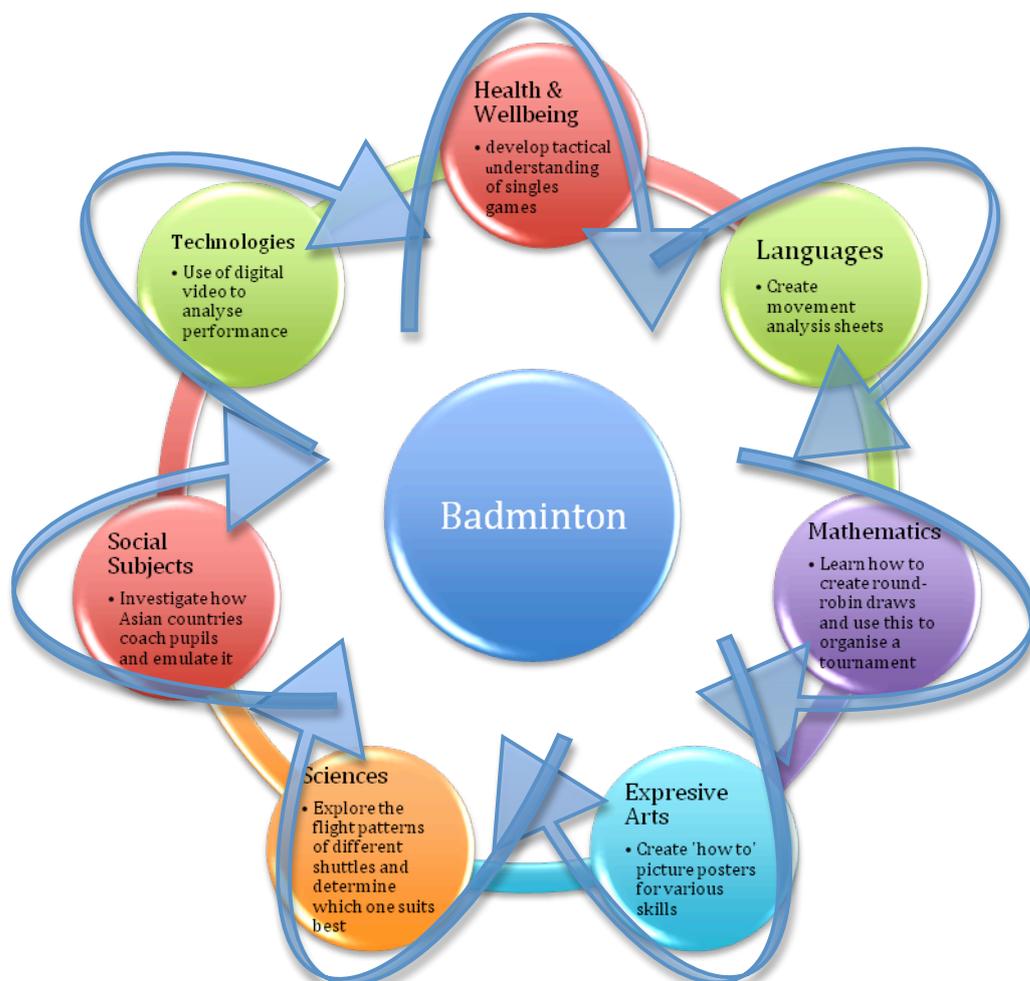
Figure 2

The Petal Model encapsulates the essence of interdisciplinary learning. It goes beyond the notion of spin-off lessons that are – sometimes loosely - connected to other subjects; it creates a sense of authenticity and meaning that pupils are more likely to value and engage with. However it must also be considered that even this approach to interdisciplinary learning must have a clear relevance to pupils' lives outside of school:

> Knowledge, being socially constructed, reflects the culture and its value as a tool for the learner depends on the learner's understanding of the concept in relation to its use in an activity within a cultural setting.
>
> <div align="right">(Rovegno, 2006, p. 264)</div>

PE is arguably better placed than any other subject to adopt reflective and active learning styles and perhaps we need to look at utilising the unique learning and teaching approaches within PE when encouraging schools to undertake more activity-based learning, particularly in relation to cross-curricular work and developing the core outcomes of CfE.

Chapter 4: The features of a quality physical education

The term 'quality' is, in itself difficult to generalise, as "a definition of what in fact constitutes good quality physical education is harder to find as it appears to be a much disputed territory and subject to differing agendas" (Marsden & Weston, 2007, p. 384) PE within CfE in Scotland is in a very fortunate position as being the only subject that has been given a specific time allocation - schools are expected to work towards providing two-hours of quality PE per week. Whilst this demonstrates the government's commitment to the subject, it does bring to the fore the uncertainty of the term '*quality'*. The Association for Physical Education Scotland (AfPE Scotland) has thus produced a position paper to help Scottish schools become clearer about the definition and their roles and responsibilities in its provision. It has developed four key principles for ensuring a quality physical education, based on their belief that children and young people must be equipped physically, socially and emotionally with the skills to enable them to enjoy lifelong participation in physical activity. These four principles are:

   1.**Physical education is developmentally appropriate**

- In order for it to be developmentally appropriate, staff must have an understanding of the developmental stages of children to ensure a progressive programme of work to develop physical, cognitive and social competencies

2.Physical education is inclusive

- Inclusion means more than just maximum participation; it means that all pupils must be engaged appropriately in the activities to enable them to develop their competencies effectively and emotionally safely

3.Physical education is connected

- PE must be connected to all other areas of the curriculum and to other aspects of childrens' learning and living, in a realistic and authentic setting

4.Physical education is life wide

- Progressing from '*connected*', PE must create pathways and links to community and other agencies that offer continued participation and progression for children and young people, to better enable them to connect with opportunities out with school

(Association for Physical Education Scotland, 2010)

It can also be considered that learning to move is the underpinning principle of PE. It is about developing movement literacy (Whitehead, 2001) – that is, equipping children with the movement skills, patterns and understanding for a lifetime of physical activity (Cale & Harris, 2009). Even more than that:

> Movement literacy is a way of thinking about education in a holistic sense, with attunement to the interplay of body and mind that is inherent in all acts of learning, and with attunement to how individuals engage the body in acts of learning.

(Kentel & Dobson, 2007, p. 150)

Wright (2004, cited in Sloan, 2010) believes the overarching purpose of PE is to provide quality experiences that foster an intrinsic sense of happiness, and Cherubini (2009) suggests that happiness within PE is achieved through best practices to increase pupils' motivation and confidence. Research suggests that the PE teacher is at the heart of quality lessons and curricula (Rose, 1999; Schempp et al., 1998; Stidder and Hayes, 2002, cited in Sloan, 2010), with the level of quality being determined by the "enthusiasm, motivation, creativity, activity and engagement" of the individual teacher (De Knop, Theeboom, Huts,

Van Hoecke, & De Martelaer, 2004, p. 30). Further, Cale (2000) and Taplin (2006) hold that leadership – from senior management and the PE teacher – is crucial to ensure a quality provision through a progressive and continuous curriculum (cited in Sloan, 2010); and De Knop et al. found that the curricular content was of paramount importance to pupils' levels of interest (De Knop, et al., 2004).

Penney et al. hold that it is impossible to pinpoint a framework for quality PE as the subject varies with different contexts; however they believe the underpinning quality of curriculum, pedagogy and assessment determine the overall quality of PE in any given context (Penney, et al., 2009).

It is clear that there are many facets of quality PE; therefore I have used information from readings, along with my professional experience to explore features that I believe to be crucial for ensuring quality provision.

It is important that we follow a developmentally appropriate (Gallahue & Donnelly, 2003) plan of action to ensure that learning in PE is progressive and effective. But crucially, in my opinion, is the notion that inclusivity must be at the heart of quality PE curricula and lessons. All pupils must be engaged through meaningfully contextual lessons (Cothran and Ennis, 1999, cited in Dyson, 2006) in order to facilitate their learning and subsequent development. The triangle below shows the features that I believe to be fundamental to meet the needs of learners, and to satisfy the holistic philosophy of CfE. The following sections will explore in more detail, these features.
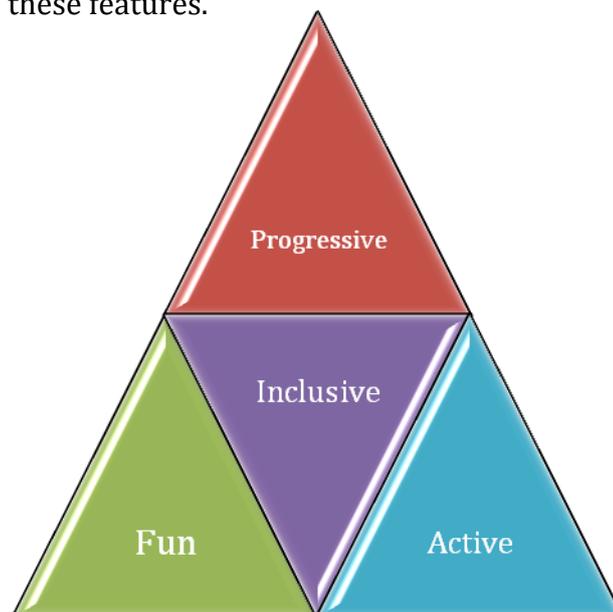
Figure 3

4.1 Inclusive

> The curriculum must be inclusive, be a stimulus for personal
> achievement and, through the broadening of experience of the
> world, be an encouragement towards informed and
> responsible citizenship.

<div align="center">(Learning and Teaching Scotland, 2009b, online)</div>

How do teachers provide an inclusive curriculum that fosters a culture of ambition and achievement? Surely the word '*inclusive'* points to an all-encompassing ethos, nurturing mediocrity for fear of marginalizing those pupils who require additional support; inclusion needs cooperation, probably at the expense of competition. How then, can pupils be expected to make a mark on the world if they do not know how to compete, or be encouraged to be striving for excellence?

Fortunately HMIE view excellence as "about realising potential, about achieving" (2007d, online) and that success is very individual and can mean different things to different people, such as improved attendance at school, achieving good exam grades, developing creativity and a plethora of other things (ibid) - but above all "Success in learning will always mean progress" (ibid). This, however is contrary to the ideals of realists, who "seem more concerned with the necessity of students measuring up to the standard curriculum than with seeing them as individuals" (Ozmon & Craver, 2003, pp. 78-79).

Most would agree that teachers should be preparing pupils to be as successful as they *can* be – not to compare success with each other, but to identify achievable goals that can be reached in a setting that emphasises cooperation, effort and improvement (Morgan, Sproule, Weigand, & Carpenter, 2005). This too is considered by Lemire (cited in Cherubini, 2009), who holds that 'involvement, encouragement, improvement and accomplishment' are the primary aspirations of everybody; and Le Cornu & Collins (2004) contend that:

> When schools provide supportive relationships...and have a clear
> focus on learning as their main priority, then they create the kind of
> learning culture that is more likely to include all young people.

<div align="center">(cited in Head, 2007, p. 71)</div>

The Teacher Training Agency (1999) indicated that there is a close correlation

between pupil achievement and quality of teaching (cited in Vickerman & Coates, 2009), and further, Jones states that "the interaction that occurs between [teacher and pupil] and the subsequent relationships they engender" (2009, pp. 377-378) impacts on the learner's motivation, understanding and, ultimately, welfare:

> It involves the teacher or coach taking the time to interact, perhaps only through a smile or friendly eye contact, with the student or athlete which conveys the message that 'I am interested in you', boosting the process of self-actualisation in the latter.
>
> (Noddings, 1984, cited in R. L. Jones, 2009, p. 383)

This correlates with research that Dyson reported on which indicated that pupils value much more, those teachers who build up positive relationships with them based on a two-way interaction of fairness and trust (Cothran, Kulinna and Garrahy, 2003, cited in Dyson, 2006).

Cherubini (2009) believes that the PE teacher is key to ensuring an emotionally supportive and inspirational curricula that allows pupils to reach these life-goals. Dyson (2002, cited in Dyson, 2006), however, discovered that implementing an innovative curricula with many opportunities for cooperative learning does not always assume inclusivity. He found that group-work often resulted in much shouting and scrabbling to establish a hierarchy, resulting in marginalising those pupils who would most benefit from the aspirations of cooperative learning. Further to that, much research has found that pupils' perspectives on the PE curricula are rarely acknowledged (Erikson and Shultz, 1992; Fullan, 1991; Corbett and Wilson, 1995, cited in Dyson, 2006), partly because of teachers' arrogance in assuming that they know best what most interests and motivates their students, and partly because of contextual challenges that make it difficult for pupils' suggestions to reach fruition. Cherubini concludes that in order to maintain interest, the teacher must first find out what interests the pupils have, and engage them in the development of the PE programme (2009).

Despite this, pupils respond eagerly to innovative teaching approaches and curricula, and if teachers can change their perception of the importance of pupil voice, then they will develop a more holistic, facilitative pedagogy that includes

everyone (Dyson et al., 2004; Fullan, 1991, 1994, cited in Dyson, 2006). It is my contention that a quality PE curriculum must have inclusivity at the heart of its ethical consideration and this is supported by Carlson in the conclusion of her research, in which she "[envisions] a form of physical education that includes *all* and alienates none" (1995, cited in Dyson, 2006).

4.2   Progressive

Quality physical education recognises the need for progression in order to instil in pupils a range of competencies that provide them with the necessary tools and motivation for lifelong participation in activity (Franck, 2007). Through PE that is guided by CfE experiences and outcomes, pupils should progress both laterally (range of experiences) and vertically (more challenging experiences) (Learning and Teaching Scotland, 2009a), thus increasing their movement literacy; however this requires a cohesive and committed approach by school management and teachers:

> Progression in learning will depend on learners having adequate opportunities to participate in higher-order learning activities and to develop breadth of learning through practice and application across a range of contexts.

> (ibid, online)

"PE in the early years is bestowed with the advantage that young children are intrinsically motivated to move and learn through and with their whole bodies" (Marsden & Weston, 2007, p. 388). Lavin acknowledges that children are naturally active, and if given appropriate opportunity and encouragement by the teacher, will develop their natural skills to a greater extent (2008b), while Bailey and Pickard assert that skill progression requires a history of the performance and performer, in that they both develop over time (2007). Additionally, Dweck (1999) "highlighted how differently children will approach a challenging task, depending on whether they have a learning-goal or a performance-goal orientation" (cited in Stephenson, 2003, p. 41). All this not only requires careful planning and consideration of pupils' needs and abilities, but also effective teaching strategies within class to promote learning, confidence and motivation, as MacNamara et al. found that in terms of motivation, pupils' *perceived* competence is a bigger drive to continue to practice and learn than their *actual*

competence (MacNamara, et al., 2011). Further, Duberry (2001) (cited in Stephenson, 2003) believes that physical confidence and competence are linked to general feelings of competence and positive social status, even in early years pupils, and Lubans et al. (2011) found that these factors contribute to pupils' perceptions of sport and activity out-with school, which is even more reason for teachers to adopt inclusive, holistic development approaches within class: "Teachers should be aware of the importance of perceived sport competence and provide social support and opportunities for skill mastery" (ibid., p.47). Light and Fawns (2003, cited in Ericsson, 2011) agree that practice situations should have a socially constructivist pedagogy, but criticize direct teaching methods and skill-based practices for discouraging less-able pupils by highlighting their (in)-capabilities in full view of the class.

Sicilia-Camacho and Brown criticise Mosston's Spectrum of teaching styles as being based around a rigid framework that removes autonomy and subjectivity from teachers (2007); instead teachers should recognise learners as individuals, each with a preferred learning style, and be able to adapt their teaching to reflect learners' needs at any given time; a view shared by Pollard: "the responsibility of teachers is to interact with children so that they actually learn…not simply to expose them to subject matter and drill" (2002, p. 138). Crucially, learning and teaching must be a two-way process, with subtle negotiations between the teacher and pupils regarding learning/teaching styles to be adopted in a lesson (ibid), as Head states "a mediational style of teaching is suggested as one possible means of constructing both teacher and pupil identities that relate to effective learning" (2007, p. 61). Additionally, Macfadyen stresses that "indirect teaching methods empower pupils and give them a sense of ownership of the lesson" (Bailey & Macfadyen, 2000, p. 43).

MacNamara et al. go further, drawing the link between perceived competence, enjoyment and self-motivation to assert that pupils need "optimally challenging tasks" in PE to enable progression (MacNamara, et al., 2011, p. 271). Essentially, teachers must know how to critically engage pupils with the subject matter (Herold & Waring, 2009, p. 338) without losing a pupil-centred pedagogy (ibid). For example, using open-ended tasks in gymnastics lessons allows pupils to feel

secure (particularly on apparatus), yet with gentle nudging on the teacher's part they are also appropriately challenged and successful.

4.3   Fun

> Fun is a fundamental asset of well-run physical education programmes because we are the purveyors of one of the greatest playgrounds known to humankind…. Our playgrounds, in short, are places for special experiences – the kinds of experiences our students have difficulty encountering when confined by classroom walls and seated in a chair.
>
> (Kretchmar, 2006, p. 7)

Wright (2004) believes that physical education brings with it an intrinsic desire for pleasure, through the mastery of movement skills associated with play-related activities. Additionally, it is widely agreed that 'having fun' is a key motivating factor for children partaking in sports activities (Weiss & Chaumeton, 1992; Wang & Wiese-Bjornstal, 1997; Kolt et al., 1999; Weinberg et al., 2000, cited in Bengoechea, Strean, & Williams, 2004; Lubans, et al., 2011) – 62% of S2 girls across Scotland indicated that 'having fun' was their prime motivation to participate in physical activity (sportscotland, Youth Sport Trust, & CAHRU, 2009); conversely, 'lack of fun' just as quickly turns children off (Bengoechea, et al., 2004). Coté et al. (2003) observed that the fun and enjoyment experienced by primary-aged children during participation in physical activity has a bearing on the development of intrinsic motivation (cited in Wall & Cote, 2007); and as intrinsic motivation becomes the dominant factor in participation levels amongst adults it is vitally important that teachers and coaches take into consideration the type of activities that children enjoy.

Regarding the earlier discussion about pupils' perceived competence having a bearing on motivation, Wankel and Sefton also found that it is the "child's perception of whether they performed well that leads to experiences of fun and enjoyment" (1989, cited in MacNamara, et al., 2011, p. 271). However, O'Reilly et al. found that teachers often misunderstand the link between fun and learning; they acknowledge the need for pupils to have fun, but sometimes find it too easy to make this the key learning outcome for pupils, as it is an easier outcome to achieve than those of performance-related learning (2001, cited in MacNamara,

et al., 2011). Conversely, Carlson and Hastie discovered in their research into social learning within Sport Education that pupils considered the term 'fun' to include teamwork, social interactions and skill development (1997, cited in Dyson, 2006). They found that the emergent themes of cooperation, leadership, refereeing and peer coaching within SE were the preferred learning outcomes for many pupils, particularly girls, who would otherwise be disengaged with a more traditional curriculum. This ties in with two of the three CfE physical education experiences and outcomes that value social, emotional and cognitive development arguably more than that of physical development. Green (cited in Cale & Harris, 2009) contends that pupils' lifelong participation in physical activity and sport depends greatly on how it was presented in PE; therefore teachers really should consider that having fun will, indirectly but very positively, enhance the motivation, interest and experience within PE for many pupils and the value of this should not be overlooked in favour of performance development outcomes.

It has been incredibly difficult to find texts to support the argument that PE must be 'fun'. Almond includes the elusive word when offering pearls of wisdom to class teachers: "physical activity needs to be fun, challenging, exciting and purposeful" (Almond, 2000, p. 10); however, authors such as Lambirth & Bailey (2000), Manners & Carroll (1995) and Grout & Long (2009) spectacularly fail to mention the 'F' word in their discussions about quality PE. Rather, they focus their attention on the need for teachers to be well prepared and to ensure lessons are structured, with clear aims etc. Rather worryingly, Grout & Long present a table in an attempt to correlate the characteristics of a successful learner – all are focussed on the behaviour/attitude of the pupil, rather than the environment the teacher creates (2009, p. 5).

4.4   Active

The issue of quality PE being 'active' at first seems rather obvious; however perhaps we need to question the reason why being active is so important for the subject, and then examine the types of activity that generate the highest levels of activity amongst pupils.

Shephard and Trudeau (2000) believe that the long-term health of pupils is the

most important aim of PE (cited in Armour, 2010), and Simons-Morton propose that a health-related PE should not only educate pupils about healthy lifestyles, but it also has a responsibility to engage pupils in an appropriate level of activity that will be beneficial to their health (1994, cited in Fairclough & Stratton, 2006). Fairclough and Stratton (2006), however, discovered in their research that a class of 11-12 year old girls was aerobically active for less than 15% of the PE time and even with an intervention programme specifically designed to address the girls' activity levels, this increased by only 5%. Further, Armstrong & Welsman found that there is little link between physical fitness and physical activity (cited in Cale & Harris, 2009) and there is no evidence to link physical fitness of young people with the health of adults (Twisk, 2000; Thomas et al., 2003, cited in Cale & Harris, 2009).

Yelling et al. acknowledge that increasing levels of physical activity amongst children is certainly one aim of the subject; however they note that this should not be the single, or most important aim; rather, PE should too be seeking to develop social, emotional and physical wellbeing (Yelling, Penney, & Swaine, 2000) of pupils. Corbin indicates that schools that focus primarily on the fitness of their pupils risk not only the safety of their charges, but also their continued participation in activity (ibid). This should persuade the profession and the government to question the importance of PE from a health perspective.

Yelling et al. highlighted a link between fun and activity - that invasion games activities generated a much higher level of activity than athletics, dance and fitness-specific activities (Stratton, 1997; Li and Dunham, 1993, cited in Yelling, et al., 2000), and Wall & Coté contend that at primary school age, children should experience a variety of sport-related activities, rather than fitness-related sessions (2007).

So we, as physical educators have a relatively easy, yet delicate job of maintaining pupils' motivation to participate by offering fun and active activities, whilst also ensuring that lessons have an educational value.

Chapter 5: Technology in Education

Information and Communications Technologies (ICT) is the fastest growing area of world economy - £40bn was spent on ICT in 2008 in the UK alone (Ofcom, 2009a) - where would we be without internet apps, mobile phones, iPads and the multitude of other gadgets available on the market to help us organise our increasingly busy lives? Tezcan (2006) considered that education and technology are major factors in global socio-economic change - we all need to become 'digitally literate', that is, develop not only our ICT skills, but be able to critically evaluate its place in a changing society (Hague & Payton, 2010), as outlined below:
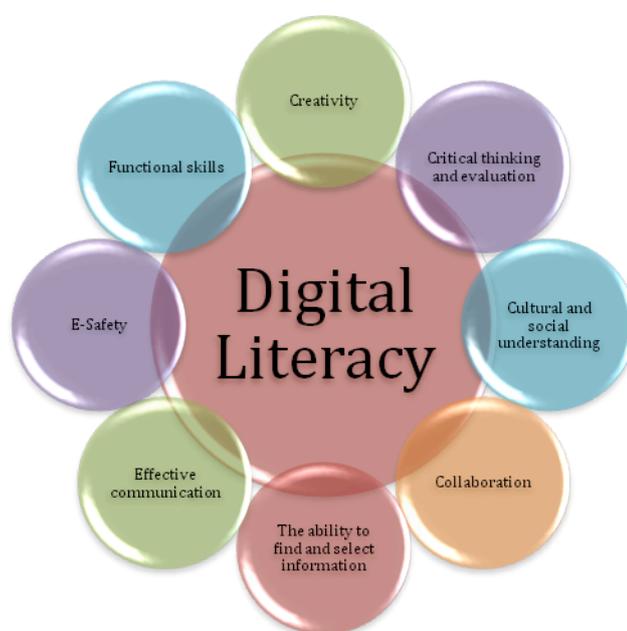
(Hague & Payton, 2010, p. 19)

Figure 4

It is appropriate then, that ICT should be at the hub of educational initiatives and indeed should even be the driving force behind education, as "digital literacy is the 'savvyness' that allows young people to participate meaningfully and safely as digital technology becomes ever more pervasive in society" (ibid, p. 5).

