

**Exploring pedagogy and digital technology in physical  
education through appreciative inquiry**

**By**

**Julia Sargent**

**A Doctoral Thesis**

**Submitted in Partial Fulfilment of the Requirements for the Award of**

**Doctor of Philosophy of Loughborough University**

**January 2018**

**© Julia Sargent (2018)**

# Abstract

Digital technology has not become commonplace in teaching and learning despite the considerable growth, availability and use in society. Moreover, when digital technology is used in education, the digital technology itself seems to take precedence over pedagogy. In physical education (PE), research shows that there is little knowledge as to how and why teachers in the UK use digital technology in their teaching. Subsequently, the purpose of this thesis is to explore PE teachers' understanding and experiences regarding how and why they use digital technology in their practice.

Guided by an appreciative inquiry (AI) philosophy, this thesis employs a case study methodology in order to explore how and why PE teachers use digital technology. This study pays particular attention to the teachers' perspective and the previously under-considered factors that enable, develop and influence their use of DigiTech, rather than the often-reported barriers and constraints. Data were gathered over a 12-month period, involving four teachers from schools across England. Methods of data gathering include AI interviews, interviews with headteachers, senior leadership team members, PE staff, heads of department and IT Managers, and lesson observations, document analysis and field notes.

The collected data were analysed using a constructivist approach to grounded theory and the findings collated into four chapters; each of which explores the views, experiences and uses of digital technology by one of the four teachers. These chapters are structured by the three themes constructed from the data analysis. The first theme, *'developing an embedded culture'*, explores the teachers' perceptions of developing an individual, department and whole school approach towards how digital technology is used. This theme explores the factors promoting the teachers' use of DigiTech and the role of the school in shaping their digital technology use. The second theme, *'keeping tasks simple'*, details the simple techniques and practices the teachers used to aid their teaching with digital technology. The third theme, *'establishing routines'*, describes the ways in which the teachers sought to develop and sustain their use of digital technology, to ensure regularity of use and confidence with digital technology.

Drawing on the work of Casey et al. (2017a), this thesis concludes by suggesting that the three-dimensional categorisation of pedagogy (in the form of teachers and teaching, learners and learning and knowledge in context - Armour, 2011) should be used as a lens for further discussion about digital technology use in PE. By using pedagogy as the starting point, we can begin to unpick and formulate future ways in which digital technology can support teachers' delivery of PE.

**Key words:** Digital technology; physical education; pedagogy; teachers; appreciative inquiry.

## Acknowledgements

This thesis could not have come together without the support of many people and the funding of my studentship from Loughborough University.

Firstly, I would like to express my sincere gratitude to my supervisor Dr Ash Casey for the continuous support of my PhD study; for his patience, reassurance, motivation, time and knowledge. Your guidance and wise words have supported me throughout my PhD and your confidence in me (even when I when I was lacking it myself!) enabled me to persevere. I have learnt a tremendous amount from you and have developed as a researcher and as individual through these years working together. I cannot thank you enough. I hope this goes a small way to showing you my appreciation.

Secondly, to my second supervisors Prof. John Evans and Dr Julie Stirrup for your insightful comments, encouragement and perspectives which helped in shaping my work. Thank you!

My heartfelt thanks go to the teachers, schools and staff whose stories are explored throughout. I am grateful for your time, enthusiasm and interest in my research. This could not have occurred without you!

To the PhD ‘squad’ and friends who have made my work and life at Loughborough a second home. Regardless of whether it was a coffee or a chat over lunch you have been true friends throughout my PhD and I am very glad to have met you all. Special thanks go to Clare and Beth who have been a part of my PhD since day one and who have been there for me through the ups and downs!

Finally, I would like to thank my family to whom I dedicate this thesis. To Mum, Dad and Chris for your continuous support in my work and life in general, your belief in me and love. Last, but by no means least, to Josh for your unconditional love, encouragement and confidence in me. I hope I’ve made you all proud.