There are many positive aspects of technology within education, such as increased motivation of pupils (Dawson, Cavanaugh, & Ritzhaupt, 2006); the use of electronic resources means that staff and pupils can more easily store their

work and staff can make better use of their preparation time by either tapping into online resources, or using and amending previous lessons; and learning can be more meaningful and personal and realistic for today's pupils (Hollingworth, Allen, Hitchings, Kuyok, & Williams, 2008).

There are also many negative aspects of technology within education, such as hardware issues – not enough up-to-date computers; 'glitches' that cause havoc with the best-planned lessons; local authority level of web-filtering causing problems when trying to access specific websites; internet connection speed; pupils perceived ability versus their actual ability; teacher competence, confidence and motivation; and finally, the expense of equipping schools with the essential tools to make technology-based learning a valuable experience.

Indeed, HMIe highlighted six major factors that affect the quality of technology in learning and teaching:

- Policy and planning from local authority level through to schools
- Roles and responsibilities of personnel involved in moving forward the set policies and plans
- Infrastructure and resources
- Management of learners and digital content – ensuring that ICT is used appropriately
- Confidence and competence of teaching staff
- Quality of technical support to maintain confidence of teachers and pupils

(Her Majesty's Inspectorate for Education, 2007e, p. 3)

This section seeks to explore the subject of using technology within the wider setting of education, before scrutinising the role of ICT within physical education.

5.1   Technology as a transformative process

"Researchers emphasise technology uses that support inquiry, collaboration, and reformed practice, whereas many teachers tend to focus on using presentation software, learner-friendly websites, and management tools to enhance existing practice" (Judith Harris, Mishra, & Koehler, 2009, p. 393). McCormick & Scrimshaw (2001, cited in Judith Harris, et al., 2009) agree that teachers are often finding ways to incorporate technology into their existing practice, rather than allowing the tools to inform and adapt their learning and teaching methods.

However, Papert's (1987) 'technocentric' discussion considered that technology is dictating the learning, rather than learning determining the technological use (cited in Judith Harris, et al., 2009).

Prensky (2001) first coined the phrase 'digital natives' to describe the current generation of school children – they have grown up with technology rather than the current generation of teachers who have (or have not) learned to be with technology, known as 'digital immigrants'. The author is revolutionary in his thoughts about learning in the digital age as he analogises the difference between digital natives and immigrants to the learning of language – when we learn as infants, language is innate; as adults we have to work hard to understand what we are trying to learn and make comparisons between our mother-tongue and the new language, and no matter how proficient we are at speaking a second language, we will "always retain, to some degree, [our] 'accent', that is, [our] foot in the past" (Prensky, 2001, p. 2). He believes that digital natives even learn in different ways from immigrants – natives like instant gratification and rewards; they like graphics to appear before the text; they can multitask and perform better when 'networked' (collaborative work); whereas immigrants enjoy step-by-step instructions, working quietly and view music and TV as distractions (ibid). This is summed up by Duffy & Cunningham: "culture creates the tool, but the tool changes culture" (1996, p. 180).

However, not everyone agrees with Prensky's view; Hague & Payne report that children may well be able to interact with technology, but they are not necessarily 'digitally literate', as this example illustrates:

> Teachers who set research tasks as homework complain of 'copy and paste syndrome', the situation in which they find entire chunks of, often only vaguely relevant, information which has been copied and pasted from a website into a student's homework without the student engaging with its content.
>
> (2010, p. 9)

The authors believe it is not acceptable that pupils are assumed to have all the skills, knowledge and understanding that they need to apply to various technologies – teachers need to furnish them with the support and knowledge to help them interact much more critically and meaningfully (Hague & Payton, 2010).

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CfE reflects this:

> Technologies will focus on practical, problem-solving and collaborative activities, which enable children and young people to show that they know, understand and can use technological skills and concepts across all the contexts for learning in the technologies.

<div align="center">(Learning and Teaching Scotland, 2009i, p. 4)</div>

With all this in mind teachers then surely need to question their entire pedagogy – Palak & Walls reported "some studies tied frequent computer use with teacher change in practice to a student-centered, constructivist paradigm" (2009, p. 417). Concurring, Angeli (2008) holds that "a qualitative transformation occurs regarding the ways teachers teach and students learn" (p. 271) in technology-based learning environments. However, in Palak & Walls' own research, it was discovered that, in some cases, even the most ICT-comfortable teachers still used a teacher-centred approach and used technology either as a reward for good work, or to reinforce learning rather than the student-centered pedagogy that encourages independent thinking and collaborative working (ibid).

Computer-based collaborative working (CBCW), according to Crook (1994, cited in Mavrou, Lewis, & Douglas, 2010), has three dimensions – interactions between pupils and computers; interactions between pupils around computers; and interactions between pupils regarding organizing computer work (ibid). The Scottish Government aspires for today's pupils to become tomorrow's leaders, as through CfE they expect that "children and young people will develop their creativity and entrepreneurial skills and be encouraged to become innovative and critical designers of the future (Learning and Teaching Scotland, 2009g, online)". So, with emerging technology and increasingly student-centred expectations, the roles and responsibilities of the teacher have changed – as a facilitator, the teacher must "constantly update information and technology for making learning authentic and relevant" (Nanjappa & Grant, 2003, online):

> Within a constructivist classroom, the teacher engenders social and intellectual climates, where collaborative and cooperative learning methods are supported. In parallel, technology-enhanced classrooms tap constructivist strategies (Jonassen, 1999), arranging problem-based projects where students actively construct

knowledge, linking knew knowledge with previous knowledge.

<div align="right">(Nanjappa & Grant, 2003, online)</div>

5.2   What does this mean for the teacher?

Harris et al. provide an interesting framework that shows the inter-relationship between *content knowledge, pedagogical knowledge* and *technological knowledge*. This was developed from Shulman's model of Pedagogical Content Knowledge (PCK), for which he argued that teaching could not be categorized into two distinct and separate areas of *pedagogy* and *content*; rather they must be closely correlated e.g. a teacher must have sufficient knowledge of the subject, but must also be able to effectively apply teaching strategies to enable the learners (1986, cited in Hofer & Swan, 2006).
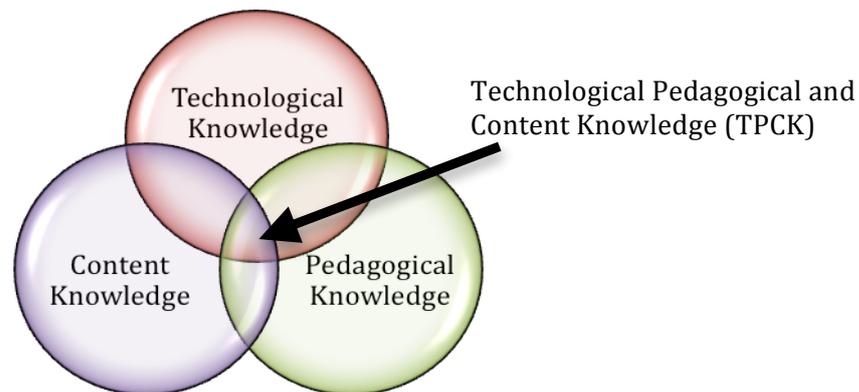
<div align="center">(adapted from Koehler & Mishra, 2008, p. 396)</div>

Figure 5

Hofer & Swan (2006) hold that teachers need to be competent and confident in all *three* areas of knowledge to effectively use technology in their lessons; alongside the interplay between *technological content knowledge* and *technological pedagogical knowledge*:

> Knowledge of specific strategies to employ in guiding web-based research (Technological Pedagogical Knowledge), understanding challenges students encounter as they learn the content (Pedagogical Content Knowledge), and acknowledging the limitations in reading…texts online (Technological Content Knowledge) all contribute to how well the teacher is able to

facilitate the project in total (Technological Pedagogical Content Knowledge).

(ibid, p. 181)

However, Hague & Payton disagree that teachers must be completely at ease with technology in order to effectively teach digital literacy, as "they are still more equipped with the higher order critical thinking skills and the subject knowledge to apply to digital technologies" (2010, p. 22).

Dawson et al. (2006) believe that teachers bring with them into the classroom a wide array of skills and attitudes regarding technology, and professional development is as important as infrastructure when developing technology in schools. Diem considers that teachers need immediate technical support, as they "are more likely to become proficient users of technology in the classroom" (2000, p. 495). However, Palak & Walls offer a differing piece of advice in their conclusion: "focus on [CPD] should move away from isolated technology training and toward integration of technology into curriculum to help teachers use technology to support student-centered pedagogy" (2009, p. 437). Additionally, HMIe highlighted contextualised professional development as an area for improvement:

> Most centres miss opportunities to develop learners' ICT skills through the wider curriculum, for example, through the subject disciplines. Most ICT skills development is not related effectively enough to the wider context within which the learner is studying.

(Her Majesty's Inspectorate for Education, 2007e, p. 5)

5.3   The digital divide

One of the major issues of technology within education is the disparity of resources both at micro and macro level. On a global platform, technology access varies enormously between countries, and issues such as internet connection speed and affordability of telephone lines segregates the world further (Miniwatts Marketing Group, 2010, online). The authors believe that bridging the gap between countries will help develop economic equality, social mobility, democracy and economic growth (ibid):

> Technology is only as powerful as it is accessible. Broader access

brings education, information, and a sense of community that can
help combat AIDS, malnutrition, ignorance and neglect. The power
of a connected and enlightened world community is just beginning.

(Hector Ruiz, Chairman and President of Advanced Micro Devices,
cited in Miniwatts Marketing Group, 2010, online)

Tierman (2002, cited in Alexiou-Ray, Wilson, Wright, & Peirano, 2003) also makes clear the connection between access to technological resources and the socio-economic divide *within* countries and communities; stating that within the USA this is growing concern, as the importance of computers in business and education is widening the socio-economic gap. In the UK, the trend is similar, as the following table shows the link between household income and the percentage of households that own a computer (either desktop or laptop):

Less than £11.5k	£11.5k - 17.5k	£17.5k - 29.9k	£30k and over
• 50%	• 64%	• 81%	• 97%
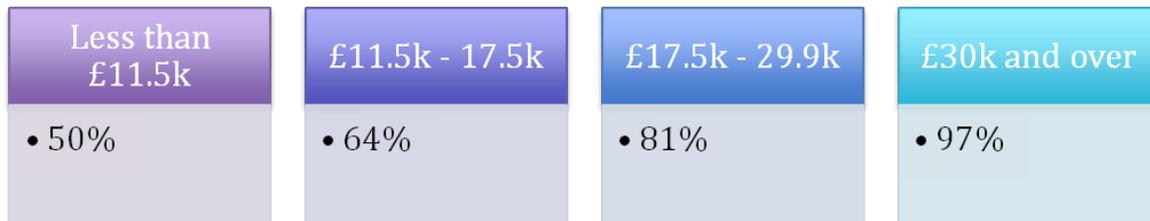
(Ofcom, 2009b, p. 30)

Figure 6

This, then surely has an impact on the value of technology to our children – on the one hand we need to be ensuring that while at school, all pupils have equal and plentiful access to technology, to better prepare them for secondary education and to succeed in the digital world; but on the other we need to take great care not to marginalise those without home access, either through setting online-based homework, or even making assumptions that pupils are accessing the internet e.g. asking pupils to 'Google' something, or look at a video on YouTube, or follow an athlete on Twitter. Taylor believes, however, that with the emergence of Virtual Learning Environments (VLEs) – school intranet – teachers can and should now consider uploading pre-lesson material (e.g. for PE this could mean a video clip of an activity about to be undertaken) and homework that can be accessed and completed online; this is counter to the concerns of the British Educational Communications and Technology Agency (Becta) in their recent publication in which the researchers suggest that "inequalities in access to, and

ownership of, computers and internet may cause inequalities in pupil progress"
(Hollingworth, et al., 2008, p. 7).

Within schools there is also the issue of hardware – according to Moore's Law, the
number of transistors that can be placed on a circuit board doubles every two
years (Intel, 2005, online); for educators this means that the gap between the
quality and performance of school computers and that of business computers is
widening enormously, as businesses can afford to keep up-to-date with
technology, but schools simply cannot update their resources (computers,
cameras etc) as frequently (Alexiou-Ray, et al., 2003, online). This has
implications for the worldwide employment market because labour supply is
directly affected by the acceleration/slowdown of educational expansion and
research shows that this too appears to be linked to technology (Oesch &
Rodriguez Menes, 2011).

Chapter 6:   Technology in Physical Education

If you Google 'Physical Education' you will get 63 million hits, many of which are
dedicated to offering ideas and lesson plans for teachers. Add in 'technology' to
the search and you will be returned with a wealth of advice on the use of video
technology to assess performance. Taylor (2009) considers questions that
should be asked of a teacher about to introduce ICT into PE:

- Does it increase the ease in which a pupil grabs a concept, idea or
  skill?
- Does it create less off-activity time with regard to the whole group?
- Does it motivate pupils?
- Does it help the more able pupils to extend their knowledge,
  understanding or application of the tasks and concepts?
- And, finally, does it allow pupils to gain or reinforce their ICT skills
  by you providing such opportunities in your lesson?

(p. 154)

There are few examples of uses of technology that support learning for pupils, but
schools are increasingly being told that digital-based learning is definitely the
way forward. Despite this apparent lack of use, there are examples to be found of
technology within physical education, although there is a need perhaps to
question the effectiveness and appropriateness of some of these.

There are a variety of reasons for using ICT, including performance-analysis; increasing motivation and connecting with disengaged learners; recording of results and organising tournaments; developing understanding of other subjects through cross-curricular work; and finally, increasing understanding of PE and health-related subjects, which is where this discussion will begin.

6.1   Increasing understanding of the health agenda

There are lots of websites dedicated to improving children's health - www.letsmove.gov, www.mypyramid.gov and www.peclogit.org are just three examples that encourage parents, teachers and pupils to lead a healthier, more active lifestyle, while at the same time providing a knowledge base for developing understanding about health and fitness that schools can use as part of their curricular work. These websites are very child-friendly – bold, bright colours with cartoon characters and animations – and they certainly grab the attention of pupils, but the question must be asked as to whether these types of sites successfully encourage children to be *more* active? A recent study of 47000 students and staff (all adults) at the University of Michigan found that 11% of participants engaged in more activity as a result of online activity-logging during an eight-week period in winter (Buis, et al., 2009); the study also considered the motivational influence of participants being part of an activity-logging team – it was found that 34% of those logging as part of a team effort were more active than normal (ibid), thus showing that, in these circumstances, team membership provided a greater incentive to be more active than online logging alone. There do not appear to be any studies of this nature with primary schoolchildren; however in a recent drive to promote the Vancouver 2010 Winter Olympics a logging website was constructed for five local primary schools – pupils were to log activity time to travel 'virtually' to the opening ceremony – initially it was set up so that schools could not see each others' results, but when this was changed it to allow schools to view each others' data there was a quite apparent increase in logging! Although the schools were essentially working together (all activity time was accrued onto the interactive map), the children were trying very hard to log more activity than that of another school.

The rate of logging had many variables to consider, such as accessibility of the

website (some classes could not access the site because their computers were not up-to-date enough); enthusiasm and 'buy-in' from the class teacher; and finally the validity of the data being logged. However, what *was* shown was a definite increase in awareness of physical activity, with online competition providing motivation to be more active.

Using technology specifically to increase awareness, understanding and level of activity is a notion that Becta supports; Futurelab is a government-supported company that has developed Physical Electronic Energisers (Fizzees) – these "accurately measure the [wearer's] exercise levels (specifically a measurement of heart-rate linked to movement that is compared to previous activity scores)" (Sutch & Lee, 2006, p. 1); this is then shown through the health of a virtual wrist-watch pet (the Fizzee):

> A core concept of the Fizzees project is in developing a prototype that allows 'applied understanding' of the components of a healthy lifestyle through actual activity. Essentially the students need to not only investigate and discover what activities would benefit their health, but they also need to apply them in order to benefit their Fizzee.

> (Sutch & Lee, 2006, p. 3)

This prototype certainly appears to be an excellent way of generating interest, motivation and understanding of the health agenda. However, as with many great ideas it has hit a snag – lack of financial support to put it into full production. This takes us back to an earlier discussion on the digital divide between emerging technology fitting so well with the pedagogy associated with CfE, and the 'real picture' of the economic status of technology within education.

6.2   Increasing motivation and connecting with disengaged learners

Linking on from the previous discussion, a Floridian high school offers an example of what they believe to be a "technology-rich PE curriculum" (DiGiorgio, 2004, online). They make wide use of interactive video games, dance mats, pedometers and heart rate monitors as part of their health and fitness block. This appears to be an excellent way to motivate pupils in a normally very traditional course of activity, as the PE staff feel they can harness technology to make "being active feel like a game rather than a chore" (ibid). It is also made clear that there

are cognitive benefits too – pupils are required to measure their stride-length so they can compute their distance using the pedometers; accurately plot their heart rate onto graphs, having first worked out their training zone; and compare different activities with each other, in terms of physical exertion (ibid).

My first reaction when I read this article was that the school was piling all their eggs in one basket in order to tick the technology box; I was determined that I could find many faults in this example – *'the pupils must surely be less active'/ 'how can there possibly be any meaningful learning using dance mats'* etc. However, upon consideration of the example, I believe that the school (for providing funding) and the PE staff (for planning and offering such a course) have been very foresighted (remember, this happened seven years ago) – Scottish schools are only just beginning to consider using technologies other than heart rate monitors and video analysis software. For a school to use technology to motivate pupils, to shape the lessons and to cultivate a sense of realism and ownership for learning deserves applause.

Schools are increasingly using interactive video games to motivate pupils in PE to be more active; however the issue of whether pupils are also improving their skill level must be raised – and answered:

> While interactive arcade games may enhance skills such as coordination, reaction time, endurance, speed, and agility, there is no research stating that, even if learned, these skills would transfer to other sporting contexts. However, interactive arcade games would be no less valuable if they failed to improve skills in other sports or physical activities. Teaching students to be physically active for life is the aim of physical educators.

> (Trout & Christie, 2007, online)

Within a Scottish context, as discussed earlier, schools are under increasing pressure to engage pupils in high-energy activities to combat obesity and other health-related issues; but also have a duty to instill confidence and motivation that will, in turn promote lifelong participation in physical activity. In the same article, a PE teacher comments on the success and effectiveness of using dance mats:

> We have been able to reach the students that we weren't reaching

with the other equipment. Our guys enjoy it as much as the girls
do. It gets them exercising when they don't even realise they're
doing it"

(Kreimer, 2004, cited in Trout & Christie, 2007, online)

The use of interactive games, like anything else, must be considered for their educational value; but thought must also be given to the logistics of using them with a large class. Only 2-4 pupils can realistically play most of these games at a time, so how can we incorporate them effectively into a PE lesson? Trout & Christie (2007) believe there are three ways to integrate this type of technology: on a rotation (pupils take turns throughout either a 6-8 week block of activity, or during the lesson; using stations (interactive game is one station in a circuit); and as a reward for improved effort/behaviour/performance. They suggest that, for example with dance mats, all pupils can be following the game on a whiteboard, with only one pupil using the dance mat and everyone else copying the dance on the floor; every minute or so the pupils rotate to give everyone an opportunity for being 'interactive'. The authors believe "that this routine is an effective component of a quality physical education lesson" (ibid, online) because everyone gets to use technology, everyone is active and everyone is improving their rhythm and coordination. But where is the creativity, personalised learning and collaborative working that constitutes the author's definition of a quality ph ysical education, and the expectations of CfE? This could be considered a clear example of using technology to 'tick a box' and it is simply not good enough to suggest that activity of this nature contributes to a quality PE lesson in any meaningful way as this behaviourist approach removes many of the principles of CfE, such as progression, personalization and choice, and breadth and depth. Additionally, the overview of the CfE Dance experiences and outcomes contrasts the lack of creative development of the learners in the lesson with the expectations of CfE: "through dance, learners have rich opportunities to be creative … creating and performing will be the core activities for all learners…" (Learning and Teaching Scotland, 2009d, online); and Hague & Payton reiterate a core value of effective ICT use when they say that "digital literacy… can help [pupils] to expand and extend their use of technology for creativity and self-expression" (Hague & Payton, 2010, p. 8).

6.3   Developing understanding of other subjects through cross-curricular work

Interdisciplinary learning and cross-curricular work are major influences on CfE and it makes sense that technology should play a part in developing links between subjects, particularly since '*using technology to enhance learning*' is a core outcome in the new curriculum. There are a multitude of applications available that support learning across subjects, from hand-held games to gps-enabled devices; but what appears to be the success factor is the teacher's imagination and foresight; and Becta report that, among various types of teachers, primary teachers and ICT teachers reported the greatest impact of ICT on teaching and learning (Baguley, et al., 2010). One such example is Coach FX software by which users create and view games-based animations. Originally designed for the commercial sports-market, the software is increasingly being used within education, and in particular class teachers are seeing its use for activities like mathematics and science (area, angles, distance, forces etc). Below is an example of one school's approach to interdisciplinary work.

An American primary school decided to do a class project between PE, literacy and technology. The pupils were to use a climbing wall as a stimulus for creating a short story using ten specific climbing-related verbs and adjectives; additionally the pupils were each to be filmed traversing the wall – this would be used to create mini-movies. The pupil's work would be collated and presented via PowerPoint. At first glance this appears to be a good example of cross-curricular work – it certainly defines *active learning* in literacy. However, based on the earlier discussion about the core values of interdisciplinary tasks; PE needing to be active; and technology informing pedagogy – is this perhaps not an example of good practice. The first inkling of suspicion is in the introductory sentence to the project: "The physical educator introduced the lesson by discussing the end product - namely the PowerPoint presentation, since these students already had experience on the climbing wall" (Fortes, 2003, online). This raises two crucial questions: firstly, why is the PE teacher, during the PE lesson, emphasizing the final product as a classroom-based activity? Secondly, if the students already have experience of the climbing wall, what physical educational value is there in repeating a previous lesson? These questions may seem biased, harsh or even

hasty; however I will now put forward a case for such criticism.

It is understood that an activity such as climbing needs to be well controlled; this inevitably means it is less active than games-based activities. However, the PE lesson was 30 minutes long and the author of the article informed readers that this meant the project took several lessons to complete the filming of pupils traversing individually; however "the rest of the class worked on their stories or sketched their own design for a climbing wall" (ibid) while the filming was taking place. Already there is an indication that PE has taken a back seat in this project – it may well be the stimulus for creativity, but it certainly is not the basis for activity; this is compounded by the seemingly legitimate admission that "students who could not climb the wall - for physical or other reasons - wrote a fictional story about themselves climbing" (ibid). The only redeeming feature of this lesson is that non-participants were also given the role of guides and spotters.

The author of the article believes that this project is a successful example of integrated work; in particular he praises the use of technology (video and presentation) and the integration of PE with literacy. Within a Scottish context the cross-curricular benefits are apparent: "Revisiting a concept or skill from different perspectives deepens understanding and can also make the curriculum more coherent and meaningful from the learner's point of view" (Learning and Teaching Scotland, 2007c, online). But this could be considered as a technology/literacy project using a climbing wall, with no real benefit to PE; even the proffered physical benefit - "in the physical domain, the students quickly began to realize that muscle strength … and stamina are extremely important in rock climbing" (Fortes, 2003, online) - is relevant only to those who participated in climbing, and even then it is contended that it is more of a cognitive understanding than a psychomotor one as he has suggested.

6.4 Learning skills

The use of video and video analysis software in schools to "observe, reflect and analyse performance" (Taylor, 2009, p. 153) is increasing considerably and it is probably the most widely integrated application in PE (ibid). There are numerous sources of video footage available through CD/DVD and websites such

as YouTube that can be used to show a model performer demonstrating various skills. Additionally, there are several companies offering video analysis software that allows pupils to observe their own performance and, depending on the software package, they can do a multitude of things with their video clips; for example, view it simultaneously with another clip; use a live delay feature that enables the performer to get instant feedback automatically; and overlay other performers' clips. *Dartfish* is one example of video analysis software, and with around 1500 schools, colleges and universities across the UK using it (Ammann, 2010), it has the market share.

The use of video analysis software for providing demonstration and feedback is becoming increasingly common in secondary schools; however, the expense of the software is, at present putting it out of the reach of most primary schools - although primaries are making more use of simple digital cameras to give instant performance feedback to their pupils. There are three main issues to consider in relation to using both cameras and video analysis software for demonstration and feedback - the educational value; the impact on activity levels of pupils during PE time; and teachers' and pupils' ability to use the resource.

Van Vuuren-Cassar & Lampianou (2006), in their article discuss the use of video and video analysis software as a demonstration tool. They argue that the benefits of using video rather than a live performance outweigh the negatives. The benefits include being able to slow down and freeze-frame the performance as often as required – this allows for a much more detailed analysis; the use of video removes the teacher from the demonstration, thus allowing the teacher to engage effectively with the class and ask/receive questions; and some skills are simply too difficult for teachers to perform well, for a variety of reasons. However the authors report inconsistent findings with previous research – Ignico (1994, cited in Van Vuuren-Cassar & Lamprianou, 2006) found that undergraduates acquired a greater amount of knowledge through video-instruction rather than teacher-directed instruction; Chung (1992) (ibid) however reported the findings to be inconclusive.

Later research by Blomqvist, Luhtanen & Laakso (2001) discovered that college students who had additional video-based badminton instruction (eight hours in

addition to eight hours of traditional instruction – the control group only received the traditional instruction) were proven to be more competent in the game at the end of the research period. The authors suggest that the findings are quite significant, with far-reaching implications for pedagogy; however they did not appear to address the issue of validity relating to the fact that the research group received twice as much instruction and practice time as the control group – surely this was a major factor to consider when reporting the findings?

There are several considerations to be highlighted when using video as a teaching aid. Firstly, an enormous amount of preparation time must be spent tracking down the appropriate video clip – individual skills are easier to find, but as we are increasingly moving towards a TGfU model of teaching we are needing to use footage that shows skills/tactics in context rather than in isolation; consider also that we should be reactive to the needs of the class at any given time (e.g. during a block of tag rugby we spot a decision-making error that we want to address), therefore it becomes increasingly difficult to obtain appropriate video clips out of the ether. Further, school web security makes it virtually impossible to access online clips, making it even more difficult to be ready with relevant material. Additionally, there is the issue of hardware use – imagine the complications associated with taking a laptop outside to have available (power, weather, wi-fi etc.); an alternative is to use a PDA and pre-loaded memory stick, but this then brings up the problem of too small a screen for classes to see.

It is also suggested that the observational analysis skills required by pupils differs between live demonstrations and video demonstrations, and teachers should ensure that their classes are taught how to observe appropriately (Van Vuuren-Cassar & Lamprianou, 2006). However, Taylor (2009) believes the issue of observational analysis is more complex than simply teaching children how to observe; he holds that the introduction of technology in PE can effect a shift away from the behaviourist to the cognitive theory of learning if it is planned and used well. The example the author gives relates to the use of video demonstration – if the teacher plays the video clip to highlight a particular technique e.g. '*look at the way the javelin thrower brings her elbow through first*', the pupils will strive to copy it; however if the teacher shows them the same video clip and instead asks the pupils to describe what they see, the pupils are cognitively challenged to

discover the elements of the skill they are watching.

But it could be considered that a change in pedagogy of this nature requires more than just careful questioning – the pupils need to take ownership for their learning and this means that they – rather than the teacher - must be in control of using the technology, a matter that Taylor overlooked in his chapter.

Banville & Polifko cite many authors when they claim that "video feedback has been statistically proven to increase a person's ability to learn and perform motor skills" (2009, online); a claim backed by Harris, who completed a case study into the use of Dartfish in PE. She indicates that video feedback is helpful because "our eyes and brains cannot process information fast enough to see all the details associated with quick and complex body movement" (Harris, Unknown, p. 3). Additionally, visual feedback is much more meaningful to the pupil if their performance can be played simultaneously with that of a model performer (Liebermann, et al., 2002), and this is a feature available on most analysis software on the market.

Harris also argues that, whilst critics of technology-use in PE claim that activity levels of pupils in classes drop, her experience shows an increase in activity, due to the fact that teachers are changing their methods to reduce whole-class demonstration times and to reduce the instances of teachers giving individual and protracted feedback: "instead, teachers are allowing students to see for themselves what they are doing and making adjustments accordingly" (Harris, Unknown, p. 3). In order for this to work, the pupils must be clear about what aspect of their performance they need to observe; Harris asserts that, in primary schools, children should focus only on one point at a time (ibid). Further, Liebermann, et al. (2002) remind us that if a learner knows the performance goal to be achieved, then feedback on their performance will have much more relevance.

6.5   Organising tournaments

The issue of using ICT to organize tournaments and record results may initially appear to be irrelevant, as this paper seeks to identify practices that increase pupils' learning; and many would assume that using technology for

organisational purposes does not do this. However, linking back to the discussion about Sport Education and Teaching Games for Understanding, we need to consider how the pupils in various roles other than that of performer/player can use technology to enhance their learning.

All pupils should feel included and valuable in PE and it is the job of the teacher to find their niche. "Models [such as SE] are likely to facilitate different and potentially better quality experiences for students ... and might address some of the problems of isolation, disengagement, and marginalisation felt by many" (Brock, Rovegno, & Oliver, 2009, p. 359). Engaging pupils in the various roles associated with the organisation of tournaments is an excellent way to keep them interested, focused and motivated - and even better if we can use technology as a tool to help them.

There are applications on computers that can be used to record results, such as spreadsheets and word documents; and there are a few specific programmes available either to purchase, or as free downloads that will create draws. For example, we can use MS Excel to create a simple table that allows pupils to enter their results and we can even insert a formula that will automatically add-up the scores, making it incredibly easy for children to announce the results at the end of the competition. With online access we can use free apps such as '*iTournament'* to generate round robin competitions; and we can use freeware such as '*Drawmaster*' to produce knock out draws. These applications are incredibly important, not only for purposes of inclusion, but to begin to make children more aware of issues of time management, scoring systems, equal number of games and other things that contribute to the smooth running of sports events.

Many may argue that using technology to organize matches etc. reduces the cognitive aspect of organisational skills, because it is the computer doing the work, rather than pupils. However, Higgins holds that technology "can help students ... manipulate complex data-sets. This then provides a context for effective discussion which in turn can help mathematical understanding" (Higgins, 2003, p. 12). One could go even further to suggest that, in order to use ICT effectively, the pupils need a greater understanding of *what* they want to achieve and *how* they envisage the software helping them do this. It is a little like

going through ethical procedure for research – ICT forces the pupils to be absolutely clear beforehand about the format they want the event to take.

Even in the lower stages of primary school it is possible to make use of technology, as the following example illustrates. I recently taught a lesson to P1/2s, on running. The intention of the lesson was to introduce the pupils to the notion of timing i.e. faster running equals lower time/number, using stopwatches. Each pair had a stopwatch and two marker discs and was asked to time each other running between the discs. Several times I brought them in to build on the next part of the lesson and to assess their understanding – it was after one of those 'pep talks' that a P2 girl put her hand up and informed me that I had been talking for 1 minute and 34 seconds! Although very amusing, on reflection this is a clear example of her effective use of technology, in that she was using it purposefully – she knew what she wanted to do and she applied her new knowledge of using the stopwatch to her new understanding of what the time on the watch represented.

These chapters have sought to identify the key components of a quality physical education and have examined current uses of technology in PE. The literature has informed the author and will shape the foundation on which the data analysis will be based. The next chapter will detail the research process, including influences on the paradigm through to the data collection and analysis methodologies used.

Chapter 7: Methodology

In order to rationalise effectively the research methodologies adopted, it is considered helpful and appropriate to draw an analogy with the underpinning concept of Higher Grade Physical Education – that of the cycle of analysis:
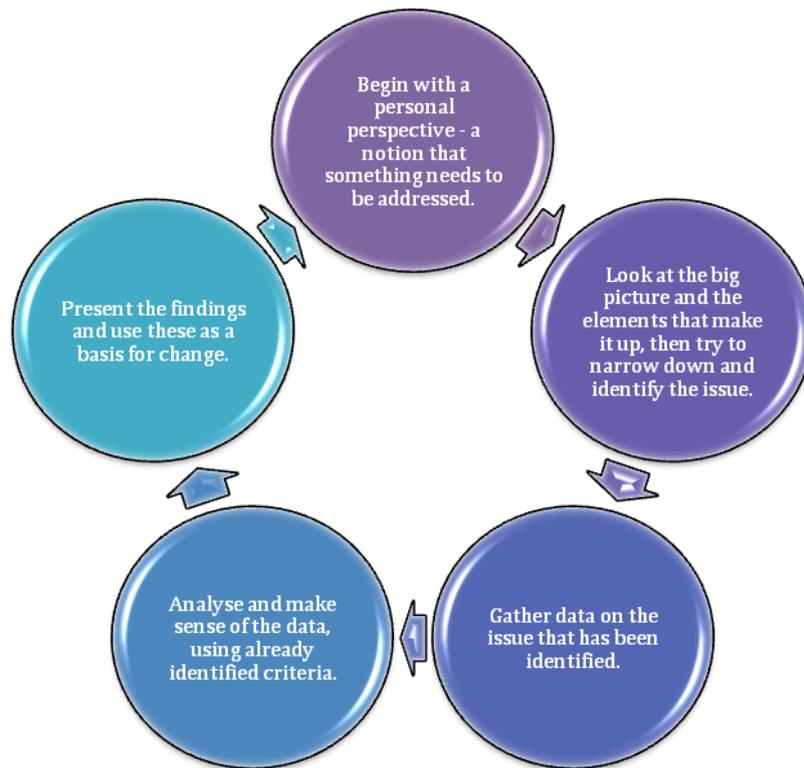
Figure 7

From an exploration of the current literature in the previous chapters it is suggested that technology is not being used to complement the notion of a quality PE - schools are being asked to use ICT within the curriculum, however it has been shown that there are few applications on the market that actually enhance the PE experience. This research sought to gather perspectives from teachers and pupils and, along with class observation, analysed the effectiveness of three different technologies that are currently being used within Scottish schools in PE. To clarify, the analysis and discussion considered the *effectiveness* of both the learning and teaching processes (pedagogy) and the outcome (understanding/attainment of the learning intentions). Findings for each case study are presented and any overarching themes that will help inform future practice are explored.

It is necessary to acknowledge that this critically reflective viewpoint is a relative of the critical theory paradigm and reflects teachers' professional struggles – they seek to follow an interpretivist / constructivist approach to their work by devising learning environments that encourage pupils to create meaning for themselves, but teachers are outcome-based, knowing already what they want

the children to achieve in any one lesson, term or year; therefore teachers are seeking not to create meaning in children's understanding, but conceivably to effect change in their activity. Thus, it could be argued that teachers at heart are behaviourists and critical reflectors.

7.1   Paradigmatic influences

O'Donoghue (2001, p. 185) asserts that interpretivist research seeks to understand the interactions and experiences between individuals and groups within societies; and "to understand education we must begin by looking at everyday activity" (ibid, p. 17). The author holds that the interpretivist approach to research values the participants' perspectives of the issue, and the data-gathering should be unobtrusive and participant-centred, by using semi-structured interviews and guiding questions (ibid). Additionally, Lincoln & Guba write that "interpretivists…see action on research results as a meaningful and important outcome of the inquiry process" (2000, p. 174).

This definition of interpretivism appears to be consistent with the author's viewpoint – it was the intention of this research to understand the issues of using technology in PE and use these insights to propose areas for development. However, the author's own experience along with examination of the literature asserts that current technology is neither effective nor being used effectively in PE and therefore it is proposed to put forward solid arguments for the development of a more pupil-centred approach to ICT use within the subject. So, although the author is influenced by interpretivist aims, the viewpoint could in fact be closer along the paradigmatic continuum to that of critical theory, as Cohen et al. define this approach as to "not only understand situations and phenomena but to change them" (Cohen, Manion, & Morrison, 2004, p. 28). This is similar to the interpretivist viewpoint; however it could be suggested that the difference between the two paradigms rests with the motivation for research – interpretivists see the need to understand a phenomenon as the reason for research and any transformation is the result of the findings; critical theorists however are driven to research by the desire for change (Kemmis, 2001).

The backdrop of critical theory shows a determinist, revolutionary struggle for change within culture and critiques the "contradictions between ideology and

reality" (Antonio, 1983, p. 331). This perhaps reflects the current situation in Scottish education – authorities are keen for teachers to embrace technology in all aspects of school life and the inclusion of ICT core outcomes in CfE highlights this idealist perspective; but the reality is very different as economic, bureaucratic and cultural issues inhibit our ability to turn these dreams into practice.

Antonio quotes Horkheimer when he asserts that critical theory "constructs a developing picture of society that exposes the prevailing system of domination, expresses its contradictions, assesses its potential for emancipatory change, and criticises the system to promote that change" (Hockheimer, 1972, cited in Antonio, 1983, p. 331). Additionally, Banfield holds that active engagement from all within education is the key to emancipation and thus transformation (2003, cited in Rikowski, 2007). This suggests that if everyone works together and frees themselves from constraints then change can be effected. Hammersley reflects this in his discussion on post-Enlightenment viewpoints: "it is the responsibility of the researchers to carry out their work in such a way as to further the particular political or practical goals to which they are committed" (1999, p. 31).

Habermas, however, keeps in check the distinction between reality and ideology when he states that "a rejuvenated critical theory must be more open to cultural modernism…and avoid utopianism" (Habermas, 1981, cited in Antonio, 1983, p. 335). This warning is certainly something that needs to be taken into account when considering the huge expense involved in using technology in schools, and this will certainly be addressed in the discussion and conclusion of this thesis.

7.2   Research Methods

The epistemological standpoint of critical theory is fundamentally pragmatic (Bohman, 1999) and this was not just useful, but essential for this particular research. Pragmatism frees the researcher from structured regimes that bind more traditional and quantitative social science methodologies such as post-positivism; therefore it was justifiable to apply the most appropriate research methods for this study, regardless of the author's philosophical stance. Welton reflects this:

> Living in the modern world demands that we give valid reasons for
> our thinking and action. By doing so, we are shaken free from taken-
> for-granted ways of seeing and acting...modernity pushes us all
> toward being active and reflective.

(Welton, 1993, p. 87)

In social science, a critically reflective approach lends itself naturally to qualitative studies. In this instance, the research critiqued several applications of technology within PE, but did not compare these with each other – rather the aim was to provide a theory-related analysis of each example within its own context, through individual case studies.

Case studies are an excellent way of presenting rich qualitative data that represent a specific context (Stark & Torrance, 2005). Stewart opines that "Merriam (1998) suggested that the case study design is relevant and useful specifically when studying educational innovations" (Stewart, 2009, p. 65) - in this instance each study focused on differing technologies. Each of the three case studies were considered on an individual basis using influences from ethnography (Wolcott, 2001) to give the reader a much deeper insight into the phenomenon being studied.

Ethnography is seen as an appropriate approach to case study research, because it focuses on a limited size of study, trying to really get beneath the skin of the issue and observe from participants' perspectives (Goldbart & Hustler, 2005). Stark & Torrance continue:

> The underpinning idea is that of accessing the participants'
> perspective – the meaning that action has for them – but reporting is
> oriented towards theoretical explanations of the action and
> contributing to social theory.

(2005, p. 34)

However, ethnography as a research approach needs to be much more intense and longer in duration than these case studies; instead it was the intention to refer to ethnography as a school of thought that related to the style of observation and reporting (Goldbart & Hustler, 2005).

With influences from both interpretivism and critical theory, an underlying process of this research was to explore the beliefs and actions of teachers and

pupils, to try to comprehend their viewpoints, and to explore the author's perceptions of the class observations.

Goldbart & Hustler (2005) do make the point that much ethnographic work tries to steer clear of proving hypotheses, preferring to use the data and analysis to generate theory, linking closely to the grounded theory approach. However, this research was analysed using themes generated from the literature review and sought to explore the view that current technology and use of technology does not enhance quality PE.

However, case studies have disadvantages that must be considered. Many authors note that the main drawback is the inability of case studies to make generalisations from the research findings – this is linked to the issue of external validity; however Lubbe contests that:

> The relevance of a case study is more important than its ability to be generalised. When a case study is carried out both systematically and critically and aimed at the improvement of understanding...then it is a valid form of research.

> (Lubbe, Unknown, p. 10, online)

However, Wolcott contends that "every case study is unique, but not so unique that we cannot learn from it and apply its lessons more generally" (Wolcott (1995), cited in Wellington, 2000, p. 99). This is reflected by Yin who asserts that "external validity could be achieved from theoretical relationships, and from these generalisations could be made" (Yin (1994), cited in Lubbe, Unknown, p. 10). More appropriately, Bassey preferred to use the term 'relatability' rather than generalisability, as teachers can relate to the case studies if their circumstances are similar (Bassey (1981) in Bell, 2005). This was important to consider in this research because although there was no intention to compare the case studies with each other, similarities in issues that arose across the studies enabled in the conclusion, some generalisations to be made regarding the use of technology in primary school PE.

The final note of concern regarding case studies is that some feel that the intense nature of a case study by the researcher biases the findings (Soy, 1997) and Wellington (2000) suggests that the objectivity of the researcher's observations

and subsequent interpretations are considerations that need reflection by both the researcher and the reader. Considering the author's viewpoint, keeping an open mind and ensuring that the observations included only factual, descriptive statements reduced issues of bias in the interpretation of the data.

Consideration was given to conducting a document analysis as the research method and this was initially appealing because it is was perceived by the author to be a less complicated way of collecting data as this could have been done from the comfort of one's own home; also there would be no need to go through the ethical approval process. Further, a document analysis would also help to create a much deeper theoretical underpinning of the issues to be examined and this could pave the way for future research. However, there were two main reasons for disregarding this type of research for this thesis - the first one was because there is currently so little available research from which to draw, that the data gathered would be mainly limited to policy documents, therefore deriving only hypothetical assumptions that would question the validity of the research. The second reason that a document analysis was deemed unsuitable was because the nature of this research depended on rich qualitative data gathered from multiple perspectives (Lodico, Spaulding, & Voegtle, 2006) to inform theory not only on policy, but also on pedagogy.

There were other methods too that were considered when designing this study, the main type being action research. This is particularly useful for testing hypotheses and for trying out new innovations as a practitioner (Wisker, 2001). The reason it was eventually disregarded is also because at present there is very little research and understanding about existing technologies in primary PE, and the purpose of this research was to evaluate what is currently being used, to provide exploratory evidence that upheld the view that education needs to develop more child-centred technologies and adapt pedagogies to support learners in the 21st century.

7.3   Data Collection

According to Stark & Torrance, "the strength of a case study is that it can take an example of an activity – 'an instance in action' (Walker, 1974) – and use multiple methods and data sources to explore it" (2005, p. 33). Three methods of data

collection were used for this study – interviews with staff; focus group interviews with pupils; and observations of the classes in action. These three strategies allowed an exploration of three different perspectives of each case and, because of the highly subjective nature of the study, three different perspectives helped to triangulate the data for analysis. The type of triangulation that could be used varies depending on the potential problems with the methods of data collection. Denzin established six types of triangulation methods that are helpful for social science research:

- *Time triangulation* makes use of cross-sectional and longitudinal approaches
- *Space triangulation* helps to overcome the limitations of studies conducted within one culture
- *Combined levels of triangulation*
- *Theoretical triangulation* draws on alternative theories
- *Investigator triangulation* uses more than one observer
- *Methodological triangulation* uses the same method on different occasions or different methods on the same object of study

(1970, cited in Cohen, et al., 2004, p. 113)

In this instance the use of methodological triangulation was helpful when collating the research findings because some critics suggest that social research methods suffer from 'method-boundedness' which limits the value of the findings (Cohen, et al., 2004). In this case it was important to triangulate the three different perspectives of the same subject in order to clarify meanings that were derived from the data (Wildy, 2003).

In order to gather the data two visits to each school were made – the purpose of the first visit was to get to know the pupils and staff in order to smooth the way for the second visit; the purpose of the second visit was to conduct the observation and interview the teacher and pupils. Stewart highlighted that "the researcher noted that on her second visit the pupils and staff were much more relaxed and appeared to forget I was there" (2009, p. 68).

The interview questions and schedule were designed after careful consideration of the themes that emerged during the literature review and of the broader issues that the research sought to address. The questions and observation agenda

followed the same structure to help with triangulating the data and subsequent analysis and discussion, and these can be viewed in Appendices 2-6.

It was decided to conduct a semi-structured interview with the class teacher of each case to understand their self-perception of teaching PE, their motivations and their reasons for using technology. Interviewing as part of a case study is valid because it allows the researcher to meet the participants and build up a rapport with them (Wisker, 2001). Semi-structured interviews are suitable for in-depth, qualitative data as they allow the interviewee to expand and diverge while giving the researcher a structure to follow (ibid) – this structure provided the opportunity to make links between the cases to help make some generalisations. Semi-structured interviews also have the flow and style of a conversation rather than a formal interview and this helped to create a connection with the teacher and pupils, which made it easier to extract rich data. In order to try to ensure the flow of the 'conversation' and probe deeper when needed, the questions were pre-prepared, along with a short checklist of responses being sought - a little like follow-up questions.

Each interview took no more that 45-minutes to complete and throughout this time it was vital to be as focussed and engaged as possible, hence the decision to audio record the interview and later transcribe it. Audio recording, rather than video recording, was sufficient because only one person was interviewed at a time, so there were no issues with identifying the speaker on the audio file. The transcription process helped to validate the interview responses, particularly as it was done using a 'naturalistic' style to include instances of pauses in the conversation, inflections in speech and descriptions of non-verbal communication at particular moments, as Oliver et al. suggested that "a transcription can powerfully affect the way participants are understood, the information they share, and the conclusions drawn" (Oliver, Serovich, & Mason, 2005, p. 1273). This could really only be achieved by transcribing the interview myself and being aware of any subjective implications:

> Similar to the discovery of fingerprints, through dusting at the crime scene, a transcriber's interpretive/analytical/theoretical prints become visible on close examination of the transcription process and the texts constructed.