## Table of Contents

<b>Abstract.....</b>	<b>i</b>
<b>Acknowledgements .....</b>	<b>iii</b>
<b>Table of Contents.....</b>	<b>iv</b>
<b>List of Tables.....</b>	<b>viii</b>
<b>List of Figures .....</b>	<b>ix</b>
<b>Chapter One: Introduction .....</b>	<b>1</b>
<b>1.1 Introduction .....</b>	<b>1</b>
<b>1.2 Background .....</b>	<b>3</b>
<b>1.3 Structure of thesis.....</b>	<b>6</b>
<b>Chapter Two: Review of the Literature.....</b>	<b>10</b>
<b>2.1 Introduction .....</b>	<b>10</b>
<b>2.2 What is technology?.....</b>	<b>10</b>
<b>2.3 Technology in education .....</b>	<b>12</b>
<b>2.4 DigiTech introduction .....</b>	<b>15</b>
<b>2.5 Pedagogical perspectives.....</b>	<b>23</b>
<b>2.6 Pedagogy and DigiTech relationship .....</b>	<b>27</b>
<b>2.7 Barriers and enablers to teachers and DigiTech.....</b>	<b>36</b>
<b>2.8 Teacher beliefs and relationships around pedagogy and DigiTech .....</b>	<b>39</b>
<b>2.9 Conclusion .....</b>	<b>43</b>
<b>Chapter Three: Conceptual Framework.....</b>	<b>46</b>
<b>3.1 Introduction .....</b>	<b>46</b>
<b>3.2 Appreciative Inquiry .....</b>	<b>46</b>
<b>3.3 Field in development .....</b>	<b>52</b>
<b>3.4 How critical can AI be? .....</b>	<b>56</b>

3.5 Personal interpretation .....	58
3.6 Practical application.....	60
3.7 Conclusion.....	61
<b>Chapter Four: Methodology .....</b>	<b>63</b>
4.1 Introduction .....	63
4.2 Justification of the social-constructivist research paradigm .....	63
4.3 Case study approach .....	69
4.4 Grounded theory method.....	72
4.5 Research design.....	75
4.6 Participants and Settings .....	80
4.7 Data Gathering .....	83
4.8 Data analysis .....	93
4.9 Ethical considerations .....	99
4.10 A relativist approach to judgement.....	99
4.11 Conclusion .....	103
<b>Chapter Five: Patrick .....</b>	<b>105</b>
5.1 Introduction .....	105
5.2 Developing an embedded culture .....	108
5.3 Establishing routines .....	123
5.4 Keeping tasks simple .....	129
5.5 Chapter Conclusion.....	134
<b>Chapter Six: Dillon .....</b>	<b>137</b>
6.1 Introduction .....	137
6.2 Developing an embedded culture .....	140
6.3 Establishing routines .....	151
6.4 Keeping tasks simple .....	158

6.5 Chapter conclusion .....	164
<b>Chapter Seven: Alice .....</b>	<b>167</b>
7.1 Introduction .....	167
7.2 Keeping tasks simple .....	169
7.3 Establishing routines .....	179
7.4 Developing an embedded culture .....	185
7.5 Chapter Conclusion .....	190
<b>Chapter Eight: Harriet.....</b>	<b>193</b>
8.1 Introduction .....	193
8.2 Keeping tasks simple .....	195
8.3 Establishing routines .....	206
8.4 Developing an embedded culture .....	214
8.5 Chapter Conclusion .....	224
<b>Chapter Nine: Discussion .....</b>	<b>226</b>
9.1 Introduction .....	226
9.2 Teachers' views and uses of DigiTech in their practice .....	227
9.3 Why teachers use DigiTech in their practice .....	238
9.4 A pedagogical approach to DigiTech .....	250
9.5 Conclusion .....	253
<b>Chapter Ten: Conclusion .....</b>	<b>255</b>
10.1 Introduction .....	255
10.2 Discovery – what gave 'life' to PE teachers' use of DigiTech? .....	256
10.3 Design – questioning, what could be? .....	258
10.4 Dream and Destiny – what could change and how could this be done? .....	264
10.5 Concluding comments .....	266

<b>References.....</b>	<b>267</b>
<b>Appendices.....</b>	<b>300</b>
<b>Appendix i: Information Letter.....</b>	<b>300</b>
<b>Appendix ii: Informed Consent Form .....</b>	<b>304</b>
<b>Appendix iii: Ethical clearance .....</b>	<b>306</b>
<b>Appendix iv: Research flyers and advertisement .....</b>	<b>307</b>
<b>Appendix v: Example Interview Schedule .....</b>	<b>308</b>
<b>Appendix vi: Analysis video.....</b>	<b>310</b>
<b>Appendix vii: Document sources.....</b>	<b>311</b>



## **List of Tables**

Table 1: Appreciative Inquiry principles	48-49
Table 2: Constructivist grounded theory actions and application	72-73
Table 3: The research process	74
Table 4: The data gathering sources	82
Table 5: Details of lesson observations	88
Table 6: DigiTech/apps, functions and how they were used by Patrick	102-105
Table 7: DigiTech/apps, functions and how they were used by Dillon	135-137
Table 8: DigiTech/apps, functions and how they were used by Alice	165
Table 9: DigiTech/apps, functions and how they were used by Harriet	190-191