(Tilley, 2003, p. 752)

It was decided that the most effective and appropriate way of obtaining high quality data from the pupils was to conduct and video record a focus group interview with approximately six pupils in P5-7 for each case study. Like the staff interview, the focus group took no longer than 45 minutes and took place immediately after the observation of the lesson; this timeframe was important to help the pupils draw on their experiences from the lesson while it was still fresh in their minds. The purpose of the interview was to try to understand their viewpoints about the lesson – how did they engage, how did they feel about the technology etc., this is clarified by Laws:

> "Focus groups are undoubtedly valuable when in-depth information is needed 'about how people think about an issue – their reasoning about why things are as they are, why they hold the views they do'".

> (Laws (2003) in Bell, 2005, p. 162)

It was decided that as the children would not be familiar with the interviewer, it would be more comfortable for them to be in a group situation rather than a one to one and that this would make it easier to conduct a meaningful interview. Also, by using the same semi-structured approach to the group interview, the pupils would hopefully interact and engage with each other, which may lead to even more high quality data (Bell, 2005). Another way of engaging the pupils in meaningful discussion was to use the technique of photo-elicitation, which "produces a different kind of information…[it] evokes information, feelings, and memories that are due to the photograph's particular form of representation" (Harper, 2002). It is also believed that this method was a good way of breaking up the monotony of an interview and given the young age of the pupils, this was considered to be a valuable addition to the methods toolbox.

Consideration was given, however, to the selection of the focus group. Ideally an even balance of girls/boys, age, ability and ethnicity would have provided rich information; however it was also important to select pupils that were willing and able to make their opinions heard. Denscombe asserts that boys tend to 'hog' discussions more so than girls and researchers must also be aware of pupils who may hide an opposing viewpoint to that of the rest of the group for fear of taunting from their peers (Denscombe (1998) in Bell, 2005). However, the validity of the research may be questioned if the pupils in the focus group were

too 'hand picked'. Therefore, the pupils were selected at random from those who had given informed consent and, where appropriate to the lesson, the pupils were selected according to their working groups within class.

It was pertinent to video record the discussion in the focus group interviews to enable different pupil's voices to be identified accurately during the transcription process, as it would have been extremely difficult to identify their voices with an audio recording alone unless the pupils were asked to say their name before speaking each time, which would have likely jeopardised the authenticity of the interview.

The final method of collecting qualitative data came from observation of the class in action. Two approaches were followed – 'observer as participant' and 'non-participant observation' (Junkers (1960) and Gold (1958) in Smith, 1997). Non-participant observation is applicable when the researcher is external to the organisation and merely observes without joining in the activity, and this approach was suitable for the studies on the digital video cameras and Cyber Coach because the school, staff and pupils are unknown and therefore it was more appropriate to observe the lesson from a distance. The second approach, called 'observer as participant', is someway between participant observation (where the researcher is part of the organisation and takes part in the activity) and non-participant observation (ibid.). This method was appropriate for the study of the Nintendo Wii because as a teacher at the school being studied it was expected that the pupils could view my presence similar to that of an additional teacher and would likely want to engage with me during the lesson, therefore it would have been difficult to assume the role of non-participant observer.

Kincheloe & McLaren (2002) subscribe to Habermas' theory of communicative action by observing that critical ethnographers in social science need to approach research with a holistic view and take account of non-verbal communication of the participants, thus the importance of observing the *actions* of the staff and pupils. Nisbet & Watt point out that observation is a good method of assimilating what people *actually* do in a situation, with what they *say* they do, during an interview (Nisbet & Watt (1980) in Bell, 2005). However Bell makes clear that observing is difficult and very subjective, as "we 'filter' the material we obtain

from observation and that can lead us to impose our own interpretations on what is observed" (2005, p. 185). There was inevitably a degree of bias in the observations – in the studies in which the school is unknown there was the possibility of interpreting observations without fully understanding them; equally, the study in the school known to me held a danger of interpreting observations using too much 'insider knowledge'. However, in acknowledging the risk of biased interpretations, this consideration was at the forefront when analysing the data.

Another safeguard against too much bias came in the form of observation schedules that helped maintain focus throughout the lessons. There are several formats that are widely used in qualitative research, such as the Bales method and then the Flanders method (Bell, 2005). These two methods form very structured criteria that enable the researcher to observe specific behaviours that have been coded and categorised; but while they keep the researcher focused they are perceived to be quite complicated to administer, and they do not allow for additional observations out-with the coded behaviours (ibid.). Upon careful consideration it was decided to create a schedule based on the interview questions, looking for interactions and behaviours intimated by the themes that were selected. This method is agreed by Jones & Somekh: "an ethnographic approach…will seek to observe in an open-ended way, screening nothing out and noting as many details as possible, guided by some overarching categories" (L. Jones & Somekh, 2005, p. 139). However it was important to remain focused throughout the observations and this took the form of time scheduling. The observations took place almost continuously and notes were entered into a timeframe; this can be viewed in Appendix 3.

7.4 Data analysis

The analysis of the case studies stemmed from the theory list that was generated from the literature review – this represented the author's viewpoint of what constitutes a quality physical education and included features such as cross curricular links, citizenship, active learning, cooperative learning, creativity, holistic development, physical competence, motivation, fun, active, inclusive, personalised and challenging. Identified behaviours, perceptions and

interactions that stemmed from this list were explored in the interviews and observations and these provided the basis for discussion. The interviews and observations were cross-matched and the responses were categorised to allow a more succinct presentation of the discussion; the categorisation also permitted any cross-study themes to emerge and this formed the basis for the overall conclusions. The categories are detailed at the start of chapter 8.

Although this was a qualitative-based study, there were occasions when it was appropriate to display the data in quantitative form through the use of tables and this helped draw conclusions and create links to the theory list in order that connections across the case studies could be made.

7.5   Reliability and ethical considerations

The three schools were chosen from recommendations from colleagues and each one was at the time involved in innovative use of technology within PE and school. This meant that the staff and pupils were already actively engaged with technology and had ascribed to its positive dimensions. The schools came from three different local authorities, although this had no bearing upon the research. The year group that were involved in the case studies varied, as some schools were very small and included multi-composite classes; however, the focus groups included only pupils in P5-7, as it was felt that they were more suited to giving in-depth answers. Another reason for selecting this age group was because the technologies being examined were more suited to Second Level pupils.

As with any new research, it was important to pilot the methods for data collection and analysis and this was done with one of my own primary schools. This did not overcome the hurdle of getting to know the staff and pupils, nor was it representative of schools that use their class teacher to teach PE. However, it did afford the opportunity to practice observational skills and test the observation schedule and interview questions, giving a clearer indication of issues such as time and type of responses to expect – from this the wording of the questions could be amended.

As with all empirical research within the University, this research has successfully been subjected to the rigours of Ethical Approval to ensure that it is

methodologically sound and both physically and emotionally safe for its participants. The letter outlining the ethical approval is attached in Appendix 1.

Chapter 8: The case studies

The purpose of each case study is to critically evaluate the use of three specific technologies that are being used within primary school physical education. These technologies are: digital video cameras; Cyber Coach; and Nintendo Wii, and each technology will be described fully at the introduction to each study. Each of the three case studies will be presented and discussed separately because they all have very different educational purposes and require to be evaluated individually. However, several issues have permeated all three case studies and these will be explored in a later chapter.

Each case study questions the various pedagogical factors of using the technologies from three perspectives: the researcher as observer, the pupils, and the teacher; and looks closely to examine the implications this has on the notion of a quality physical education. In order to succinctly discuss the data that has been collected within each case study, all three perspectives will be presented and interpreted simultaneously, and collated using a thematic approach. The themes were developed during the planning stage of this research and are derived from pedagogical and curricular considerations that form current discourse within wider education and physical education in particular. In order to triangulate the findings and help ensure data authenticity, the questions for both interviews, along with the observation schedule were cross-matched and these can be seen in the appendix. For the purpose of presentation the themes have been categorised - these categories and the themes within them are:

- Perceptions of a quality physical education
    - o Fun; active; inclusive; progressive
- Perceptions of own and others' performance (learning and teaching)
    - o Self-efficacy; motivation; group dynamics/collaborative working
- Holistic education and development
    - o Social, physical and cognitive development; cross-curricular learning; creativity; active citizenship
- Learning and teaching pedagogies

- o Pupil-centred learning environments; stages of learning; learning styles; technological pedagogical use; issues with technology

8.1 Case study one – digital video cameras

This case study seeks to gain a better understanding of the use of digital video cameras to enhance motivation and learning in PE. The particular cameras that were used in this research are Cisco System's 'Flip' video cameras. These are becoming widely used within education because they are robust and very simple to use. However it should be noted that the findings from the research can apply to any type of compact digital video camera which uses a hard drive or SD card.

8.1.1 Data collection

The data was collected during the course of two visits to the school and a telephone interview with the teacher a few days after the second visit. The purpose of the first visit was to meet the teacher and pupils, to become familiar with the school and gym layout, and to begin to understand the lesson structure and ethos. The second and arguably more important reason for the initial visit was to allow the teacher and pupils to experience being observed in their lesson – I spoke with the pupils before the lesson and interacted with them during the lesson in order to help them become comfortable prior to the second visit. I spoke with the teacher to discuss the groupings that she used in class, in order to identify pupils for the focus group interview. The purpose of the second visit was to undertake the class observation and then the focus group interview with the pupils. The reason that the interview with the teacher was conducted a few days later by phone is because she moves from one school to another at lunchtime and was therefore unable to undertake the interview during the second visit.

8.1.2 Overview of Case Study One

This case study was conducted with a rural school that has a total roll of less than seventy pupils split between four classes including nursery. The class that were involved with this research were a multi-composite P5-P7 co-educational and mixed ability group of fifteen pupils. They currently receive two-hours of PE each week with a visiting specialist teacher and it is this teacher who is also involved

in the case study. The teacher is local to the area and initially trained as a PE teacher before re-training as a primary classroom teacher. She has taught PE at both primary and secondary level and has extensive experience as a classroom practitioner. She is currently undergoing the Chartered Teacher programme and works full-time as a primary peripatetic teacher of PE.

The lesson from which this study is based was on gymnastics and was mid-way through the block. The learning intentions given by the teacher were:

- Improving the quality of our skills
- To be a helpful partner
- Use the 'stars' system to describe your level of skill

The success criteria were negotiated by the pupils and the teacher and were agreed as follows:

- Concentrate, try your best, practise the skill first
- Encouraging to each other

After the initial warm up, the class were split into 5 small groups of varying size and paired within each group. Each group worked at one of five stations – two teacher-directed skill-based stations (springboard with long box; and partner balances), and three stations with various apparatus that were to be used for self-assessment through the use of the Flip video cameras. Additionally there was a sixth station that was used in conjunction with the partner balances station at which time the pupils were to view previous video clips of their performances on a laptop to complete a 'next steps' personal targets sheet. The groups rotated throughout the lesson and would visit all the stations during the course of two lessons.

At each of the three self-analysis stations the groups were given task cards and prompts to help them achieve the given task. Each task was based around the pupils working individually to create a short sequence that would be filmed by their partner. The pupils would view the video clip and use this to complete a self-assessment sheet using the 'stars' system as an indicator of performance:

I can perform this skill extremely well

I can perform this skill quite well

I need to work on this skill; it's tricky

The analysis sheets were different for each station and were closely linked to the criteria set by the task. Each task required the pupils to focus on different aspects of gymnastics (flight, rotation, balance, inversion, travel). Each sheet required the pupils to assess their own performance of discreet skills within a sequence, and aesthetic appreciation of linking movements to enhance the overall performance. The task cards also reminded pupils of the important points of 'Oscar quality' filming – this was related to a previous lesson.

There were five cameras being used that equated to one per group and within each group the cameras were shared between the pairs. The teacher gave clear instruction that the cameras were to be used only once the sequence had been practised to ensure that everyone had ample opportunity to film and be filmed.

8.2   Presentation, interpretation and discussion of the data

The data will be presented and discussed within the four categories as previously outlined. At times there is cross-category discussion due to the narrative style of discussing issues that came up as particular questions were asked.

8.2.1   Perceptions of a quality physical education

The eight pupils in the focus group were asked to list the features they believed were important in a PE lesson. This was done as two small group tasks to enable and encourage collaborative thinking. Their responses are listed overleaf:

Response	No. of pupils who concur	No. of pupils who believe they experienced that in this lesson	Features that were observed in this lesson
Team effort	4	4	✓
Fair teams	3		
Exciting/Fun	5	4	✓
Challenging	5	8	✓
Working independently	2	1	
Everyone included	5	5	✓
Different activities	2	2	✓
Everyone kind and helpful	2	1	✓
No mucking about	1		
Group working	1	1	✓
Technology/Flip videos	4	4	✓
Games-like warm ups	1	2	
Learn new skills	6	4	✓
Outdoor learning	1		
Dancing	1		
Individual and group tasks	4	4	✓
A game that everyone likes	3		
We decide what game to play	2	3	
Walt/wilf	1		✓
Kind teacher	2	2	✓
Games	3		

Table 1

From the table it is shown that the pupils value *learning new skills, inclusion, challenge* and *fun* as their key components for a quality PE and these were all observed during the lesson. Further, some of these components were identified during the focus group interview when the pupils were asked what they were learning about in the lesson (colour-coded to represent different pupils' voices):

> *Well the one thing we are learning about is our quality filming…Oscar quality filming…yeah…yeah, Oscar quality…to trust your partner, or people that are in your group…yeah…to trust them…today, my group especially were doing forward rolls, on the bench, and *** was practising on the mat…yeah…and I was encouraging *** to do a forward roll.*

It is interesting to note that the pupils placed the quality of their filming as a high priority for the success of the lesson despite this not being one of the learning intentions, and this is augmented by the fact that half of the group believe that the use of technology, and Flip cameras in particular, are an important feature of

quality PE. During the group interview one of the pupils commented on the importance of being able to film with a steady hand in order to help their partner improve his/her performance. The use of this technology is corroborated by the teacher in her interview when asked about her motivations for using the digital cameras:

> *Assessment, both self and peer assessment and my assessment with children to get more to grips I suppose with Curriculum for Excellence, and that, it's a fantastic tool for assessment, both for the kids own assessment and for my assessment of them.*

Additionally during the group interview, **all** the pupils agreed that their PE lessons are challenging; three pupils commented that they learned new skills and two commented that it was fun and active. The group unanimously agreed that they enjoy PE and it was their favourite subject. In fact, when they were asked about aspects of PE that they did not like they began the conversation by reiterating their favourite activities. The group were asked how they felt when they were using the cameras (either as the operator or performer) and they all thought that it was fun and helpful. They unanimously agreed that they were completely comfortable with the technology and firmly believed that their PE experience has been enhanced since the introduction of the cameras. One pupil mentioned that it was sometimes embarrassing when the video clip was shown to the whole class, but another pupil considered that this added to the enjoyment of the lesson:

> *When we get to look at it again on the computer there's some stupid bits, but we all get a good laugh.*

During interview, the teacher was asked about *her* perception of what constitutes a quality physical education. She highlighted three main features:

- Fully qualified *education* staff (**not** activity coaches)
- Pupils have some ownership of *what* they are learning and *how* they are learning
- Pupils have input into their learning, assessment and next steps

Although the pupils did not comment on the differences between a teacher and a coach, it was highlighted by two group members that a *kind teacher* was

important to them, and draws attention to the fact that the pupils must have, at some time, experienced a lesson in which the teacher was not so kind. It was observed during the lesson that the teacher used positive discipline strategies e.g. *I need you to ... / thank you for....* to encourage good behaviour. It was also noted that the task cards were all open-tasked to allow pupils to work at their own level, thus achieving success. These observations correlate with the pupils' concept of a *kind teacher* and this is illustrated during the group interview:

> *You don't have to do it if you don't want to. Miss *** sometimes just...if you don't want to do something in gym she doesn't make you...she lets it go...she says okay...and Miss *** lets you do it in your own time, if you can't do something she lets you do it in your own time...yeah, she helps you.*

It is interesting too to note that the pupils and the teacher value encouragement and helpfulness amongst pupils and this ethos is perhaps instilled through the actions of the teacher – firstly in including *helpful* in the learning intention and, secondly through a plenary task in the lesson in which the pupils had to mark each other out of five for their encouragement and helpfulness during the lesson, and the pupils had to justify their grading by identifying ways in which their partner could be more encouraging and helpful next time. This positive ethos was also noted in the focus group interview when the pupils were looking at photos taken during the observation. Of one particular photo, the group commented:

> *I think he's about to do a forward roll...and that's Mrs *** encouraging him at the side...*

It is believed that a positive and secure environment will encourage the pupils to work hard and be willing to challenge themselves to try new skills. Research has shown that teachers' and coaches' philosophies and work ethic influences pupils' sense of autonomy and competence; and self-determined motivation is prevalent in environments that support and value performance for participation rather than performance for competition/winning (McLean & Mallet, 2012).

The pupils also valued being a part of the decision-making process about PE and within PE with responses such as *walt/wilf* ('*we **a**re **l**earning **t**o*' is the learning intention for the lesson; '*what **I**'m **l**ooking **f**or*' is the success criteria in order to achieve the learning intention), and *we decide what game to play*. This was also

evident in the class observation, as the pupils were very much making the decisions about the success criteria they would need in order to achieve the learning intentions. This discussion was led by the teacher and, through careful questioning, the pupils reached the agreed criteria and therefore believed they were taking ownership for this lesson, and this alone perhaps helps to create a positive work ethic within class. In the interview the teacher justified her reason for negotiating the criteria:

> Unless you have Assessment is for Learning embedded in what you do, Curriculum for Excellence is going to be just floating about there somewhere, it's not going to happen.

The question of why Assessment is for Learning (AifL) must be inherent in everyday teaching is perhaps answered in the three key features that underpin the philosophy of the programme:

> **The integrity of the change:** people involved have to believe that what they are doing matters and helps them to make a difference.
>
> **Building informed communities:** developing individual teachers' and groups' understanding of the nature and value of the proposed change, and interaction between and across groups to develop and sustain changes.
>
> **Real involvement:** participants developing a sense of shared purpose in undertaking collaborative ventures that focus on key principles and create purposeful projects to develop understanding and practical applications of those principles.

<div align="center">(Scottish Government, 2006, online)</div>

These key features are very similar to those of CfE and clearly value learning communities that both foster a sense of belonging and are related and relatable to the demands of the wider world. Both AifL and CfE encourages pupils and staff to have shared ownership for learning and teaching and expect the traditional roles of teacher/learner to adapt to become more collaborative.

It was clearly evident during the observation that the teacher puts her beliefs about AifL into practice, as the pupils were given ownership for their learning, assessment and next steps. They were given responsibility for their learning through the use of open tasks, shared learning intentions and success criteria which gave them a target to reach, and three stations that involved very little teacher input but required a lot of collaborative working to achieve the task.

They were given responsibility for assessment to help their learning through the use of the Flip cameras and analysis sheets and, while the specific purpose of the analysis sheet was to do a self-assessment, pupils were also observed talking and working together to view the video clips and suggest improvements to their performances, as indicated in the focus group interview:

> *Did you have to fill in ***'s sheet, or did *** do his own sheet?* *No no, well we sort of, we did both of ours basically…we did it together…you did it together, right, so you both watched what you filmed and…we agreed like a star or a triangle…we both had the same, we both had two triangles.*

It was interesting that the pupils chose to work collaboratively on their analyses despite the teacher asking them to self-assess. The reason for this is perhaps linked to the social-constructivist environment that has been established by the teacher and as such, the pupils are naturally attuned to co-constructing new knowledge and understanding. This corresponds with complexity theory which acknowledges that learning must be adaptive, fluid and interdependent on relationships not only concerning the teacher and pupil, but between pupils themselves (Atencio, Jess, & Dewar, 2011). Another possibility for the pupils choosing to work collaboratively may be linked to Prensky's (2001) notion of '*digital natives'* as discussed in the literature review. Tapscott, an advocate of Prensky expands on this discourse on the traits of – as he calls them – the '*net generation'*:

> They collaborate naturally, they enjoy conversations over reading, they are interested in scrutinising organisations; they insist on integrity; they want to have fun at work and at school, and for them speed and innovation are a part of life.
>
> (Tapscott, 2009, cited in Sanchez, Salinas, Contraras, & Meyer, 2011, p. 545)

This description conjures up an image of a socially adept learner who is confident (*collaborate naturally*), responsible (*scrutinising organisations*), successful (*insist on integrity*), and effective (*speed and innovation*) in his/her learning, and this epitomizes the philosophy of CfE.

8.2.2   Perceptions of own and others' performance (learning and teaching)

The pupils were asked what parts of PE they thought they were good at, and how did they know they were good at these things. Some of the group members cited basketball as an activity they were good at and one group member felt that everyone in the class was good on the gymnastics apparatus. This was furthered by another pupil who believed that the reason for this was because:

Everybody encourages everybody else, so everybody has a good time

When probed about how they know they are good, the group valued the verbal feedback from their peers and one pupil commented:

It's really good when people tell you that you're good at it, it makes you feel much more better.

The teacher in her interview reiterated the emotional development that was alluded to by the pupils when she was asked if she felt her lessons nurtured active citizenship. She discussed the importance of including social targets in the learning intention and credited this to a cooperative learning course that she had attended:

You have to be encouraging and supportive towards your partner.

This cooperative behaviour was observed during the lesson and is illustrated in four of the photographs taken for the focus group interview, each depicting pupils working together to complete the analysis sheets. The pupils also linked the importance of being encouraging and supportive towards each other to their motivation and confidence:

And you get a lot of courage. Oh right, do you? YEAH. So it gives you a bit of... [fist triumphantly in air]...quite happy to try things? Yeah. Yeah.

This behaviour must positively affect the ethos within the class, and in fact actually characterises the Aristotelian perspective of ethos as embracing "good sense, good moral character and good will" (McLaughlin, 2005, p. 312).

During the class observation it was also noted that some pupils are much more self-critical than critical of each other. In one instance a pupil was watching the

video of her own performance and she was holding her hands up over her face as if embarrassed; her partner continually made encouraging remarks throughout the video clip until the performer was happy and able to be positive about her own performance. These feelings of embarrassment seem to be more prevalent amongst the girls, as it was girls too who voiced their concern about the video clips being shown to the whole class. This raises concerns in terms of self-efficacy related to lifelong participation – Biddle et al. contends that self-perception and perceived competence are determinants of physical activity participation rates (2005, cited in Lubans, et al., 2011). However the teacher in the interview did not identify this; instead she regards the positive motivation that comes with using the cameras as an asset that enhances pupils' performance within class:

> *It's a valuable tool in teaching and learning…in terms of motivation, it gives kids, it makes the kids go oh, this is getting videoed, I better do this properly…It's a tool that's used for motivating, raising standards of their performance.*

The pupils in the focus group also identified the use of the cameras to motivate pupils to try their best. At several points during the discussion they used words and phrases such as *concentrating, trying my best, work harder, not mucking about, intense, it's serious, keeps us focussed*:

> *Because you really want to get whatever you're working on.*

This comment is indicative of a pupil who is intrinsically motivated and according to goal motivation theory, has a mastery goal orientation, in so much as being driven by the desire to improve competence and develop new skills, as opposed to someone with a performance goal orientation who is extrinsically driven by the desire to be better than their peers (Clayton, Blumberg, & Auld, 2010). The question of whether the use of digital cameras has played a significant role in increasing the learners' motivation, or indeed if the technology has impacted on their motivational drive is difficult to answer because of a lack of empirical evidence elsewhere. However the data gathered for this research from observation and interviews would suggest that the cameras certainly increase the

pupils' levels of interest and appear to shift the goal emphasis more towards improving their performance.

This apparent increase in motivation to perform well may be linked to the value that has been placed upon the quality of the filming, as was commented in the discussion:

> *No…apart from when you get a really rubbish video…and sometimes it can be quite annoying when someone comes in front of it and you'd have to do it all again.*

On three occasions during the lesson pupils were observed having minor arguments regarding the quality of the filming and in one case the performer snatched the camera from his partner and asked another group member to film him. In a different group, one pupil was observed filming everyone in his group, and despite protests from other group members he did not relinquish the camera. In another group one pupil was observed sulking because it wasn't his turn to do the filming. Finally, in another group, one pair (girls) got quite annoyed at the other pair (boys) who they deemed were 'hogging' the camera and apparatus; it was noted that the boys had control of that particular station for 80% of the time spent there.

There are three main issues that arise from these incidents, and these are:

- Hierarchy within a single sex group - what are the reasons for one pupil dominating the use of the camera?

- Hierarchy within a mixed sex group – is it typical for boys to control and commandeer the equipment?

- Do these behaviours indicate an issue with the availability of the technology?

The first two issues – relating to hierarchy – are major and are out-with the scope of this research; however it is interesting to consider a link between the observed behaviour and Kolbert and Crothers (2003) notion of evolutionary psychology in which they contend that aggression between males and aggression by males towards females could be ascribed to Darwin's theory of evolution.

The issue of availability of the technology is one that is easily answered but not easily addressed, as the teacher in her interview stated:

> *I think I need to perhaps use a few more different types of technology in PE, but then it depends what your resources are, doesn't it (laughs)…I would love a Promethian board in the gym…wouldn't that be amazing (laughs), is that going to happen?*

These behaviours and comments highlight the perceived value of being in control of the technology and, perhaps more importantly, the shift in emphasis away from performance as the main aim of PE, towards a more holistic approach that celebrates and values non-performing roles such as camera person, referee, coach etc.

8.2.3   Holistic education and development

The teacher has placed a lot of importance on the pupils' social development – she commented that every lesson includes a social target in addition to a physical or cognitive target. However, when asked whether she felt that providing pupils with a holistic PE experience was a strong point, she hesitated and was quite reluctant to acknowledge that it was a positive attribute. From re-reading the transcript it could be construed that she is struggling to accept and justify the importance she places on cognitive and social development within PE, and perhaps this stems from the very traditional way in which the subject was presented during Initial Teacher Education. Nonetheless, when the focus group pupils were asked what they thought they were learning about in the lesson, aside from '*Oscar quality filming*', they spoke exclusively about partnership working:

> *To trust your partner, or people that are in your group…yeah…to trust them…and I was encouraging…me and *** were like encouraging each other because we trust each other when we're doing pairs.*

This conversation demonstrates the value that the pupils place on social competencies, as they did not mention any physical skills as the focus for learning or improving during the lesson. This is consistent with Wright and Burrows' (2006) research which found that pupils value PE for the social aspects such as fun, playing with peers and respite from classroom work, and this is illustrated by the pupils:

…Yeah, it's really enjoyable… and it gives you a break from doing hard stuff.

However, when the focus group were asked how they knew they were learning, their answers referred predominantly to their learning of gymnastics skills. This anomaly suggests two things: 1) that the AifL triangulation of learning (assessment *is/as/for* learning) is not fully embedded within the structure of the lesson i.e. the social target is included in the learning intention, success criteria and the plenary but not addressed in the self-analysis sheets, and the pupils associate the analysis sheets with their learning, thus they could only draw upon the 'hard data' from the analysis sheets to justify their learning experience and; 2) sub-consciously the pupils regard practical performance as the real indicator and importance of learning in PE.

Interestingly, when probed a little further, two pupils drew attention to the fact that their peers and the teacher would give them verbal feedback – nobody commented on the use of the cameras to help them know they were learning. This is contradictory to the conversation with the teacher during which time she said:

> *It gives the kids instant feedback on what they're actually, how they're performing, because you can say to a child, doing a handstand, right, straighten your legs up, and they think my legs are straight, she tells me to straighten my legs up but my legs are straight. But they don't know what it looks like because they can't see, so if you video them you can give them instant feedback.*

On the other hand, when the focus group were asked if they felt there were other ways of learning the same things without technology, they were rather appalled at the thought of lessons without cameras:

> *Pause…we'd have to, well, make somebody look at us (gestures and shrugs)…and watch us…it would be a lot harder…it definitely would…it would…it wouldn't be the same, I'd rather the technology…yeah, because if we didn't have the flip videos…we wouldn't know what's bad and what's good…*

They acknowledged the importance of being able to see themselves perform, and one pupil believed that if he relied on his partner to give him feedback, the partner might rubbish his performance rather than give him constructive help. This is counter to observations made in the class, during which time pupils were seen discussing, in considerable depth, their performances and ways to improve.

It was noted that it was the partner that was filming who offered constructive advice e.g. *your back leg needs to be straighter*, whereas the performer generally only commented on what they did e.g. *my back leg is bent.*

It is interesting to consider the teacher's input to this task. She at no time requested to be a part of the learning process either by offering help with the analyses or opining about pupils' performances. This implies that she was effectively giving the pupils ownership for their learning, which is typical of a constructivist approach; however how then does she impart her own expertise to enhance and consolidate their learning, and how does she monitor and assess their learning? This question can be answered in part by her use of the video clips between lessons – she transfers the files onto her laptop to allow the pupils to view their performances on a larger screen and this enables pupils to be active in identifying their development needs. She then uses the files to create and maintain pupils' learning logs. The question as to how she monitors pupils' learning within the lesson can be addressed by examining the learning intentions. One of the three learning intentions was based on social competence (*to be a helpful partner*) and therefore could be monitored from a distance and summatively in the plenary session; the other two intentions were focussed on cognitive competence (*use the 'stars' system to describe your level of skill*) and physical competence (*improving the quality of our skills*), but were worded in such a way that the pupils could self-regulate their improvement i.e. there was no specific technical information that required input from the teacher.

Associated with issues of holistic development is that of cross-curricular links and this is an area in which the teacher felt she needed to develop. She remarked that links to Technologies was the only real cross-curricular learning she believed the pupils to be involved with. It is her contention that real links to class-work could only be done if the class teacher was prepared to feed into a Health and Wellbeing topic based around PE. She acknowledged that class teachers are extremely busy with other areas of the curriculum and, as she covers McCrone non-contact time she does not get to make links directly with the class teacher. Further, the teacher also believes that at this time of CfE becoming more embedded in schools it is becoming increasingly difficult to establish links to class-work:

Schools at the moment have been…quite unsettled with the introduction of Curriculum for Excellence, so it's not as apparent, you know, at the start of the year half of them are trying different planning processes, they're trying different approaches to topics…so it's actually less easy to get involved with class teachers now than it was before.

Certainly there was no overt mention of links to literacy or numeracy experiences and outcomes during the lesson, however during the class observation the pupils were constantly engaged in discussion with each other and were often heard making descriptive comments to each other about their performances – this was illustrated during the focus group interview when the pupils were discussing a photograph that depicted two pupils standing over a clipboard and holding a camera:

> *That was me and *** discussing the sequence…yeah, discussing the sequence.*

Another observation that was noted was that the comments between pupils were usually made using positive, constructive language and perhaps this was because of the social learning intention of *be helpful towards each other*.

This fits in very well with the CfE **LIT 2-02a** experience and outcome which is a *responsibility of all*:

> *When I engage with others, I can respond in ways appropriate to my role, show that I value others' contributions and use these to build on thinking.*

<div align="center">(Learning and Teaching Scotland, 2009f, p. 3)</div>

Another aspect of holistic development that was observed was that of creativity. The very nature of the task cards required pupils to be creative in their response to them, but more than that, they were asked to be creative within a set of limits that necessitated problem-solving on their part – one of the tasks was to create a sequence using three from the following list: *travel, inversion, rotation, flight, balance*; but the pupils had to roll a dice to decide which skills must be included and this also determined the order of the skills within the sequence. It could be considered that this might make the task easier as it provides more structure, but alternatively the pupils might regard that the task is more difficult because they

must adhere to fairly rigid parameters. When questioned about this, the pupils appeared relaxed with the notion of a problem-solving task:

> *We pick, was it, three out of a pack, then we would try to practise those three…in a sequence…to make them better. And could you choose what the three were…no…or was it random…random…random, yeah. We didn't really mind if there was some that we didn't like, cos we just practised them…yeah.*

The nature of the task and the pupils' responses to it are indicative of a constructivist learning environment in which the learner must engage in an "interpretive process of meaning making" (Light, 2011, p. 370). When questioned about the development of creativity within lessons, the teacher acknowledged that she was comfortable with this in dance and gymnastics, but needed to develop her ability to get the pupils thinking creatively within structured games activities (i.e. a specific activity, not games-making).

8.2.4   Learning and teaching pedagogies

Throughout the class observation and interviews with the teacher and pupils it has become apparent that pupils are actively engaged in their learning, through involvement in deciding the walts/wilfs, pupils supporting each other during filming and analysis, and through the use of challenging, open tasks. The teacher commented that when appropriate to do so, she tried to make lessons as pupil-centred and challenging as possible, but also worried about this approach to learning:

> *Sometimes I think I throw too much at the kids, sometimes I think I've gone too much the other way and throw too much at them.*

The pupils, however commented that they found the walts/wilfs to be very helpful and also indicated that they much preferred their lessons with this teacher rather than either their class teacher, or the previous PE specialist. They compared their current learning experiences with those from the previous PE teacher and it was apparent that they value the pupil-centred approach to lessons as opposed to a teacher-led style:

> *It was different with Mrs *** because we didn't really have a sequence, she made you practise one thing…yeah…then another thing…yeah, and before that she just, like, we didn't have the goals or anything…no, she'd make us practise it, and if it was good, she'd say, right you can*

> *move onto the next thing, and if it was bad...yeah...she'd make us stick*
> *at it until it was good.*

Through discussion it was also evident that the pupils associate the use of the cameras with a learner-centred pedagogy. They discussed the notion of analysis without cameras and their styles of language indicated that they believed they would be less engaged in their learning and have less ownership of it:

> *Before we had Mrs *** and before we had videos we just had to*
> *talk...so you had to just talk, okay...and tell the people...okay...and*
> *also, like show our sequence...right...and, em, whoever was teaching us*
> *would tell us.*

This illustrates from a learner's perspective the apparent shift in pedagogy that has mirrored the integration of technology. But more than that, it has been suggested that the level and success of technology integration is much dependent on the teachers' self-efficacy beliefs in their ICT competence, and this in turn correlates with the motivation and positive learning environments they create for their pupils (Bandura, 1993, cited in Moore-Hayes, 2011). It is clear from the observation and interviews that the teacher in this research has a strong sense of self-efficacy in her ICT abilities and can therefore commit her time and effort to its pedagogical use. Research has recommended that technology should be used to enhance pupils' higher order thinking skills (Moore-Hayes, 2011) and Strudler (2010, cited in Moore-Hayes, 2011) believes that the definition of 'good' teaching should include the use of "appropriate learning technologies as meaningful pedagogical tools" (ibid, p. 3). The teacher reflected this in the interview when she was asked what her motivation was for using the digital cameras with the class:

> *How could I use ICT in PE? And not just for the sake of using it, but it*
> *has to be something that has a purpose otherwise there's no point in*
> *using it, you've got to use it for a purpose otherwise there's just no*
> *point doing it. And how can it enhance teaching and learning.*

It could be considered that the use of cameras to give feedback engages more pupils because it caters for visual learners and this is an area that was addressed by the teacher in the interview:

> *It [video] helps to develop the kinaesthetic, because they get the visual*
> *experience of it, it helps to develop their kinaesthetic appreciation of*

> *what their body's doing as well. They don't have that acceptance, they*
> *need the visual, because a lot of kids learn visually as well.*

This comment shows the teacher's awareness of the needs of her learners and Fielding highlights the importance of this: "In cases where there is marked mismatch between the style of the learner and the approach of the teacher, learning suffers considerably" (Fielding, 1994, p. 394). The teacher has raised an interesting concept in her consideration that visual learning aids kinaesthetic learning; this theory corresponds with Kolb's model of experiential learning in which it is made clear not only the four stages of learning as outlined also by Honey and Mumford, but the importance of the visual feedback being sandwiched by the kinaesthetic and cognitive stages of learning:
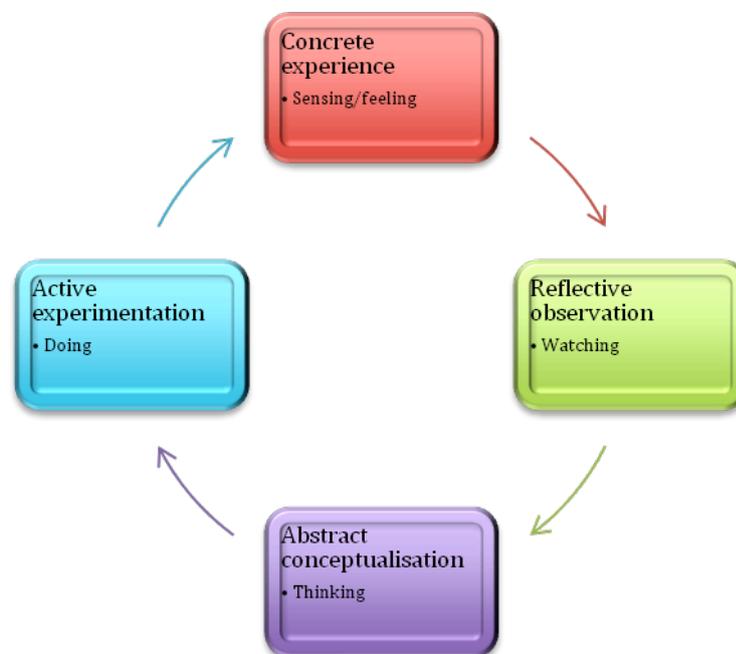
(Kolb, 1984, cited in Fielding, 1994, p. 398).

Figure 8

Kolb's experiential learning cycle certainly addresses the four main stages of learning and how they are interconnected, however the role of the teacher is not considered; instead Fielding developed the *Learning Magnet* in which he includes the influence of a motivational environment to develop learning (shown overleaf):

(Fielding, 1994, p. 407)
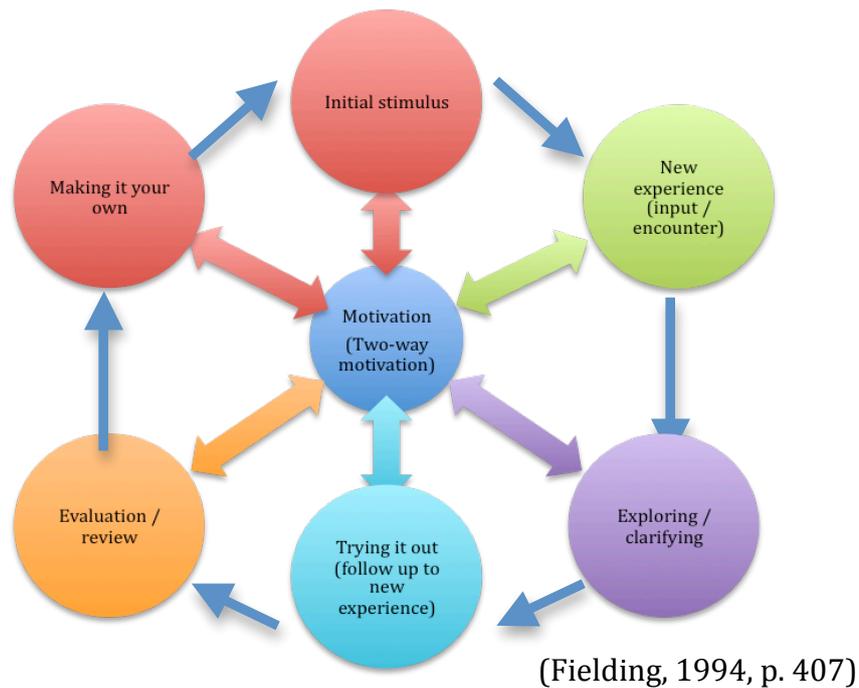
Figure 9

This model is more closely associated with the lesson that was observed and the data collected indicates that the use of the video cameras certainly increases motivation; therefore according to Fielding's model, the technology enhances the learning experience.

The pupils also agreed that the use of video helps them to learn, as two pupils commented that *it shows more detail* and another pupil valued the ability to watch the video clip as often as required. This is consistent with the teacher's contention that the use of video helps pupils to learn because:

> *Kids need to see what it is that they're doing and how that matches against the criteria, which happens in other curriculum areas but with PE the only way you can really do that is to video it.*

Additionally, some members of the group discussed the importance of being able to see their own performance and delete the video immediately before performing again, whilst others felt that it was important to keep both video files to use to compare the performances prior to suggesting ways to improve.

The important issue that has arisen here is the question of who is controlling the use of the technology? In particular are the questions of *how* is the technology used and *who* is using it? In terms of who is controlling the technology, an

inspection of the lesson and its structure helps to identify that it is a dual-control between the teacher and the pupils – the teacher has given the learning intentions and made clear that the cameras were to be used only after plenty of practice; and the pupils made the decisions as to who filmed and in what order and for how long. Regarding the question of how the technology was used – it has been shown through observation and transcripts that the pupils decided how they would utilise the equipment, but again, this was within parameters set by the learning intentions and the task cards. Once again it appears that the teacher has nurtured a social-constructivist learning environment - Kennedy and Tipps highlight that Vygotsky's theory of constructivist teaching contends that "learning occurs as new knowledge is internalised by learners through participation in discussions of new concepts and skills" (Kennedy and Tipps, 2000, cited in Gouws & Dicker, 2011, p. 571); and social-constructivism recognizes and celebrates the uniqueness and the unique learning needs of every child (Gouws & Dicker, 2011). These theories can be applied to the lesson that was observed – the pupils at all times were challenged to work at their own ability and collaboratively through the use of open-task cards and clear social learning intentions.

The question of who is using the cameras is an easy one to answer – the pupils used them exclusively and it was clear that they had used them numerous times before. This was proven in the group interview because they spoke confidently and knowledgeably about the cameras; and during the class observation the pupils needed the teacher's help only once, and this was because one of the camera's batteries was flat and needed to be replaced.

The issue of the flat battery opens up another area of debate, and that is of the reliability of technology and its impact on teachers' willingness to integrate it into their lessons. The teacher discussed this in the interview and acknowledged that this was a major concern for teachers who were less confident in their abilities:

> *So many people are turned off technology because it's not reliable, or they haven't got the knowledge of how to fix it when it goes wrong, you know, they might have done something really simple, press a button and it's back working fine again, but because they haven't had the level of training that makes them comfortable with that, then it's a huge issue and it turns a lot of people off.*

This comment correlates with Hofer and Swan's (2006) contention that teachers must be competent and confident in their technological pedagogical knowledge and their technological content knowledge, as discussed in the literature review:

Technological Pedagogical and
Content Knowledge (TPCK)
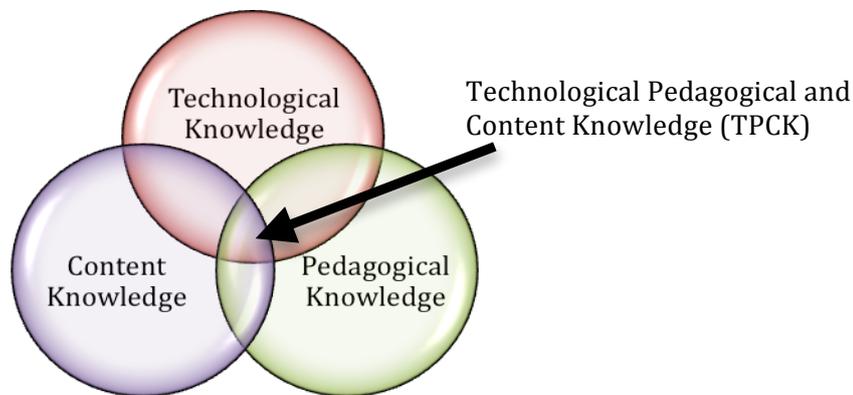
(adapted from Koehler & Mishra, 2008, p. 396).

Figure 5

8.3   Summary of the findings

The summary of findings will be presented firstly as a list of results that correlate directly with the data collected and are specific to the subjects of this research. Further generalised findings that can be interpreted from the data will then be presented.

8.3.1   Findings specific to the lesson:

- The pupils value a secure learning environment in which they are appropriately challenged and supported to learn at their own pace
- The pupils recognise and value the importance of social competencies
- The pupils believe that the use of digital video cameras increases their motivation and helps them to learn
- The pupils place high importance on their ability to use the cameras to help each other learn
- The pupils value opportunities to take ownership for their learning and target setting
- The pupils link the pupil-centred learning environment to the use of the cameras
- Collaborative working was prevalent when using the cameras

- Collaborative working using the cameras naturally links to CfE Literacy and Technologies experiences and outcomes
- Partner feedback was more constructive than pupils' self-assessment
- The pupils were comfortable using the cameras and therefore focussed on their learning rather than the technological aspects of use
- The task stations that required the cameras were the stations that the pupils related to their learning
- Limited technology often resulted in arguments between pairs as to whose turn it was to use it
- Some of the girls are not comfortable with others viewing their performance on video

8.3.2   Interpreted findings that could be generalised:

- The constructivist learning environment increases pupil confidence, motivation and engagement in their learning
- Actively involving the pupils in choosing the success criteria gives them perceived ownership for their learning
- The use of open tasks instils confidence
- The use of the cameras encourages collaborative working
- The level of ICT integration is linked to teacher confidence and competence with TPCK
- A constructivist learning environment with the use of ICT is linked to teacher confidence and competence in the pedagogical technological use of the cameras
- The use of digital cameras engages visual learners and enhances the learning of kinaesthetic learners
- Pupils' use of the technology impacts on the hierarchy and relationships within class
- Using the cameras to analyse performance can increase social competencies such as encouragement and helpful positive comments
- Using the cameras enables AifL but does not necessarily guarantee it

8.4 Implications from this case study

The data gathered has shown that the pupils value the use of digital video cameras in PE for a variety of reasons: they increase motivation, social interaction and learning. Further, the cameras encourage collaborative working even when the pupils are set self-assessment tasks and the pupils appear to be more positive towards each other's learning by making encouraging and helpful comments. This is no doubt linked to the social-constructivist approach used by the teacher that gives the pupils a perception of ownership for their learning through giving them the opportunity to negotiate the success criteria, giving them open tasks that ensure a high level of success, by enabling the pupils to set their own targets for improving and finally, by giving the pupils absolute control of the cameras albeit within structured parameters.