## **List of Figures**

Figure 1: A triadic model of pedagogy	25
Figure 2: The 4D Model	50
Figure 3: Example of initial coding using gerunds	92
Figure 4: Example of code note memo	93
Figure 5: Example of analytical memo	94
Figure 6: An example of core apps used by Patrick and his department	117
Figure 7: A flipped learning mat used by Patrick	124

# Chapter One: Introduction

## 1.1 Introduction

This thesis explores physical education (PE) teachers' understanding and experiences when seeking to use digital technology (referred to henceforth as DigiTech) in their practice. It aims to help the field of physical education and sport pedagogy (PESP) better understand the pedagogical use of DigiTech from the perspective of PE teachers. Specifically, this is undertaken by exploring the ways in which four PE teachers construct and perceive the factors and experiences that influence how and why they use DigiTech. This thesis draws on AI and the case study methodology to explore and document these aims; with a focus on strengths rather than the weaknesses of teachers' experiences and practices when using DigiTech.

My desire to explore teachers' practice with DigiTech in PE stemmed from my own personal experience when I working as an assistant teacher for a year. As an undergraduate, I had been taught that the focus of any unit of work or lesson should be on students' learning rather than teachers' teaching (Stidder and Capel, 2010). Therefore, the focus of any lesson using DigiTech must be on whether the use of DigiTech enhances students' achievement of the objectives and intended learning outcomes set by the teacher (Stidder and Capel, 2010). The reality of making this happen in practice, however, seemed much more difficult to achieve for both myself (as a teaching assistant) and the teachers I was supporting. As a direct result, I decided that my undergraduate dissertation would examine how PE teachers negotiated the pedagogical use of DigiTech through the exploration of both the trials and successes teachers experienced (Sargent et al., 2015). Through this undertaking, I became increasingly interested not only in how I could support teachers in the use of DigiTech to enhance students' learning, but also why would I use DigiTech at all. I found that the iPads we were given made administrative tasks, taking registers and communicating with staff more efficient; but these were supplementary to the delivery of the lesson and to students' learning. The truth was, the teachers were not really using them pedagogically. The lack of findings around pedagogy in my undergraduate dissertation suggested that this was an area that required further investigation. I wanted to explore PE teachers' practice with DigiTech in other contexts; to

## Chapter One: Introduction

understand how and why teachers felt able to use different pieces of DigiTech to enhance students' learning and what *they* felt helped them to develop their practice with DigiTech.

Since the introduction of portable music devices (such as the compact disc player, Sony Walkman and the first iPods) I have been intrigued by DigiTech. In many ways, I would consider myself an individual who has 'bought into' DigiTech as it had made my life more efficient, portable and shareable. Despite not using DigiTech with any regularity during my own education, those instances where I have witnessed or experienced it in an educational setting always left me with questions (e.g. how it could be utilised efficiently in a lesson and not deviate away from students' learning? and how can the benefits afforded by DigiTech in our personal lives/society be transferred to or replicated in education?).

Whilst accepting the educational potential of different types of DigiTech, I have not made the assumption that these are inherently positive or negative. My intention throughout this thesis is to present the debates that characterise the ongoing negotiation of DigiTech's place in education. In doing so, I undertake what Selwyn (2012b, p.82) calls one "of the most uncomfortable intellectual leaps for academics to make", by seeking to disconnect the analysis of DigiTech from my own personal experiences (or perceptions) of DigiTech. I will always be positioned in the study through its design, analysis and write up, but my aim is to understand others' experiences and views, rather than how these align with or contradict my own. My reflections will be on-going in this thesis and, where possible, I will attempt to highlight my position in my research design, analysis and findings. In the conclusion, I will reflect on the study and its outcomes in more depth and provide a small epilogue to articulate how this research has changed my perspective of DigiTech and what I might do differently if I were to do the study again.

The purpose of this research has, therefore, developed from two overarching areas: (1) DigiTech use in PE, and (2) PE teachers' beliefs regarding the pedagogical use of DigiTech. These are broadly discussed in the section below and serve as the focus of the literature review that follows. This introductory chapter discusses the background to this thesis before exploring the research aims and questions. The chapter concludes by providing an outline of the structure and content of the chapters that follow.

### 1.2 Background

In the rapidly evolving society of the 21<sup>st</sup> century, DigiTech is playing an important role in the lives and homes of many people in developed countries. DigiTech devices are widely seen as tools to enhance learning and a means of making our lives more efficient (Livingstone, 2012). In line with societal trends, the integration of DigiTech in education has increased in recent years. This has resulted in a plethora of opinions and investigations among educators and researchers with regard to its place in, and impact on, education (Casey et al., 2017a; Ertmer et al., 2012).