The evidence suggests that the use of the cameras enhances motivation and learning, but only if they are used within a constructivist learning environment that is emotionally secure. The pupils need to value the learning experiences gained with the cameras and this must be articulated by the teacher through the setting of appropriate learning intentions – particularly the development of social competencies to encourage not only collaborative working, but also to promote positive interactions amongst the pupils. Consideration of ways in which the videos are viewed is important to instil confidence in all pupils, in particular the girls who, in P5-P7 are at a very precarious stage in their lives and could easily be turned off PE and physical activity if they feel insecure in class.

The control of the cameras appears to be of high importance for the pupils and this has both positive and negative connotations. The very positive offshoot from the value of actually using the cameras is undoubtedly the slant towards a more holistic PE experience, and this is of particular value to those pupils who are less physically competent than their peers. Being good at filming and subsequent analysis allows more pupils to experience success because the focus for learning is no longer primarily on physical competence. This raises pupils' self-efficacy beliefs, which in turn increases motivation and enjoyment, which ultimately enhances their learning. However, unless there are enough cameras for one between every two pupils there is going to be varying levels of tension and

jostling as the pupils try to share the technology. This could result in a typical hierarchal structure in which the pupils who are most confident and outspoken – and often those who are the best performers in PE – take control of the cameras and therefore also control the dynamics of the group/class. This could lead to those pupils whose confidence would most benefit from using the cameras once again appearing to be at the bottom of the pecking order, and therefore being less engaged in the lesson.

The issues of technology availability and reliability are also worth considering, particularly if teachers are not very confident in its use. As discussed previously, teachers must be confident in all three areas of *technology*, *pedagogy* and *content* (TPCK) in order to make appropriate use of ICT. Appropriate use should mean that the pupils are in control of the technology and this can only happen within a constructivist environment. In turn, this learning approach can only be fully implemented if the teacher is confident and competent with TPCK. Teachers who are less confident and competent will be easily dissuaded if the ICT is not readily available (e.g. memory cards that are full, batteries that are flat, another class using the cameras etc), or if the technology does not work the way it is expected to (e.g. difficulties with transferring the video files to a laptop, pupils pressing a button on the camera and inadvertently changing the settings). Much debate continues as to the type of in-service training that teachers require in ICT – should it be purely their development of ICT competence (e.g. how to work a camera) or should it be related to pedagogy (e.g. using cameras to analyse performance). I would suggest that in-service training should be relevant to today's learning and teaching approaches and should take the format of the teachers-as-learners, for example, the teachers would attend a mock lesson as a pupil, therefore giving them ample opportunity to get to grips with the ICT, but in the context of a lesson.

8.5 Case study two – Cyber Coach

This case study seeks to gain a better understanding of the use of Cyber Coach to enhance motivation and learning in PE. Cyber Coach is an interactive media system consisting of a hard drive that holds a multitude of instructor-led dance and fitness sessions that can be accessed by the touch-screen on the device, and projected onto a large screen. The sessions can be tailored to suit the

requirements of the groups using it, including deciding the difficulty and length of the routines. The types of activities can also be 'mixed and matched' to really suit the needs of the users. Additionally, the software comes with many games that can be used in conjunction with wireless dance mats.

8.5.1 Data collection

The data was collected during the course of two visits to the school and a telephone interview with the teacher a few days after the second visit. The purpose of the first visit was to meet the teacher and pupils, to become familiar with the school and gym layout, and to begin to understand the lesson structure and ethos. The second and arguably more important reason for the initial visit was to allow the teacher and pupils to experience being observed in their lesson – I spoke with the pupils before the lesson and took them for some fun warm up activities in order to help them become comfortable prior to the second visit. I spoke with the teacher to discuss the groupings that she used in class, in order to identify pupils for the focus group interview. The purpose of the second visit was to undertake the class observation and then the focus group interview with the pupils. The reason that the interview with the teacher was conducted a few days later by phone is because she is the Principal Teacher and was called away to deal with an incident and was therefore unable to undertake the interview during the second visit.

8.5.2 Overview of Case Study Two

This case study was conducted with a school in an urban setting and has a total roll of approximately 170 pupils. The school attendance rate is in line with the national average, but the number of children entitled to free school meals is higher than average. The class that were involved with this research were a P5 co-educational and mixed ability group of nineteen pupils. They currently receive 100 minutes of PE each week – one hour with their class teacher and 40 minutes with the Principal Teacher and it is this teacher who is also involved in the case study. The teacher is a trained primary class teacher with no particular PE specialism. She is local to the area and has taught in the school for many years.

The lesson took the format similar to that of an aerobics class. The janitor set up the Cyber Coach hardware in the school gym and the children assembled behind it facing the large projector screen. The teacher asked them what their activity preference was, and the pupils unanimously chose a Zumba session.

The pupils chose where to stand in the gym and worked individually for the duration of the lesson. The teacher programmed the software to play a warm up track, followed by six Zumba tracks, finishing with a cool down session. As soon as the interactive coach came on screen the teacher stood at the back of the class while the pupils followed the instructions. The lesson lasted approximately 40 minutes, which was the length of the Cyber Coach session, after which time the pupils were escorted back to class.

8.6   Presentation, interpretation and discussion of the data

The data will be presented and discussed within the four categories as previously outlined. At times there is cross-category discussion due to the narrative style of discussing issues that came up as particular questions were asked.

8.6.1   Perceptions of a quality physical education

The eight pupils in the focus group were asked to list the features they believed were important in a PE lesson. This was done as two small group tasks to enable and encourage collaborative thinking. The pupils required considerable support to complete this task. Their responses are listed below:

Response	No. of pupils who concur	No. of pupils who believe they experienced that in this lesson	Features that were observed in this lesson
Eat fruit	3		
Be awake	2	1	
Have fun	6	4	✓
Be healthy	5	3	✓
Be good and enjoy	3	2	✓
Join in	4	3	✓
Have a great time	3	1	✓
The teacher joins in	2		
Remember gym kit	2		✓
Play games	2		
Be wild in gym	1		
Play video games	1		
Be friendly	3	2	✓

Don't fight	1		✓
Be organised	1		
Be active	5	3	✓

Table 2

From the table it is shown that the pupils value *being active, joining in, being healthy* and *having fun* as their key components for a quality PE and these were all observed during the lesson. Further, some of these components were identified during the focus group interview when the pupils were asked what they were learning about in the lesson (colour-coded to represent different pupils' voices):

> We were doing different stretches…we were doing different stages and dances and stuff…eh, if we keep doing it we get better at it…you'd get stronger, you will get fitter.

These comments indicate that the pupils were able to relate *what* they were learning about, to *how* they knew they were learning, as they recognised their skill progression over a number of weeks. This indicates that they are aware of the intrinsic kinaesthetic feedback they receive whilst participating. The pupils also commented that other people had told them they were good at Zumba, and two boys in particular valued the teacher's praise:

> *Because, like when you do Zumba… sometimes when you're good at it she* [the teacher] *gives you a spot. Like me and him got a spot once.*

This comment typifies the reaction of pupils when they receive praise, and research has shown that this 'contingent teacher praise' has a very positive effect on increasing motivation for future work (Kalis, Vannest, & Parker, 2007).

The pupils were asked how they felt when they were doing Zumba with Cyber Coach and they responded very positively:

> *Excited…why are you excited? Because it's like fun and it's like energetic and it helps you keep fit and warm…my friend, he came into school just after playtime and he said is Zumba on yet, cos he wanted to do it.*

This comment correlates directly with the pupils' notion of a quality PE as being inclusive, fun, active and healthy, and the teacher shares these opinions. When asked what her motivations were for using Cyber Coach, she made it very clear

that the main reason was to increase the pupils' levels of fitness. It was observed that the majority of the pupils were active for most of the time, and although no specific measures of work-rate intensity or duration were taken, it is estimated that approximately 90% of the pupils were moving energetically for most of the session, with only a few appearing to be less engaged with the lesson.

The teacher believes that Cyber Coach is a good way of motivating pupils because of the trendy instructors, music and sessions; and she also believes that it is inclusive because the pupils can participate regardless of their level of ability, or whether or not they have the correct PE kit. This school is situated in an area of a mixed socio-economic climate and so it is understandable and appropriate that the school puts importance on healthy living ahead of wearing the correct kit. The school's push towards healthy living might also explain the pupils' responses of *eat fruit, be healthy, be awake* and *be active* in the focus group interview. The teacher also considered that the pupils could take their learning and motivations for Zumba sessions home with them, thus encouraging other family members to lead healthier lifestyles. This philosophy correlates with research that found that PE is the "most suitable vehicle for the promotion of active, healthy lifestyles among young people" (McKenzie, 2001, cited in Cale & Harris, 2009, p. 90).

The teacher values the use of Cyber Coach because it gives the pupils an opportunity to try activities that are out-with the expertise of the teaching staff, and believes that the pupils also benefit from external instructors:

> *I wouldn't be able to do that myself. I think the personality of the people that are doing it…it's different for them; they're seeing a different face and voice.*

This is an interesting statement because on the one hand it signifies the teacher's awareness of her lack of confidence and competence to teach Zumba; but on the other hand she is finding the best resources possible to get around the problem to ensure that the pupils do not miss out on what she perceives to be a valuable learning opportunity. Research found that the majority of non-specialist teachers' levels of self-efficacy and motivation towards PE were directly related to their own experiences as pupils (Morgan & Bourke, 2008) – the teacher's comment suggests that her own experiences were positive because she wants her

pupils to experience 'good' instruction, but at the same time she may be comparing her ability to teach with that of her own teacher during childhood.

The teacher's self-perception only partly corresponds with the pupils' perceptions of her, as they were asked if they could learn the same things without Cyber Coach and two pupils thought that it was possible, with one pupil in particular suggesting that the teacher could lead the session using only music.

8.6.2 Perceptions of own and others' performance (learning and teaching)

The pupils were asked what parts of PE they were good at, and how did they know they were good at these things. Every member of the focus group listed skills and activities that they thought they were good at, such as *skipping, dodgeball, basketball* etc. No mention at all was given to any cognitive or social development, and similar responses were given when questioned about things they would like to be better at. This could be due to the young age of the pupils, as illustrated in this comment from the teacher:

> *Do you know, at first, one or two of them weren't sure that the instructors couldn't see them. It sounds ridiculous, but honestly. You know how they say things like "you at the back" and things like that, some of them honestly, at the beginning thought he could see them. It was really quite cute (laughs).*

The teacher was passionate about the use of Cyber Coach in PE, and one particular reason given was because the individual nature of the sessions allows pupils to work at their own ability (fitness and co-ordination) without worrying about others' perceptions of them, as these comments from the pupils show:

> *It's like you're dancing…you're jumping about, having fun…okay, anything else? You could do it…relax and enjoy yourself.*

The use of the word *relax* by one of the girls is indicative of her enjoyment and positive self-efficacy. The pupils chose where to stand in the gym and it was observed that all the girls stood near the front, while the boys stood in several rows behind – within the boys rows it was observed that the more confident and able performers stood nearer the front, while the less able (or perhaps less engaged) stood near the back of the group. It is surely quite unusual for girls to actively put themselves in full view of boys, thus potentially opening themselves up for nonsense comments from the boys - it was noted that the girls were very

mixed in their ability to do Zumba, therefore it could be considered that this type of activity is enough of a motivator to disinhibit the girls and therefore free them for learning. The issue of perceived competence and its links to intrinsic motivation and enjoyment could also be considered when attempting to understand the reasons for the girls opting to go to the front of the class. Research has shown that girls' perceived competence reduces with age (Fairclough, 2003), and as these pupils are still very young they are perhaps less conscious of their abilities and less concerned with self-efficacy issues; thus, they are more motivated to participate.

During the class observation it was noted that there was no collaborative working between the pupils at all during the session. Occasionally the pupils chatted to each other and this was more prevalent during the cool down session – this may be because the cool down is less physically intensive, but it could also be due to the pupils' perceptions of it:

> *I don't like the cool down…boring…neither do I…the first one we did was a bit hard…it's a bit boring after a while once you've done loads of them.*

The lack of collaborative working does not appear to be something that worried the teacher, as she stated categorically that the purpose of Cyber Coach is to increase the pupils' fitness, and she believes there are more opportunities for working together in games activities. However it is suggested that this linear approach to learning and teaching is counter to the philosophy of CfE that envisions learning akin to complexity theory; that is, to be dynamic and creative in order to develop the four capacities of *successful learners, confident individuals, responsible citizens* and *effective contributors* at the heart of CfE (Atencio, et al., 2011).

8.6.3   Holistic education and development

The earlier discussion about the pupils' responses to the question of what they felt they were good at (all physical skills and activities) could also be attributed to the learning and teaching approaches used in PE that focus primarily on physical development. The teacher alluded to this during the discussion about her strengths and areas for development in teaching PE – she gave the impression

that she had little awareness of the connections of her PE lessons to the holistic development of the pupils. Additionally, the teacher thought that her lessons lacked cross-curricular links and opportunities for cooperative learning, and certainly during the observation there was no evidence of learning-related interactions between the pupils. They chatted sporadically and informally – although this in itself is a positive observation, as the pupils were comfortable with each other and were clearly enjoying the lesson. She also addressed the issue of creativity and acknowledged that there was no opportunity for the children to be creative during a Cyber Coach session, and this remark correlates with the observation, during which time the pupils engaged in what could almost constitute rote learning – aside from the easier alternative offered by the instructor, the pupils were expected to follow the set routines. On the other hand, one pupil commented that he felt the P5s would be able to teach the P1s some of their Zumba moves. This indicates that he may not have been merely a passive recipient during the sessions; rather he was engaged in some level of cognitive understanding to feel confident enough that the class would be able to remember the moves. This comment also shows an awareness of the notion of the pupils helping others, which could be construed as a basic level of active citizenship.

The teacher is emphatic about the importance of the subject, so this apparent lack of appreciation of the wider benefits of PE could be linked to inadequate CPD. She may not have had the opportunity to be engaged in current debate and developments around the subject and this could, in part be attributed to the school not having a visiting PE specialist for staff to connect with and draw ideas from. Conversely, research has shown that even with specialist input, classroom teachers' lack of expertise and lack of ongoing quality CPD means that they are not adequately equipped to work collaboratively with each other to share ideas and experiences (Harris, Cale, & Musson, 2011).

The main purpose of Cyber Coach that was offered by the teacher, pupils and was observed during the lesson is, undoubtedly the health-related benefits and awareness of healthy living. The teacher indicated the physical progress that she has witnessed from weekly Cyber Coach sessions:

They don't ask for breaks in the middle of it (laughs)...particularly the
Zumba, they couldn't do five or six sections of it without collapsing.
Now they can...at the beginning they'd do two wee sections then want
a rest.

The teacher's ongoing, informal assessment of the pupils' progress could be considered a refreshing and effective approach to monitoring their fitness levels because it is inclusive, active and does not detract from the value of the PE lesson. Research has found that formal fitness testing in school PE is inappropriate because of the testing protocols used; it is invalid because of the huge number of variables that are not considered when carrying out the tests; and finally, the potentially daunting nature of formal fitness testing can put off pupils from participation in lifelong physical activity (Corbin, 2002; Cale and Harris, 2005, cited in Cale & Harris, 2009).

The pupils were also able to make links between the work-rate of the session and healthy living when they were asked in what ways did Cyber Coach help them to learn:

> *It's good...right, why's it good?...and it's kind of PE...right...it makes*
> *you stronger...okay, anything else? What is it about CyberCoach that's*
> *good? You always need a drink of water if you do it for ages...uh huh,*
> *anything else? It's energetic.*

The interesting phrase from this extract is "*and it's kind of PE*". On reflection, it would have been very good to follow up this response with a query as to what was meant by the comment; however it could be suggested that the pupils do not regard the Cyber Coach lessons as PE, perhaps because of the fact that it is being led by a virtual instructor rather than a real teacher, thus with no meaningful interaction during the lesson. The comment taken in context could also suggest the pupils perceive that it is not real PE because it is not a traditional game such as basketball or dodgeball; on the other hand it could be construed that their other PE lesson is less energetic than this lesson.

8.6.4   Learning and teaching pedagogies

The class observation indicates that the learning and teaching approach used in the lesson is similar to that of behaviourism, in that the teacher was striving to instil in the pupils an appreciation for healthy living through a high energy

activity that required no higher-order thinking skills. In essence she was trying to adapt their behaviour (attitude towards healthy living) and improve their physical fitness and physical skills using a linear '*Style A'* approach (Mosston, 2002).

Due to the very individual nature of the activity the pupils relied on their own intrinsic feedback to assess their learning, and there was no observed indication that the teacher checked their awareness of learning. But in the focus group interview, when questioned about how they knew they were learning, they were able to reflect on their progress:

> *Eh…em…people…like, the first day we done it…we weren't very good, were we…quite bored…we were actually quite good, all of us…and we enjoyed it, and we started to talk about it…as it got on it got really better, and as it got on we got better.*

This extract suggests two things: firstly, the pupils are able to assess their own and others' performance and progress and; secondly, the lessons are not pupil-centred. The class observation did not note any instances of the pupils giving peer-feedback, nor did it note any real degree of differentiation – the limited differentiation observed stemmed from the pupils' responses to the instructor. Therefore it appears that the pupils are not being appropriately challenged cognitively, physically or socially in their learning and development.

The teacher interacted with the pupils frequently and this was always as positive reinforcement to encourage more activity. She occasionally joined in at the side of the class, and it is suspected that she did this to motivate the pupils to continue working hard. This reflects research that found that teachers' positive verbal encouragement *across* the gymnasium and directed generically resulted in *more* pupils being more physically active (Patterson & Mars, 2008).

In terms of interactions between the pupils and the technology, it was observed that the pupils responded enthusiastically to the virtual instructor, but that was the extent of their engagement with the technology. The pupils were not actively involved with using the Cyber Coach to select or design sessions other than responding to the teacher's question as to which type of activity they would like to do. This could suggest that the teacher is at an early stage of using technology in

school - as Papert terms it '*technocentric*' (1987, cited in Judith Harris, et al., 2009), meaning that she is in the process of becoming proficient in the technological and content use of it, but is not sufficiently confident to explore ways of adapting her pedagogy to enable it to become a more constructivist, collaborative venture.

The final issue to discuss is the reliability and availability of the technology. The Cyber Coach system itself is quite large and sits on a wheeled trolley. It requires a data projector and large speaker (both included) that both also sit on the trolley. This makes the system reasonably portable and the touch-screen makes it very easy to select the session – and certainly it is believed that the pupils could do this themselves. As previously mentioned, the system contains hundreds of instructor-led sessions, although the teacher felt that not all the sessions were appropriate for primary schools, and she carefully selects the sessions to use, which may be the reason why the pupils are not involved with designing the sessions. The issue of suitability is perhaps why the company has developed an online bank of sessions specifically aimed at the primary school market; however this was still in development at the time of data collection.

8.7   Summary of the findings

The summary of findings will be presented firstly as a list of results that correlate directly with the data collected and are specific to the subjects of this research. Further generalised findings that can be interpreted from the data will then be presented.

8.7.1 Findings specific to the lesson:
- The pupils most value activities that are fun and active
- The pupils consider that Cyber Coach is fun and active
- The pupils link the use of Cyber Coach to being healthy
- The pupils rate their proficiency in PE on physical competence alone
- The girls are uninhibited when using Cyber Coach
- The pupils are motivated through positive teacher interactions

- Cyber Coach used in this way does not provide an holistic learning experience for pupils
- Cyber Coach used in this way does not support a constructivist learning environment
- Cyber Coach used in this way enables ongoing fitness monitoring
- Cyber Coach in this format is not completely suitable for primary school use

8.7.2 Interpreted findings that could be generalised:

- Cyber Coach can increase awareness and levels of fitness
- The behaviourist approach to using Cyber Coach engages more pupils in sustained physical activity
- The use of Cyber Coach discourages collaborative working
- The level of ICT integration is linked to teacher confidence and competence with TPCK
- A behaviourist learning environment with the use of ICT is linked to teacher confidence and competence in the pedagogical technological use of Cyber Coach
- The behaviourist approach to using Cyber Coach does not complement the *Learning with Technologies* experiences and outcomes within CfE
- Behaviourist use of the technology positively reduces pupils' self-efficacy issues

8.8   Implications from this case study

The pupils value the ability to be active and to have fun as their main priorities for a PE lesson, and these features are reflected in the Cyber Coach session; thus it can be deemed that this technology enhances these pupils' interest and enjoyment of the subject. However, the age and stage of the pupils must be considered when making evaluative assumptions, and so too must the 'whole picture' of the PE provision within the school. The pupils get their weekly PE time with two classroom teachers and, from interpretation of the transcripts, it would appear that both lessons follow a linear, skill-based approach to learning rather than a collaborative, constructivist pedagogy; this may influence the pupils' perceptions

of a quality physical education because they only have these experiences from which to draw.

The second issue to stem from this research is regarding teacher confidence and competence relating to teaching PE. In the interview the teacher suggested that CPD would help her become better with the development of a more holistic pedagogy that seeks to address the social, emotional and mental wellbeing of pupils in addition to their physical development. The lack of accessible and appropriate CPD currently seems to be a national problem despite researchers recommending that teachers need access to career-long CPD in order to address the lifelong health agenda (Makopoulou & Armour, 2011).

The issue of appropriate CPD provision can also be applied to address the urgent need for staff to receive training and support in the pedagogical use of technology to enhance learning. Cyber Coach does not lend itself easily to a constructivist learning environment that CfE envisions; however it is believed it is possible to develop effective lessons to encourage collaborative working while using this technology. Firstly, the pupils should be given more ownership for the structure of the lesson, even something as simple as being able to take turns in groups to choose the routines, and let them actually engage with the technology i.e. use the touch screen. The pupils must be given opportunities to reflect more on what they are learning, how they know they are learning, and what they can do to continue to learn. It is contended that Cyber Coach could and should be used as a stimulus for learning, but there should be other approaches employed to challenge pupils' higher order thinking skills in relation to the perceived health benefits.

The anecdotal evidence regarding the increased levels of fitness amongst the pupils is an area that merits further investigation. The government is concerned about the rising obesity rates and reduction in activity levels, but has thus far been unable to find an effective and clinically robust way of monitoring the fitness levels of children. Active Schools continue to administer the Multistage Fitness Test which is believed to be wholly inappropriate (Cale & Harris, 2009) for primary schoolchildren; perhaps it is now time to look at a more holistic, educational and longitudinal method of monitoring the fitness of pupils. It is

suggested that the approach used by the teacher in this research could be adapted and developed further.

8.9   Case study three – Nintendo Wii

Nintendo Wii is an incredibly popular games console that uses the movements of the user to control the game via handheld controllers that link wirelessly to a sensor. This encourages the players to stand up and engage in physical activity when playing the multitude of games available, including dance games, fitness-related games and sports games. It is relatively inexpensive to purchase and this has encouraged schools to use it for 'Golden Time' and other extra-curricular activities. The use of Nintendo Wii in curricular PE has permeated many secondary schools; in particular it is being used with S3/S4 classes to encourage disengaged girls to participate. Thus far there are very few primary schools utilising the Wii for PE and therefore the purpose of this case study is to explore the potential of this interactive-games technology in a curricular setting.

8.9.1   Data collection

The data collection was carried out during the class' planned PE time. I acted as 'participant as observer' throughout the lesson, meaning that I took observation notes but also assisted the pupils where necessary, simply because they found it difficult to distinguish between me as their teacher (I teach at this school) and me as an observer, and they often asked me for help. A random selection of P5 pupils were selected for the focus group interview and this was conducted in the afternoon, prior to the interview with the class teacher that evening.

8.9.2   Overview of case study three

The school involved is a rural school and has a total roll of approximately 60 children including a fully integrated pre-five unit. The class that were involved in this study are the teacher's own class, a group of 16 composite P4/5s of mixed gender and ability.

For this study the class teacher planned a lesson that integrated the Wii in the existing programme that she was working on. In this instance she was teaching a block of racket activities and therefore it was appropriate that she would use the

Wii tennis game as part of the lesson. The learning intention for the lesson was to *'investigate the ways we get information about our performance'*. The reason that this learning intention was chosen was because she wanted to link the learning in PE to learning in maths, specifically data handling. Also she did not want the Wii to be the focal point for the class; rather that the technologies used in class should integrate and *aid* learning rather than be the *purpose* for learning. Four stations were set up, each one concentrating on a different type of analysis:

- **Knowledge of Results** – pupils work in pairs to drop-serve 20 balls into hoops, one person performing and their partner counting how many land in the hoops, before swapping over.
- **Movement Analysis** – pupils watch a video clip of a simple tennis volley and must choose three important things to do when playing the volley. They work in pairs to watch each other perform 15 volleys (5 for each important point) and the partner marks a '✓' or a 'x' for each one.
- **Self Analysis** – pupils work in groups of 4 to video each other playing a short game of singles. After the game the pupils watch themselves and answer questions based on their perceptions of their performance.
- **Match Analysis** – pupils work in groups of 4 using the Wii. One pair play a short game of doubles against the consol while the other pair use a scatter-gram approach to mark where each shot lands.

The pupils were split into four groups by ability. The class worked for 90 minutes, which ensured that each group rotated around the four stations. This could be seen as a technology-rich lesson because it uses the Wii, a laptop and a digital camera; however it should be noted that the pupils regularly use the laptop and camera and therefore do not regard these technologies as unusual in any way within a PE setting.

8.10 Presentation, interpretation and discussion of the data

The data will be presented and discussed within the four categories as previously outlined. At times there is cross-category discussion due to the narrative style of discussing issues that came up as particular questions were asked.

8.10.1 Perceptions of a quality physical education

The seven pupils in the focus group were asked to list the features they believed were important in a PE lesson. This was done as a group task to enable and encourage collaborative thinking. Their responses are listed below:

Response	No. of pupils who concur	No. of pupils who believe they experienced that in this lesson	Features that were observed in this lesson
Not fighting - teamwork	6	5	✓
Having lots of fun	7	5	✓
Having lots of lessons	1	5	
Working together	5	5	✓
Doing games you like	6	5	
No arguing	6	3	✓
Working in groups to improve things you are not good at	5	2	✓
When the teacher asks us what we would like to do	6	1	
When you get to go with your friends	4	2	
I like it when we help demonstrate	3	2	
Going to different areas	4	4	✓
I like having a good teacher	5	3	
Doing lots of things in one session	3	4	
Taking turns of different things	2	2	✓

Table 3

The pupils regarded '*having lots of fun'* as the most valued feature of PE and this was certainly observed through their enthusiastic responses to the various tasks in the lesson. Further, when asked about what they enjoy most about PE they were unanimous and wholehearted in their reply that is was fun (colour-coded to represent different pupils):

> *It's fun…it's really fun…we get to travel to different places…we have a lot of fun doing it…we get to do different things…we don't just stay in school, you get to go to different places…sometimes we get to choose what we do…it's really fun…we're lucky because we always get to travel around and do different stuff…having a really good time…having a brilliant time going like geocaching…it keeps us active.*

During the group interview five of the pupils considered that they had lots of fun playing the Wii and, further, when shown a photo of two of them playing the Wii during the lesson one girl described the pupils in the photo as '*having lots of fun'*. Additionally, none of the pupils made any negative comments regarding their

enjoyment of the lesson. Additionally, when the class teacher was asked what her motivations were for using the Wii, she was quite clear that pupils' enjoyment should be at the heart of their learning:

> *When we use it in Golden Time the children just love it; the girls in particular really have fun trying out the different games. But we've never used it in PE before and I suppose I wanted to see if they'd still enjoy it as much.*

It was noted during the lesson that the animation and excitement shown by the pupils on the Wii was initially higher than that of the station with the 'normal' game, but these levels quickly dropped to become more equitable and it is presumed that this initial excitement was because of the novelty factor of using the Wii with a data projector for the first time as opposed to using it with a TV screen as they normally do.

It was also observed during the lesson that the levels of activity were considerably lower than during a typical lesson using a TGfU approach to learning and teaching. In this lesson only half of the pupils were active at any given time, as they were required to work in pairs to complete analysis sheets for and with each other. One of the pupils believed that he enjoyed PE because it kept him active, however he felt that he was less active when he used the Wii:

> *The computer runs for you so you don't have to.*

This contradicts the popular myth that interactive video games increase levels of physical activity. Further, research into Wii Sports found that it increases activity levels by approximately 2% in relation to traditional handheld gaming devices only, and *not* in relation to real-life activity (Heyward, 2010).

On the other hand, there is a pupil in the class who has Autism and cannot cope with ball games or activities that require teamwork. His support teacher previously used the Wii tennis game with him and commented that he was able to concentrate for a prolonged period of time; he improved his skill level during the twenty-minutes that he was playing for; and he was active to the point of breaking into a sweat. This is an enormous step forward and it was fascinating to note his extremely positive attitude towards the lesson once he knew he would get to play on the Wii.

The issue of inclusivity is relevant to discuss not only because of the pupil with Autism, but also because the pupils highlighted '*working together', 'working in groups to learn things'* and '*working with your friends'* as features they consider significant for ensuring an enjoyable lesson. The aspect of '*working with your friends'* was particularly significant to one pupil, which for her was the crucial element in her engagement with the subject:

> *When your friends congratulate you and you feel good and when you're with your friends because when you're not with your friends you feel like funny, and then when you go to do stuff you're under pressure.*

These features suggest that the pupils place a high value on their emotional safety within PE and the example below illustrates the exposure felt by some pupils when they participate in whole-group activities:

> I don't like hip hop because it's embarrassing…yeah (laughter)…now which bit's embarrassing, is it going in the middle or copying the person in the middle? The middle…the middle…and the outside…you don't know what the person in the middle is doing, so you just stand there.

The structure of the observed lesson contrasted with the hip hop activity because the pupils were working in small groups and were all engaged in different tasks; the tasks were all focussed on the analysis rather than the performance and therefore the pupils might feel less exposed. Also, the pupils were put into ability groups which coincidently matched their friendship groups, and each task required them to work together to complete it; therefore the three features listed by the pupils might hold more significance for them because these are things that were prevalent in the lesson and with which they associate positive feelings towards playing the Wii. Barab et al. hold that educationally sound digital gaming can empower children, support their learning and increase their social skills (2005, cited in Devlin-Scherer & Sardone, 2010), but it could be contended that paying attention to the lesson structure and groupings are also vital to complement the natural appeal of digital gaming.

It can be noted too from the responses to the question of why they like PE that the pupils value the opportunity to participate in a wide variety of activities, and one pupil in particular commented that she enjoyed having an element of choice about which activities she could do in PE. This was highlighted in the table of responses

above, in which six out of the seven pupils believed that choice was an important feature of quality PE. However it was noted that the structure of this lesson did not allow for pupil choice in any way and was in fact a very rigid approach to what could be perceived as a problem solving based learning intention.

8.10.2 Perceptions of own and others' performance

The pupils, in their responses also consider that a collaborative and cooperative ethos within PE is valuable to them to provide a sense of emotional security. This is highlighted several times in the group interview during which time some pupils said that they did not like it when people argued with each other. Further, another pupil also linked the importance of positive reinforcement from peers to feelings of emotional wellbeing:

> *Well sometimes when you do stuff and you feel you haven't done it that well, but then people congratulate you and you feel much better.*

These issues of camaraderie and positive inter-relationships were also spoken about several times as pupils mentioned matters of sportsmanship:

> *I like it when you win against someone and they come up to you and congratulate you and they're not in a huff or anything…I've got good sportsmanship.*

These are just two examples of pupils' perceptions of positive sportsmanship, of which there were many in the interview. It is interesting to note that the pupil who made the comment in green text also remarked that she enjoyed playing tennis with the Wii because '*the computer can't boast*' if it wins. Another pupil also believed that using the Wii was a positive experience because he felt he was better at Wii tennis than real-life tennis and very much enjoyed beating the computer:

> *[I like] when you win against the computer because the computers usually cheat and they always win.*

Two pupils also commented that they particularly enjoyed playing doubles, rather than singles on the Wii. They both alluded to feelings of camaraderie when playing doubles – one of them enjoyed the security of winning as a team and losing as a team, and the other commented that she felt determined to try her hardest so she wouldn't let her partner down. Interestingly, both pupils displayed a high-degree of self-awareness regarding their interactions in group situations,

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as shown below in their comments when they were asked about what parts of PE they would like to be better at:

> *Being in groups with other people because sometimes I don't like the groups I'm in and I go in a huff...I want to be better at being part of the group and not being the leader...I take over the group and no-one gets to say anything.*

These pupils epitomise the aspirations of the principles of Health and Wellbeing within CfE which expects schools to nurture pupils to *'develop... self-awareness, self-worth and respect for others'* (Learning and Teaching Scotland, 2009c, p. 1).

When the group were asked what they thought they were learning about in the lesson only one of the pupils remembered that the learning intention was related to analysis of performance; three pupils thought that the purpose of the lesson was to learn to play fair; two pupils thought it was to learn how to play tennis and one pupil considered that it was to learn how to use technology. However, when the pupils were asked what they thought they were learning about when they were using the Wii, the discussion got a little contentious, as one pupil was quite adamant that he was learning nothing more than how to play a computer game, much to the dismay of another pupil who was so passionate in his belief that the Wii helped him be better at tennis that he got over-excited and stood up on a chair!

> *We didn't really learn much because we were only playing a computer game...what are you talking about...you can, because you're holding the bat and you're about to serve, you throw it up, you hold it up and you go (whack)...you learn how to hit the ball in a video game...is that not like hitting the ball for real? No, because if you're in real life you can see the ball coming to you and you can hit it and you're at different angles.*

When the class teacher was asked what she wanted the pupils to learn when using the Wii, her response was certainly linked to the learning intention of performance analysis, but it hinted towards a desire for the pupils to improve their skill level:

> *Well, obviously I want them to work on their observational skills, but these are the pupils who are watching. I think the ones on the Wii are maybe improving their hand-eye coordination?*

The wording and intonation of her response suggests that she is a little unsure of the educational purpose of the Wii – on the one hand she is clear about the cognitive benefits associated with it, but on the other hand she perhaps feels that every aspect of PE must have a physical outcome and is thus putting forward a proposed benefit of using it. This may in part be attributed to the teacher's own experience of PE as a pupil, as Morgan and Bourke reported on much research that found that personal PE experiences can influence the attitudes, beliefs and teaching practices of non-specialist teachers (Morgan & Bourke, 2008). So perhaps the class teacher experienced a traditional skill-based approach to core PE that valued physical performance ahead of cognitive and social skills, and therefore the teacher may ascribe these same values to her belief of what PE is about. This is a potentially precarious scenario because past research highlighted that a PE curriculum that focuses on physical performance outcomes over the process of learning and the development of social skills will become inaccessible for some pupils and only serve to alienate them further (Williams, 1996).

8.10.3 Holistic education and development

As discussed previously, the purpose of the lesson was to explore ways of analysing performance through small-group tasks, and although the analyses were based upon practical performance, the learning intention was to develop a cognitive understanding of performance analysis and in order to do this the pupils had to work cooperatively; thus a hidden outcome was the continued development of their social competencies. However, the extent to which they appear to have developed their social skills has been somewhat underestimated – during the observation there were many recorded instances of the pupils working together and the methods by which they did so varied considerably, including examples of them working as a team, working together to decide what an answer should be, one partner encouraging the other and even sticking together to claim their working space. These examples illustrate in practice the ethos of the Health and Wellbeing overarching experiences and outcomes, in particular:

> **HWB 0-11a / HWB 1-11a / HWB 2-11a / HWB 3-11a / HWB 4-11a**
> *I make full use of and value the opportunities I am given to improve and manage my learning and, in turn, I can help to encourage learning and confidence in others.*

During the interview the class teacher was asked whether she believed that her PE lessons nurtured holistic development – she regarded her ability for this as needing improvement, mainly because she had never really considered the value of social/emotional competence in PE; however during discussion of the observed lesson she reluctantly acknowledged that although she was perhaps quite unaware of the extent of the holistic development, it was undoubtedly intrinsic to the lesson. The observations indicate that the pupils were engaged in contextualised learning activities and, looking at the broader picture of the social, emotional and cognitive skills that were being developed in the lesson, it contradicts the concerns of some researchers who believe that traditional blocks of activities in PE fragments and de-contextualises learning (Kirk, 2004, cited in Thorburn, et al., 2011); and this is exemplified by the fact that most of the pupils in the focus group associated their learning with social and cognitive development rather than physical development.

Another interesting issue that arose from the initial pupil focus group question was an indication that PE was fun but not associated with 'real' class work, as illustrated by these comments:

> *It takes over maths…it takes over doing work…we get to miss work.*

Much surmising can be done from this, such as the question of whether the pupils link fun with learning i.e. PE is fun and perhaps maths is not? Or maybe the pupils regard only work done in the classroom as a valid form of learning. Goudas and Biddle used a similar data-collection method to that of this study to explore pupils' perceptions of factors that influence their enjoyment of PE lessons and concluded that *having fun* and *a change from schoolwork* were the most significant responses (Goudas & Biddle, 1993, cited in Williams, 1996, p. 24). However, taken within the context of the conversation – and with insider knowledge – it is likely that the pupils mean that they are regularly taken out of school for extra PE activities such as geocaching, orienteering and biking, and these activities are done over a prolonged session, thus meaning that they miss the planned class work.

Linked to this is the issue of cross-curricular learning and again, the class teacher was asked about her ability to include cross-curricular learning in her PE lessons. Like the holistic development example given, she reflected that this was the first time she had deliberately tried to make links with another subject through PE. She believed that she likely unwittingly alludes to cross-curricular learning in PE but does not make overt links; however she did state that she sometimes used physical activities to teach a particular concept of classwork and gave the example of using jumping and throwing to investigate different units of measurement. We discussed issues of cross-curricular links in relation to the Wii and specifically regarding this lesson, and the class teacher became quite animated as she explored the positive contribution that the consol made to teach maths concepts:

> *Until we actually tried the lesson… I had no idea just how relevant their learning in PE was to maths*

Certainly the station that used the Wii was an ideal learning experience for teaching the concepts of data handling and analysis as the pupils were expected to accurately record the position of the struck ball on the Wii screen onto a map of a tennis court. However, the reality of the lesson was that the pupils did not get enough time on each station to record genuinely useful and meaningful data, and the pupils brought this to attention as they described a photo of the station:

> *Me and *** playing the Wii and *** and *** writing stuff down…it was very, very short…we only played three shots and we won…I can see me writing down and *** is running about shouting.*

8.10.4 Learning and teaching pedagogies

The learning intention for this lesson was pupil-centred and the group-work tasks certainly leant towards a social-constructivist pedagogy. However the structure of the lesson was very rigid and not at all pupil-centred. Although this was due to time and space constraints, the approach appeared to detract from the childrens' understanding of the learning intention, as was highlighted by the pupils when only one of the seven in the focus group could remember what they were trying to learn in the lesson. Constructivism is underpinned by the assumption that new learning is built upon prior knowledge, with an understanding of pupils' perspectives of their knowledge in order to create meaningful and relevant learning opportunities for them (Kanuka & Anderson, 1999). In this case the

pupils' lack of clarity of the learning intention could indicate that the lesson was in fact closer to that of a behaviourist approach to pedagogy because the learning was linked to the completion of the tasks rather than the purpose and process of completing the tasks. The class teacher however, appeared to be very comfortable with this approach and commented that she felt the pupils were '*safe and organised*' during the lesson. This comment suggests that the teacher may be a little unsure of less formal, pupil-centred approaches to teaching PE and this was reiterated when she replied to the question of areas of PE that she did not like teaching:

> *Gymnastics, and trying to do games outside with them, they're all over the place and running riot I'm sure!*

This comment indicates that the class teacher has a low-level of perceived competence in her ability to teach PE, and this typifies the growing concern that a continued reduction in contact time in ITE for PE over the last twenty years (Jo Harris, et al., 2011) is having a detrimental effect on teacher confidence, as Morgan and Bourke found a strong link between ITE in PE and teacher confidence (Morgan & Bourke, 2005, cited in P. Morgan & Bourke, 2008).

Three of the four stations utilised technology to complete the tasks and this may have been incredibly daunting for a teacher; however the class teacher is extremely comfortable with each of the technologies and was therefore able to focus the pupils' learning on the completion of the tasks rather than on the use of the ICT. It was observed, however, that the pupils needed a little support using the Wii – although nearly all had used it before the teacher made a point of being at the station as the groups changed over to ensure that the pupils selected the correct game and format, and to help the analysis pupils understand what was expected of them.

The pupils were very mixed in their abilities to play Wii tennis, and although the consol is designed to enable them to adjust the level of difficulty, the teacher kept the level the same for all the pupils. It is suggested that the main reason for this is because of time constraints, but it should too be considered that the learning intention was focused on the analysis of performance rather than the actual performance. However, as previously discussed, the pupils regarded the Wii

station for its ability to improve their tennis, and one pupil also alluded to the consol being good for cooperative and social interactions:

> *I think the Wii is a good experience because on the tennis you can choose to go one game or three games or five games and you can go four player.*

The observed lesson demonstrated ways to include the various learning styles of the pupils in its structure and pedagogy. But it must be considered that each station, in its effort to be unique and address a very specific aim, might actually inhibit some learners. For example, the use of video clips to demonstrate a skill could appeal to visual learners; however the nature of that particular task expected them to observe closely to unpick the key features, and this may prove too challenging to those learners who prefer auditory demonstrations. The challenge at this particular station was met with mixed responses in the pupils' abilities to identify key features of a simple volley. Some pupils found the task very easy whilst others struggled to get started with their first key feature. It was observed that there appeared to be no correlation between ability to complete the task and their ability to perform the volley itself, indicating that on this task there is no link between cognitive and physical competence.

This lesson was rich with technology and it was observed that the pupils were in control of it almost all of the time. Because the pupils had previously used the laptop and digital camera many times they required virtually no support to use them. Their proficiency in the technologies' use, and the fact that the novelty factor had worn off enabled the groups to focus their learning on the task that was set. During the observation it was noted that there was considerable excitement and also a great deal of concentration from the pupils at the Wii station and this was still regarded as a novelty. However they appeared to be very focused and were disappointed when it was time to change groups. The focus group pupils were asked about how they felt when they used the Wii and their responses suggest that the technology is an excellent tool for motivation:

> *It made you feel funny because if you missed it, it made you go...it made me determined...a bit anxious...it made me feel that I was inside a screen as a tiny person...it made me feel like a big person against a computer...Did you enjoy using the Wii? Yes...yes...yes...When you were playing it what was going through your mind? Hit the ball, hit the ball...don't let your partner down, but try your hardest.*

Recent research found that digital games can positively influence intrinsic motivation and the desire to learn (Devlin-Scherer & Sardone, 2010), and it would appear that in this particular case the increased intrinsic motivation enhanced pupils' desires to improve their performance, as illustrated by the comment '*don't let your partner down, but try your hardest'*.

8.11 Summary of the findings

The summary of findings will be presented firstly as a list of results that correlate directly with the data collected and are specific to the subjects of this research. Further generalised findings that can be interpreted from the data will then be presented.

8.11.1 Findings specific to the lesson:

- The pupils most value 'having fun' in PE
- The pupils regard using the Wii in PE as fun and enjoyable
- Using the Wii reduced levels of physical activity within the PE lesson
- Using the Wii as part of the 'station' formatted lesson increased pupils' feelings of emotional security
- Using the Wii as part of the 'station' formatted lesson increased the class teacher's feelings of emotional security
- Some pupils considered themselves more successful playing Wii tennis than actual tennis
- Pupils most regard their learning using the Wii for developing social skills
- Collaborative working was prevalent when using the Wii
- There was incongruity between the constructivist learning intention and the behaviourist set-up of the lesson which caused confusion amongst the pupils
- The Wii demonstrated its usefulness to develop data handling skills in maths & numeracy
- Pupils were very focussed when using the Wii
- Using the Wii increased some pupils' intrinsic motivation

8.11.2 Interpreted findings that could be generalised:

- The Wii is a tool that engages learners who require to feel emotionally safe
- The Wii is useful to engage learners who have physical and/or social support needs
- The Wii is not a substitute for actual physical activity
- Lesson structure and groupings underpin the educational benefits of using the Wii
- The Wii increases pupils' perceived confidence and self-efficacy
- Pupils do not perceive the Wii as a tool for improving physical skills
- The physical movements required to play Wii tennis are not comparable to the physical movements required of real tennis
- Using the Wii engages pupils in contextualised technology-learning activities
- The use of the Wii encourages collaborative working

8.12 Implications from this case study

From the research it is apparent that the Wii is a tool suitable for engaging a wide range of pupils in the development of their social and emotional skills. It positively benefits those pupils who may be marginalised by traditional PE activities which favours competitive team-games because it can increase their feelings of self-efficacy in a number of ways:

- Using the Wii in small groups can increase pupils' confidence because they play against the consol using avatars as their representation - this creates an emotionally safe environment because the avatars do not interact with each other during game-play, meaning that the pupil does not fear any form of recrimination from their 'opponent' for winning or losing.
- The set-up of the consol means that the station is very structured and if supervised adequately, should provide those pupils with additional support needs, the opportunity to wholly participate in a game (tennis) that may otherwise prove to be frustrating for them. This in turn gives the pupils positive feelings towards a subject for which they may have previously feared.

- There appeared to be no correlation between the physical ability of pupils playing 'real' tennis and their ability to play the Wii; therefore the consol could be viewed as a way of levelling the playing field, which could help to re-engage those pupils who may have preconceived opinions of their own ability level.

A concern with the Wii is the fact that very few pupils can play it at any one time, and if it is used solely for engaging pupils in their social/emotional development, teachers could run the risk of behavioural issues arising as pupils await their turn to play. The level of concentration from the pupils who were completing the analysis sheets was noted during the observation and it is therefore suggested that teachers find ways of actively engaging pupils who are waiting to play. The observation notes and the interviews showed the Wii to be a useful device for supporting cross-curricular learning, particularly with the pupils who are not actually playing on it. It is suggested that there is considerable scope for development of resources that utilise the Wii for the learning and teaching of other subject areas, and this in turn would also help alleviate the potential disruption while pupils wait their turn to play.