DigiTech is positioned as a key component in educational improvement around the world. The Digital Technologies Curriculum in Australia (Australian Curriculum, Assessment and Reporting Authority, 2015), the National Curriculum for Computing in the UK (Department for Education, 2013), and the National Education Technology Plan in the United States (Office of Educational Technology, 2016) all serve as examples from the English speaking world of DigiTech's prevalence in policy rhetoric. It may be safe to assume that these policies and national curricula were developed in the belief that DigiTech is both potentially beneficial for education and would ensure support for more efficient teaching and learning (Fullan, 2013; Selwyn, 2014a). However, the ways in which these strategies may ultimately contribute to DigiTech's integration in schools remains largely unexplored (Tondeur et al., 2016b).

Due partly to the rise in the number of academy schools in the UK, flexibility in terms of curriculum content and approaches to teaching means the use of DigiTech in schools has diversified. With the absence of formal guidelines to structure the use of DigiTech, schools have been left in an ambiguous situation. Schools and teachers are not required to use DigiTech; yet policies and curriculum guidance encourage schools and teachers to “foster the integration of ICT in teaching and learning processes” (Tondeur et al., 2007, p.963). In 2011, for example, the UK (the context in which this research is situated) Government's inspectorate, the Office for Standards in Education (OfSTED), argued that schools should ensure that “all students are able to benefit from the use of information and communication technologies (ICT) and applications across *all subjects*” (OfSTED, 2011, p.8 emphasis added). Two years later, however, the inspectorate were still noting the rarity of teachers' use of DigiTech and took to questioning the impact on students' learning in subjects such as PE

## Chapter One: Introduction

(OfSTED, 2013). Therefore, despite the increase in guidance and investment, DigiTech is not embedded into everyday schooling (Selwyn, 2014a).

Against this backdrop, the PE curriculum has focused some of its attentions towards DigiTech. In 2015, the Department of Education made DigiTech an explicit part of the PE General Certificate of Secondary Education (GCSE) and Advance level (AS and A-level) subject content. The GCSE and A-level specifications suggest that students should be equipped with knowledge and understanding in “the role of technology in physical activity and sport” (Department for Education, 2015, p.3). The minimum requirement for these specifications is “the use of technology to analyse physical activity and sport” (Department for Education, 2015, p.7). In the same year, the Future Foundation (2015) published a report that looked ahead 20 years to 2035 and asked what PE and school sport might look like. They argue that “technology should be at the front and centre of sport engagements strategies” (Future Foundation, 2015, p.5) and question the expectations and possible futures of PE. Given that there are many possible futures for PE (Kirk, 2010), DigiTech presents both opportunities and challenges to teachers and schools that are tasked with negotiating the best place for, the value of, and a rationale for DigiTech use.

Whilst we have seen the increasing recognition of DigiTech in government agendas and reports, little has reportedly changed regarding our current understanding of how DigiTech is used in UK PE lessons (Casey et al., 2017a; Lupton, 2015). Previous research conducted in the UK, that the most widely used piece of DigiTech used in PE was a compact disc player (Thomas and Stratton, 2006): a piece of DigiTech that has subsequently become obsolete in most households let alone educational contexts. Furthermore, the most common use of DigiTech by teachers was to monitor, assess and report on students (Thomas and Stratton, 2006). Beyond this there is sparse up-to-date understanding of how and why DigiTech is being used in PE: both internationally and in the UK.

From a pedagogical perspective, what PE teachers think, say and do with DigiTech has received little attention (Lupton, 2015). Subsequently, insufficient research has been conducted on PE teachers’ views of DigiTech. This dearth of research results in a field that is increasingly well versed in discussions about how DigiTech *could* be used in PE. Worryingly, this lack of research means the field appears less competent and confident

## Chapter One: Introduction

having discussions about how and why DigiTech is *actually* being used (Selwyn, 2014a). In addition, little information exists about what shapes or contributes towards a teacher's DigiTech practices (Prestridge, 2017). Consequently, a more complex understanding of pedagogy and the places where learning, teaching and context converge with DigiTech is required (Casey et al., 2017b).

The lack of information regarding DigiTech use may be due to the way that research has addressed and positioned teachers and their pedagogical beliefs regarding DigiTech. For example, scholars in the educational literature have suggested that: teachers' beliefs are often positioned as a barrier to DigiTech integration (Underwood and Dillon, 2011); teachers are labelled as the problem as to why DigiTech integration has not been achieved (Orlando, 2015); and teachers are often blamed for failing to see the 'obvious' benefits of DigiTech for their classrooms (Perrotta, 2013). As a result of the current focus of research in this area, there is a call to move away from what Perrotta (2013, p.315) calls "discourses of deficiency" and a need to more deeply explore PE teachers' beliefs regarding the pedagogical use of DigiTech.

In addition, there is no real consensus as to the 'types' of teacher beliefs that influence DigiTech integration (Kim et al., 2013). Teachers' beliefs regarding the use of DigiTech are based on a variety of factors such as pedagogical (Prestridge, 2017), value (Ottensbreit-Leftwich et al., 2010) and teaching and learning beliefs (Park and Ertmer, 2007). Thus, it is important to explore further not only what pieces of DigiTech are being used, but also, how and why they are being used to enhance students' learning. This information is pertinent not only to counteract the narratives mentioned above, but also to acknowledge that there are many factors that can also support a teacher's use of DigiTech in subjects such as PE.

As a result of these proposed gaps, it is particularly timely and pertinent to explore the practical and pedagogical realities of how and why current UK-based PE teachers use DigiTech in their practice. If we can better understand the views and experiences of teachers in regard to how and why they use DigiTech, then we can gain more information on what teachers believe are beneficial pedagogical approaches to be used with DigiTech. Furthermore, we can also begin to appreciate how teachers can be better supported in developing meaningful pedagogical experiences for themselves and their students.

The absence of a formal and established ICT curriculum leads to an ambiguous situation, because there is nevertheless an observable policy towards the adoption of ICT in schools. This policy fosters the integration of ICT in the teaching and learning processes but builds on the professional attitude and willingness of the individual teacher and school principal. Whilst the potential for the use of DigiTech in PE is considerable, the realities in practice are often unplanned (Tearle et al., 2005).

Against this background, this thesis set out to explore PE teachers' understanding and experiences when seeking to use DigiTech in their practice. More specifically, it aimed to understand the pedagogical use of DigiTech from the teachers' construction and perspective, which included the factors and experiences that influence how and why PE teachers used DigiTech. Through the research questions below, I set out to answer how and why DigiTech was being used in PE, teachers' rationales behind its use and the factors that influenced practice with DigiTech. The questions therefore were centred on teachers' experiences and views of DigiTech, teachers' use of DigiTech and the school/contextual factors that enabled its use.

***(RQ1) How do physical education teachers view and use DigiTech in their practice?***

1. How are these practices developed and/or sustained across their careers?
2. How do individual's views and experiences of DigiTech shape the use of DigiTech in the school context?

***(RQ2) Why do physical education teachers use DigiTech in their practice?***

3. What are the factors that prompt PE teachers to use DigiTech?
4. What role does the school context play in shaping teachers' DigiTech use?

In the chapters that follow, I seek to identify some answers to these questions through the use of AI, case study approach and the use of grounded theory analysis.

### **1.3 Structure of thesis**

Following this introductory chapter, the thesis is presented in nine further chapters. This section outlines the content of each chapter.



## Chapter One: Introduction

**Chapter Two - *Review of the Literature*** - locates this thesis, and the research questions, in the context of existing literature pertaining to DigiTech, pedagogy, PE and teachers' beliefs. Several salient issues are discussed in relation to DigiTech, its emergent position in PE and the lack of critical discussion in relation to pedagogy. This is discussed alongside the role of the teacher and their beliefs in terms of pedagogy and DigiTech. The analysis of the literature presents the argument for a greater focus on pedagogy and DigiTech in the context of PE research and foregrounds this discussion with a focus on the teachers' perspectives. Furthermore, it argues that due to a barrier-focused approach to documenting teachers' views and beliefs regarding DigiTech, to attempt to move the field forward we should explore teachers' views and beliefs from an AI perspective.

**Chapter Three - *Conceptual Framework*** - provides an overview of the concept of appreciative inquiry that has informed this study. It discusses the current literature and appreciative inquiry's emergence in organisational development before discussing its burgeoning position in the PE literature. The chapter explores key aspects of the approach, including criticisms, and how it is interpreted for this thesis. This chapter goes on to highlight the benefits of utilising this concept to provide a lens through which to explore DigiTech, PE and pedagogy.

**Chapter Four – *Methodology*** - outlines the methodological approach used in this thesis and the ontological and epistemological assumptions which underpin it. The appropriateness and benefits of using an AI, case study approach with teachers is explained. This chapter discusses the constructivist approach to grounded theory which is used as the method of analysis before detailing the research design and the methods utilised in order to understand the intricacies of the teachers' DigiTech use. It also provides an overview of the participants, settings, analysis process and finer details of the data construction.