Analysis of the observation notes and the interviews suggest that the Wii does not improve specific sports skills and it is questionable as to whether it even improves skill-related fitness such as balance and coordination – in particular the study found that playing the Wii does not resemble the movements required to play real tennis, and for that reason it should not be used to attempt to improve physical literacy. Nor does the consol engage the majority of pupils in meaningful activity that is beneficial to their physical wellbeing; thus teachers should not use it in a misguided attempt to improve or even sustain pupils' levels of activity and fitness. However it does motivate pupils by virtue of them perceiving the Wii to be fun and enjoyable; therefore as the vast majority of pupils believe that PE should be fun, appropriate use of the Wii must be considered for this reason. Nonetheless, caution must be taken to ensure that PE lessons are not diluted into physical activity sessions in order to more easily satisfy pupils' desires for fun.

The observed lesson demonstrated the pupils working collaboratively when at the Wii station and they were certainly all actively engaged with each other to

complete the task. But it could be suggested that the amount of collaborative working that was observed was due to the task rather than the consol.

The Wii certainly engages pupils with technology-centred learning, but teachers should be clear about the purpose of using the consol - as a technology tool it has been demonstrated to support learning in maths and numeracy, specifically *data handling and analysis*, but whether it actually enhances the learning of these concepts is still unclear because of the limited nature of this study. It is therefore suggested that further research is conducted to get closer to ascertaining the true value of using the Wii for enhancing learning, particularly in maths and numeracy.

Chapter 9: General conclusions and implications

This chapter will bring together an understanding drawn from existing theory and from the research findings in an effort to make informed judgments and recommendations regarding the use of technology in primary school PE.

9.1 Emerging themes

The research design was never intended to compare and contrast the case studies because each lesson was unique in its purpose and application of the technologies. However, several themes have emerged from the data analysis and subsequent discussion that umbrellas the three studies, and it is appropriate to address these and make some elementary recommendations regarding the general use of technology in primary school physical education.

9.1.1 Technology increases intrinsic motivation

The notion that PE lessons should be fun and enjoyable was overwhelmingly the most valued feature for the pupils in the focus group interviews, and the class teachers too acknowledged the importance of fun within PE. It has also become apparent that the pupils regard the use of technology as fun and consider this as not only valuable for the lesson, but actually an essential ingredient to their perception of a quality PE.

The research has shown that the concept of fun is positively linked to motivation; therefore because intrinsic motivation is linked to an openness for learning it is

important to consider the motivational benefit that technology holds to increase the desire to learn. The studies indicated a shift away from pupils' *extrinsic* motivation and towards *intrinsic* motivation when using technology, and it is believed that this is - at least in part - due to the motivational climate set by the teachers through the use of the technologies and the associated learning intentions, which value the *process* of learning rather than the *outcome* of learning. This could be significant to consider, particularly when teaching competitive games because previous studies have shown there to be a decrease in intrinsic motivation as pupils get older (Lepper, Corpus, & Iyengar, 2005). Spittle and Byrne (2009) agree that teachers can manipulate pupils' motivational drive by altering the motivational climate within class; in this instance more use of technology could support younger pupils' engagement with the lesson and also help focus older pupils in their learning to a greater extent.

9.1.2   The pedagogical approach to lessons using technology might be influenced by teacher confidence and competence with TPCK

These studies imply that the teacher's *technological* confidence and competence within the technological pedagogical content knowledge (TPCK) framework had a bearing on the way that the technology was used in and with the class. The digital cameras and the Wii case studies both involved teachers who had high levels of self-efficacy regarding technology and both lessons were of a constructivist nature. The Cyber Coach case study on the other hand had a teacher who was less comfortable with technology and this lesson was more in line with that of a behaviourist pedagogy.

The limited nature of this research makes it difficult to conclude that there is a definite link between the pedagogical approach and teacher confidence/competence, because Cyber Coach more naturally fits with a behaviourist pedagogy as opposed to a constructivist approach and for that reason the technologies cannot be compared with each other. Therefore another study is needed to explore the different approaches to Cyber Coach by teachers of varying technological skill-levels to begin to draw robust conclusions.

There also appears to be a link between teacher confidence/competence with the lesson *content* within the TPCK framework, and the pupils' perceived

understanding of the learning intentions. The teacher involved with the study using the digital cameras was the most experienced teacher of PE and the pupils had a very clear understanding of what they were learning; the teacher involved with the Cyber Coach study was also an experienced teacher but with less confidence within a PE environment, and whilst the learning intention was quite narrow, the pupils' perception of what they were learning accurately reflected the teacher's; finally, the teacher involved with the Wii study was the least experienced teacher and least confident within a PE setting and this was mirrored by the pupils who were less clear of the learning intention.

If we look at each case study within the TPCK framework it suggests that the lesson using the digital cameras was the most balanced in terms of pedagogical approach, pupils' use of the technology and their understanding of what they were learning, and perhaps this is because the teacher had the most experience across all three areas of TPCK – *content*, *technology* and *pedagogy*. Therefore it is proposed that CPD training should be designed around this framework to enable teachers to become more proficient and comfortable using technology in context; equally, developing their understanding of teaching PE needs to be within an educational context rather than CPD which focuses on teaching activities.

9.1.3 Technology increases pupils' development of social and emotional skills

There were clear examples from each case study to indicate that pupils value technology for improving their self-esteem and their ability to work cooperatively with others in the class. In particular the two studies that adopted a constructivist approach to learning and teaching, the pupils considered that the technologies helped them to feel better and to work better with each other and they believed that their social and emotional development was the main learning intention for the lesson. The Cyber Coach study demonstrated that the behaviourist approach engaged all the girls and reduced their inhibitions about their physical abilities, although the pupils deemed that the learning intention in this lesson was linked solely to their development of physical skills, in particular their levels of fitness.

These findings correlate with the observations that noted a higher level of physical activity in the Cyber Coach lesson than that of those using the digital cameras and the Wii. This would point towards the notion that a technology-rich constructivist environment develops pupils' social and emotional skills but reduces their levels of physical activity; and conversely a technology-rich behaviourist learning environment increases pupils' levels of physical activity but reduces the opportunities for collaborative and cooperative engagement which develops their social skills.

This is a very crude generalisation but it does suggest that there is much research still to be done around this area to better understand the learning experiences brought about by different technologies and using different pedagogical approaches. It also offers ample opportunity for active research to find ways of using technology to develop social and emotional wellbeing whilst maintaining a high level of physical activity.

9.2   Reflections on the research findings and the research process

When designing the research at the beginning of this process I was quite clear that my viewpoint fell towards that of critical theory because I was resolute that current technologies and their uses were not conducive to a quality physical education, and I wanted to explore this area further. I have been acutely aware of my preconception that may have biased the findings, and as such I made a deliberate and concerted effort to keep an open mind and look for positive aspects of each technology in the case studies. As the data collection and analysis process got underway I found myself in a more interpretative frame of mind, in that I was much more open to seeing the positives of the technologies than I expected, particularly from the pupils' viewpoint. This, I think helped enormously to see the vast potential of these technologies to enhance the pupils' PE experiences – for example I had an understanding of the role that technology played to increase motivation but had not considered the importance of the links between motivation and pupils' desire to learn, and therefore had not considered the value of technology for this. Nor had I considered technology to be a useful tool for engaging pupils in their social and emotional development - I had only

considered that technology could increase their cognitive skills and I was keen to explore whether it had an effect on their physical development.

I was of the opinion, however, that technology reduced levels of physical activity and whilst proven correct in two of the studies, it was quite bittersweet to be proven wrong in the Cyber Coach study – bittersweet because I had a preconceived opinion that this technology was not remotely educational and was a 'quick fix' solution to two hours of PE that would infest schools and dilute the essence of a physical *education*. Instead I discovered that Cyber Coach appeared to increase girls' levels of confidence and therefore their motivation to participate, which in the current climate is invaluable; boys seem to love the activities too, and all the pupils were engaged in high levels of activity throughout the session. Whilst I cannot bring myself to be too effusive about Cyber Coach, I happily acknowledge its place within a balanced PE curriculum.

Another thing that struck me during the data collection and analysis was the extent to which the pupils were acutely aware of their connection to learning – they were very astute in their observations and willing to share their thoughts and feelings in an often very eloquent manner. On reflection I now realise that I very much underestimated their engagement within the lessons and this is something that I will take forward with me in my own teaching practices.

9.3 The Future

This research sought to explore the use of current technologies in primary school physical education, with a particular focus on examining each one in relation to the notion of augmenting a *quality* PE experience, then to propose suggestions for development. The findings have indicated that there are sound educational reasons for continued and further use of these technologies, but their usefulness must be evaluated carefully to ensure that they meet the needs of the pupils and are used appropriately to support learning.

It also appears quite clear that there is much scope for development of the current technologies to develop skills that were not prevalent in this research – for example to increase levels of activity when using the digital cameras, using the Wii to develop physical literacy, and using Cyber Coach to develop

cooperative skills. Further, there appears to be a plethora of possibilities to adapt and develop existing technologies that are not yet used within education – for example it would be feasible to develop apps that could be used within PE; the iPad could be adapted and made simpler and cheaper for educational use; we could use a Bluetooth device to connect laptops and Smartphones to data projectors; and we could even develop smart wristbands that record activity levels/time – the possibilities are endless.

In terms of my future engagement with research I feel that, having explored existing uses of/and technologies, I would like to participate in an active research project to put the findings from this research to use in the development and analysis of a new approach to current technology, or an approach to a new technology.

This has been a valuable study for me on a personal level because I am passionate about education and pedagogy, and as a current teacher I have discovered that the process of this research has undoubtedly informed my practice. Some of the literature readings have validated and helped justify my current teaching approaches and I am much more confident in my ability to discuss at length with colleagues, the thought processes behind the PE programme I implement. I have also learned many new things in relation to both pedagogy and research and I am able to apply this newfound knowledge to my everyday practice.

I also feel that this study and its findings are valuable for other PE staff and primary class teachers. The general issues of technology integration and associated pedagogy may inspire PE teachers to make more use of it, and help them to justify its implementation costs by offering both literature and empirical evidence from which to draw. It may also help PE staff by highlighting the learning domains (physical, emotional, social, cognitive) that can be developed through learning with technology. However I think the real value of this research will be to primary school class teachers, and in particular those teachers who are less confident about teaching PE. This paper highlights the holistic approach to the subject and celebrates the extent to which technology contributes. The research has shown ways in which technology links PE to other learning and this may be just the carrot that is needed for some staff to help them get enthusiastic

about this wonderful subject. Finally, the findings regarding teacher confidence and competence within the TPCK framework may be of interest to local authorities and agencies that provide CPD training, as it highlights the need for contextualized, meaningful and authentic CPD which mirrors the expectations of the experiences we should be offering our pupils in Curriculum for Excellence. After all, we are expected to prepare our young people for twenty-first century life, so we should be preparing our staff in the same manner.

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Appendix 1

University of Glasgow | School of Education

Ethics Committee for Non Clinical Research Involving Human Subjects

EAP4 NOTIFICATION OF ETHICS APPLICATION OUTCOME

Application Type: Resubmission

(select as appropriate)

Application Number: :EA1686RR

Please add R to the end of the application number if this review is for a resubmitted application.

Applicant's Name: Sharon MacKechnie

Project Title: An exploration of the use of technology in primary school Physical Education

Date Application Reviewed: 2/11/10

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APPLICATION OUTCOME

(A) Fully Approved   ⊠

       (select as appropriate)

Start Date of Approval: 3 November 2010   End Date of Approval: 30 May 2011

If the applicant has been given approval with amendments required, this means they can proceed with their data collection, with effect from the date of approval. The School Ethics Committee expects the applicant to act responsibly in addressing the recommended amendments. **The amendments should be submitted to the Ethics Office** for completion of the applicant's ethics file. An acknowledgement that all requested amendments   have been made will be made within three weeks of receipt.

(B)   Amendments Accepted. Application Complete.   ☐

       (select as appropriate)

This section only applies to applicants whose original application was approved but required amendments.

(C)   Application is Not Approved at this time   ☐

Please note the comments below and provide further information where requested. The full application   should then be resubmitted to the Ethics Office via e-mail to Terri.Hume@glasgow.ac.uk.

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<u>Major Recommendations</u>

Not applicable.

<u>Minor Recommendations</u>

Review PLS for pupils to simplify language. A copy should be provided to the Ethics Secretary.

Please retain this notification for future reference. If you have any queries please do not hesitate to contact Terri Hume, Ethics & Research Secretary, in Room 425b, St Andrew's Building, 11 Eldon Street, Glasgow, G3 6NH.

Appendix 2: Observation Framework

Questions to consider during time sample and analysis	Observable features during time sample	Themes on which to base analysis and discussion.
Describe the structure of the lesson.	Format (traditional, TGfU etc - start to finish); is it pupil or teacher-centred - i.e. who decides the pace/methods/LI for lesson?	Cooperative learning, active learning, physical activity, motivation/fun/engagement, inclusive, controlled/safe, differentiated/effective/appropriate/challenging, holistic development, learning styles, learning skills, organising tournaments,
What do I think the pupils were learning today?	Aside from LI's, what were the 'hidden' outcomes, relating to cognitive, affective, physical, cross-curricular.	Cross-curricular links, citizenship, active learning, cooperative learning, creativity, holistic development, physical activity.
How do I know they were learning?	Activity levels, ethos (enjoyment, motivation etc), Q&A, improved competence etc.	Motivation/fun/enjoyment, active, controlled/safe, inclusive.
What is the perceived focus when using the technology?	Is it to motivate/enhance learning of PE related outcome; is it to enhance learning of ICT; it is to enhance learning of cross-curricular?	Cross-curricular links, citizenship, active learning, cooperative learning, creativity, holistic development, physical activity.
How is the technology used?	Does it define the lesson, or does it fit in with and aid the needs of the pupils?	Learning styles, inclusive, active learning, cross-curricular links, controlled/safe, motivation/fun/engagement.
Who is using the technology?	Mainly the teacher/pupils; pupil participants/non-participants; many pupils or only a few.	Learning styles, inclusive, active learning, cross-curricular links, controlled/safe, motivation/fun/engagement.
In what ways do I think [this technology] helped them to learn?	"Does it increase the ease in which pupils grab a concept, idea or skill?"; "Does it create less off-activity time with regard to the whole group?"; "Does it motivate the pupils?"; "Does it help the more able pupils to extend their knowledge, understanding or application of the tasks and concepts?"	Cooperative learning, active learning, physical activity, motivation/fun/engagement, inclusive, controlled/safe, differentiated/effective/appropriate/challenging, holistic development, learning styles, learning skills, organising tournaments, health understanding.
In what ways are the pupils interacting with each other, the teacher and the technology?	Are there clear-cut roles, does everyone keep to these roles? Are the interactions positive/negative, productive, helpful? Are the interactions similar/different when using the technology?	Cooperative learning, inclusive, holistic development, learning styles.
Describe the role and behaviours of the teacher during the lesson.	Facilitative/authoritative, engaged in one-to-one/whole class teaching, stays at one station/moves around gym etc.	Learning styles, inclusive, motivation/fun/engagement, controlled/safe.

What are the perceived positive aspects of [the technology] in the lesson?	Positive perceptions of technology, how can it enhance learning in PE and support learning in other subjects.	Learning styles, inclusive, active learning, cross-curricular links, controlled/safe, motivation/fun/engagement.
What are the perceived issues/difficulties with [the technology] in the lesson?	Negative perceptions of technology, difficulties with organisation, time, costs, glitches etc. What are the barriers for you as a teacher, and perceived barriers for your pupils?	Learning styles, inclusive, active learning, cross-curricular links, controlled/safe, motivation/fun/engagement.

Appendix 3: Time schedule

	Stage of lesson	Observations of class
5 mins		
10 mins		
15 mins		
20 mins		
25 mins		
30 mins		
35 mins		
40 mins		
45 mins		

Appendix 4: Staff Interview Questions

Questions	Sought-after response categories, follow-up questions if needed.	Themes on which to base analysis and discussion.
Do you like teaching PE?	Attitude towards PE.	Teacher's perception of self/PE.
Are there things you particularly like about teaching PE?	Positive attitudes, perception of constituents of a quality PE experience, are they teacher-centred or pupil-centred?	Teacher's perception of self and others.
Are there things you particularly dislike about teaching PE?	Negative attitudes, logistical difficulties, value of PE in relation to rest of curriculum.	Teacher's perception of self and others.
Curriculum for Excellence talks about 2 hrs of quality PE. What do you believe quality PE to be?	What makes a quality PE? Understanding of difference between PE and physical activity? View of importance/place within wider curriculum.	Cross-curricular links, citizenship, active learning, cooperative learning, creativity, holistic development, physical activity.
What do you believe to be your strengths and areas for development in teaching PE? Use the attached questionnaire.	Self-perception relating to physical ability, pedagogy etc.	Teacher's perception of self and others.
Think about the ones that you selected as 'strengths'. From where do you draw these conclusions?	Intrinsic/extrinsic feedback, pupil/teacher oriented perception of valuable experience.	Teacher's perception of self and others.
What would help you get better? What support could the school or authority provide to help you?	CPD, logistics, McCrone time, equipment, support from SMT etc.	Teacher's perception of self and others, CPD
What did you want the pupils to learn today?	Aside from LI's, what were the 'hidden' outcomes, relating to cognitive, affective, physical, cross-curricular.	Cross-curricular links, citizenship, active learning, cooperative learning, creativity, holistic development, physical activity.
Do you feel that was achieved and how do you know?	Activity levels, ethos (enjoyment, motivation etc), Q&A, improved competence etc.	Motivation/fun/enjoyment, active, controlled/safe, inclusive.
What is your motivation for using [the technology]	Decision-making process leading to use of technology, LI's specific to the technology.	Teacher's perception of self and others, learning styles.
What did you hope the pupils would gain from using [the technology] in today's lesson?	LI's specific to the technology, hidden benefits of using technology - motivation, expertise, increase activity, literacy etc.	Cross-curricular links, citizenship, active learning, cooperative learning, creativity, holistic development, physical activity.

Do you think the technology did help achieve these aims?	"Does it increase the ease in which pupils grab a concept, idea or skill?"; "Does it create less off-activity time with regard to the whole group?"; "Does it motivate the pupils?"; "Does it help the more able pupils to extend their knowledge, understanding or application of the tasks and concepts?"	Cooperative learning, active learning, physical activity, motivation/fun/engagement, inclusive, controlled/safe, differentiated/effective/appropriate/challenging, holistic development, learning styles, learning skills, organising tournaments, health understanding.
Are there other ways for the pupils to learn the same thing?	Is technology influencing the pedagogy, or is the LI influencing the technological use?	Teacher's perception of self and others, learning styles.
Can you describe how you feel about using technology in PE? Are you comfortable, excited, anxious etc?	How much does technology influence decision-making regarding the lesson/outcomes etc.	Teacher's perception of self and others, TPCK.
What are the positive aspects of [the technology] in PE and in classroom work?	Positive perceptions of technology, how can it enhance learning in PE and support learning in other subjects.	Learning styles, inclusive, active learning, cross-curricular links, controlled/safe, motivation/fun/engagement.
What are the issues/difficulties with using [the technology] in PE and classroom work?	Negative perceptions of technology, difficulties with organisation, time, costs, glitches etc. What are the barriers for you as a teacher, and perceived barriers for your pupils?	Learning styles, inclusive, active learning, cross-curricular links, controlled/safe, motivation/fun/engagement.

Appendix 5: Staff Interview Question 6

Responses for Q6 of staff interview Linked to theory-list		STRENGTH	OKAY	AREA FOR DEVELOPMENT
Lessons are challenging				
Lessons are progressive				
Lessons are appropriate				
Lessons are fun				
Lessons are safe				
Lessons are pupil-centred				
Lessons have cross-curricular links				
Lessons are active				
Lessons nurture holistic development				
Lessons encourage cooperative learning				
Lessons encourage creativity				
Lessons encourage active citizenship				

Appendix 6: Pupil Focus Group Interview Questions

Questions	Sought-after response categories, follow-up questions if needed.	Themes on which to base analysis and discussion.
Can you work together with the flipchart and write/draw all the things that you think makes a great PE lesson. If you think a particular bit is really important for you, add a ✔	Individual concept of a quality PE; generate group discussion.	Pupils' perceptions of PE, linked to theory list.
Can you add a ★ on the flipchart at each bit that you experienced today e.g. fun	Perception of the lesson.	Pupil's perception of self and others, motivation/fun/engagement.
Do you like PE?	Attitudes towards physical activities and PE. Their concept of quality PE.	Pupil's perception of self and others, motivation/fun/engagement.
What - if anything - do you like about PE?	Positive attitudes towards activities, lessons, individual/group-work, time, indoor/outdoor etc. Their concept of quality PE.	Pupil's perception of self and others, motivation/fun/engagement.
What - if anything - do you dislike about PE?	Negative attitudes towards activities, lessons, individual/group-work, time, indoor/outdoor etc. Their concept of quality PE.	Pupil's perception of self and others, motivation/fun/engagement.
What parts of PE do you think you are good at?	Physical, cognitive, affective elements.	Pupil's perception of self and others.
How do you know you are good at that?	Self-perceptions, benchmarking against own criteria - what is important to them?	Pupil's perception of self and others.
What parts of PE would you like to be better at?	Physical, cognitive, affective elements.	Pupil's perception of self and others.
What would help you get better?	Teacher input, individual/group work, peer feedback, more time, equipment, tasks etc.	Pupil's perception of self and others, learning styles.
Let's look at the photos. Can you describe what was happening in each one? The following questions will stem from the photographs.	5-minute time sampling; describe the interactions between peers, pupil/teacher, technology/pupil.	Motivation/fun/enjoyment, active, controlled/safe, inclusive, feedback, differentiated/effective/appropriate/challenging.
What were you learning about today?	Physical, cognitive, affective elements, cross-curricular - literacy, numeracy, ICT, awareness of LI's.	Cross-curricular links, citizenship, active learning, cooperative learning, creativity, holistic development, physical activity.

How do you know you were learning?	Increase in confidence/competence, helping others to understand something.	Motivation/fun/enjoyment, active, controlled/safe, inclusive, feedback, differentiated/effective/appropriate/challenging.
When you used [the technology] today, what do you think you were learning about?	LI specific to ICT use - did it relate in any way to the LI? Cognitive, physical and affective aspects.	Cross-curricular links, citizenship, active learning, cooperative learning, creativity, holistic development, physical activity.
In what ways do you think [this technology] helped you to learn?	Give feedback about performance, break into easier parts, help understand a concept, allowed time to practice/groove movements, increased enjoyment/motivation.	Cooperative learning, active learning, physical activity, motivation/fun/engagement, inclusive, controlled/safe, differentiated/effective/appropriate/challenging, holistic development, learning styles, learning skills, organising tournaments, health understanding.
Can you think of other ways to learn the same thing?	Teacher input/demonstration, using flashcards etc, working in small groups, peer feedback etc.	Pupil's perception of self and others, learning styles.
Can you describe how you feel about using technology in PE? Are you comfortable, excited, anxious etc?	How much does technology influence attitude towards PE. Attitudes towards the technology, how it fits with their concept of PE - time, activity and activity level etc.	Pupil's perception of self and others, TPCK - pupil ability.
What parts of using [the technology] do you like in PE, if any?	Positive attitudes towards the technology, how it fits with their concept of PE - time, activity and activity level etc.	Learning styles, inclusive, active learning, cross-curricular links, controlled/safe, motivation/fun/engagement.
What parts of using[the technology] do you dislike in PE, if any?	Negative attitudes towards the technology, how it fits with their concept of PE - time, activity and activity level etc.	Learning styles, inclusive, active learning, cross-curricular links, controlled/safe, motivation/fun/engagement.