**Chapters Five, Six, Seven and Eight – *Patrick, Dillon, Alice and Harriet*** - Each chapter explains the perspectives of the four case study teachers and the three main themes of '*developing an embedded culture*', '*establishing routines*' and '*keeping tasks simple*'. These are discussed further through a variety of subthemes and an analysis of some of the literature pertinent to each case. **Chapter Five – *Patrick*** - explores his experiences regarding the

## Chapter One: Introduction

positioning of himself as an on-going learner, the role of the school as a catalyst to his development and the need to embed simple cultures and routines of DigiTech use. **Chapter Six – Dillon** - unpacks how Dillon sought to embed a culture of DigiTech use in his department through trial and error. Keeping tasks simple ensured that DigiTech was focused on students' learning and Dillon sought to establish routines of practice to increase his own and students' familiarity with DigiTech. **Chapter Seven – Alice** - describes Alice's simple uses of DigiTech to help enhance her delivery of information. Alice sought to establish routines of practice with DigiTech in order to develop a positive relationship with her students and highlighted the role of the school as important in providing consistent messages to students regarding DigiTech use. **Chapter Eight – Harriet** - demonstrates how Harriet used DigiTech in small and simple ways to support her communication with students, her students' skill development and assessment. Harriet reflected on the need to establish regular uses of DigiTech to improve her students' expectation for learning with DigiTech.

**Chapter Nine – Discussion** - draws together the findings of the research and discusses them in relation to the research questions and the literature. In particular, this chapter is guided by a pedagogical analysis of 'pedagogies of technology' as a means to discuss the overarching themes across cases. It is argued that, by using pedagogy as the starting point of our analysis of how and why we use DigiTech, we can begin to support the use of teachers' DigiTech use in PE towards students' learning.

The final **Chapter (Ten) – Conclusion** - closes this thesis by discussing the four elements of AI as a means to bring together the findings explored in Chapters 5-8: *Discovery* explores the key findings and their significance in terms of pedagogical reflection and the pertinence of the teachers' learning process; *Design*, discusses my reflections on the research process and incorporates the implications of this research for practice. This is discussed in terms of using pedagogy as a starting point and the importance of trial and error. Furthermore, it discusses the implications and reflections for future research using AI. *Dream and Destiny* considers future directions for research in the field in regard to focusing on the 'realities of practice' through avenues such as self-study and research *with* teachers and students.



# Chapter Two: Review of the Literature

## 2.1 Introduction

This literature review draws upon current research in relation to DigiTech, pedagogy, PE and teachers' views. It will be argued that there is a need for a better understanding of both how PE teachers view and subsequently use DigiTech in their practice and the contributing factors as to why DigiTech is used. Furthermore, and through discussing the literature surrounding teachers' knowledge and beliefs in relation to DigiTech use, the argument is presented that research has mostly focused on the barriers of DigiTech integration whilst viewing teachers as a 'problem'. By contrast, the position taken in this literature review is that we need to be cautious of a barrier-focused approach to teachers' DigiTech practices and move away from a focus of documenting the factors that are seen to inhibit progress. Consequently, it is argued that a change in the way we 'frame' our understandings of these experiences may allow us/the field to take a step forward in understanding DigiTech in PE practice.

## 2.2 What is technology?

Arthur (2009) argues that most of us do not stop to ponder technology. It has become so commonplace in our everyday lives (certainly in advanced industrialised, Western and Westernised societies) that many of us do not question it. In a given period of time, many technological innovations were seen as 'new'. For example, when first introduced, the television was seen as 'new technology'. However, now we rarely stop to think about the television as 'new' technology. Even more fundamentally we might ask, is a pencil or a pen still considered a form of technology? These questions seek to problematize our personal definitions of technology and demonstrate that they are both historical and temporal. It would seem pertinent, therefore, to discuss some of the definitions of technology that capture contemporary thoughts on its nature.

Technology remains an "unusually slippery term" (Nye, 2007, p.15). Many scholars refer to technology but do not provide a definition, or bring to the fore their understanding, of the term. There is, however, much to be gained from a more precise examination of how the term is actually used (Dron, 2013), especially in deconstructing its intricacies and differing

## Chapter Two: Review of Literature

features from digital forms of technology. Feenberg (1999, p.xi) argued that the “essence of technology, whatever that is, ought to...have categories under which we can recognise aspects [of technology] that are not reducible to a means-ends relationship”. To put this more simply, not all aspects of technology can be reduced to the sole purpose of achieving something else (e.g. economic gain or power). This argument is illustrated by Golding (2000) who contends that essentially these ‘means and ends’ arguments (or the meaning of technology and the outcomes of its presence) create two types of technology: Technology One and Technology Two. ‘Technology One’ allows “existing social action and processes to occur more speedily, efficiently or conveniently” (Golding, 2000, p.171). Whereas, ‘Technology Two’, “enables wholly new forms of activity previously impracticable or even inconceivable” (Golding, 2000, p.171). For example, a ‘Technology One’ would be the laptop computer where the user can more conveniently transport their computer. A ‘Technology Two’ would be the original telephone, which permitted two or more users to conduct a conversation when they are too far apart to be heard directly. Golding (2000) argues that in essence, many more DigiTech devices are Technology One, rather than Technology Two.

Selwyn (2012a) contends that we must resist the temptation to swiftly associate technology with inevitable change or progress and remain mindful of the continuities, recurrences and repetitions associated with ‘new’ technologies. In other words, we must not assume that all technologies enable new practices or activities to occur. As Arthur (2009, p.51) discussed, technologies are not just tools but a “collection of phenomena captured and put to use”. Thus, he viewed technology as objects that can be formed into endless new combinations and highlighted the use of the technology over the technology itself. This use and purpose of technology is well illustrated by Dron (2012, p.25) in stating that:

“A tool separated from its use is meaningless: a stick lying in a forest is just a stick. If it is picked up by an ape to extract ants from a nest, it then (and only then) becomes a technology”.

In essence, Dron (2012) argues that technologies’ uses and purposes vary, dependent on the context in which the technology finds itself. The centrality of purpose and context is also

## Chapter Two: Review of Literature

discussed by Arthur (2009). He (2009, p.28) argued that there are three definitions for technology:

1. Technology as a means to fulfil a human purpose.
2. Technology as an assemblage of practices and components.
3. Technology as the entire collection of devices and engineering practices available to a culture.

For Arthur (2009) these three definitions point towards technology as having multiple definitions and meaning. Taking into consideration the ideas of Feenberg (1999), Golding (2000) and Arthur (2009), a common thread and overall definition emerges; that technologies have (in some capacity) a purpose and occur in many forms (i.e. a device, method or process). These definitions are appealing as they apply technology as a process and also a product (Dron, 2013). It can, therefore, be summarised that technology can allow processes and actions to occur in quicker, more efficient and convenient ways, but also in some cases allow new processes of activity to occur. However, in adopting this position it is pertinent to consider what is considered as technology by its user, as it is ultimately that person who decides on how and why the technology is used. Thus, technology may not always be seen as making processes or actions occur more efficiently or appear convenient. In considering how and why technology is used, the focus moves to education as a specific area of society that has developed (and has developing) use of technology.

### 2.3 Technology in education

Selwyn (2012b, p.216) posits that “taking a historical perspective should underpin any academic account of education and technology”. Framing the development of education and technology from a historical perspective can have many benefits. For example, it provides a rich framework for exploring contemporary contexts and issues (Edwards, 2012) and “offers clearer understandings of the meanings and significances attached to technologies before they are seen to be inevitable, invisible and somehow ‘natural’ within education” (Selwyn, 2012b, p.216).

Education has been subject to a variety of technological innovation and debates amongst academics, policy makers and schools in regard to whether technology is ‘good’ or ‘bad’, or

## Chapter Two: Review of Literature

how technology can best be used to reach educational goals. Against this backdrop, technology's position in education provides a fruitful area to explore and narrows the broad lens of technology integration into a specific area of society.

What one means when one talks about 'educational technology' has changed over hundreds of years (Ferester, 2014). Sometimes we talk about technology in relation to the artefact itself and other times the meaning or outcome of its use. In this way, Pinto (2016, p.9) suggests that there tends to be a "pattern of entanglement" between the subject (i.e. the teacher or education) and the object (the technology). For example, one of the earliest innovations in 1467 was the hornbook. The hornbook was a leaf of written or printed paper, pasted to a board and covered with horn. The significance of the hornbook is that it directly married a teacher's delivery and subject content into a physical device (Ferester, 2014). In other words, the content or object of study could be displayed on the hornbook for students to learn and could also be used as a tool by teachers. This was similar to many of the educational technologies in the early 1700's, such as the goose quill pen and ink, which tended to be centred on the student rather than the teacher (Ferester, 2014). It was a tool for students' learning rather than teacher's delivery of content. This development was followed by the basic form of the textbook in the 18<sup>th</sup> century which became widely popular as 'teacher helpers' (Cuban, 1986; Ferester, 2014). The textbook limited the autonomy of individual teachers and produced a more uniform and controlled experience. The textbook developed how information was communicated and framed as a syllabus of material for reference (Edwards, 2012; Ferester, 2014).

The rise of 'teaching machines' was also popular in the 1960's and 1970's and was founded upon the notion that any subject could be broken down into a series of component parts and taught in small steps or frames (c.f. Edwards, 2012; Ferester, 2014). For example, Skinner (1958) believed that teachers must have the help of mechanical devices (e.g. film projectors, television sets and tape recorders) to supplement lectures, demonstrations and textbooks. The rationale behind this perspective was that the technology could support teachers to present clear and interesting information for students to learn and to promote a productive interchange between teacher and student (Skinner, 1958). In order to promote this, Skinner (1958) suggested that reinforcement via teaching machines would allow for specific forms of learning behaviour to be controlled and maintained. Teaching machines allowed students to

## Chapter Two: Review of Literature

compose a learning response or select a response from multiple choices. This was known as ‘programmed learning’ as students needed to answer questions correctly to move forward to the next sequence of questions. Despite its initial uptake (albeit mainly in the USA), programmed learning did not revolutionise education (e.g. by improving examination performance or making students enjoy their subjects more).

In the 1980s and 1990s, constructivist theory of learning came to dominate the field of educational technology. This theory was driven by the notion of students constructing their own understanding and learning through the use of educational technologies and was rooted in a process of exploration, inquiry, interpretation and meaning making (Selwyn, 2011a). Constructivist theories of learning with educational technology, therefore, placed a larger emphasis on learning as a more active process.

Print culture brought a number of significant changes to education. Because text could be reproduced, a much wider audience could be reached and the dominant means of transmitting ideas and knowledge became visual (Edwards, 2012). In the 19<sup>th</sup> century, the focus of instructional tools shifted from the student to the teacher and focused upon whole-class presentations through technologies such as chalk and blackboards (Ferester, 2014). Between 1920 and 1980, educational technology became synonymous with audio-visual technology such as slide projectors, film and televisions (Cuban, 1986; Edwards, 2012; Ferester, 2014). In essence, the focus was on ‘Technology One’ (Golding, 2000) and making actions and processes in the classroom occur in quicker, more efficient and convenient ways, rather than allowing completely new processes of activity to occur. As such, much of the justification for technology was as a form of pedagogic corrective. In other words, a means to encourage certain forms of learning into formal educational settings that are otherwise seen to be lacking (Selwyn, 2011a), and for these processes to be more efficient.

These discussions on the early development of educational technology outline the varying interpretation and drivers of technology in education. Similarly, it documents the challenges faced by early adopters and questions that arose on how best to use technology in an educational context. These debates continue to occur when we look at DigiTech and its place in education and will be the subsequent focus of the next section.



### 2.4 DigiTech introduction

It is not the intention of this section to discuss the history of DigiTech. Whilst this is important, it is not specifically relevant to this study and is not covered in detail for this thesis (see Freeman and Louca, 2001 for a fuller discussion). What this section will discuss is the emergence of DigiTech in education and why it is the focus of this thesis.

Revisiting Arthur's (2009) argument that we have multiple definitions of technology and multiple eras from which they emerge, for the purposes of this thesis the term 'DigiTech' is used. This term was first coined by Casey et al. (2017b) and refers to digital forms of technology (such as electronic hardware systems, personal computers, audio-visual devices, ICT, worldwide web content, internet applications, computer software etc.) and differentiates between discussions on technology and DigiTech. The rationale behind such an approach is that 'new' forms of technology are primarily concerned with DigiTech. For example, pre-digital technologies such as the pen or whiteboard are now being converted into digital formats such as the interactive whiteboard and pens.

We live in an increasingly digitised society, in which social relations, institutions and spaces have become profoundly configured by DigiTech (Lupton, 2015). In essence, we now have a stronger focus on Technology One (technology that allows quicker and more efficient processes) rather than Technology Two (enables new forms of activity). In a similar vein, the use of DigiTech is not commonplace to many teachers' practices and, thus, the use of DigiTech has been argued to require teachers to adopt new pedagogies (Ertmer, 2005). Subsequently, given the conceptual understanding that DigiTech has the potential to change the nature of instruction (see Herrington et al., 2008) and the difficulty of their integration in schools, DigiTech provide an important aspect of education to explore in relation to teaching, learning and context.

#### 2.4.1 *DigiTech history*

Although our current lives may seem saturated with DigiTech, the digital era (commonly referred to as the third wave or information age by Toffler (1984)) began around the mid 1900's. Prior to this digital period, the economy focused on information which was analogue or the use of information represented by a physical product such as hands on a watch or

## Chapter Two: Review of Literature

written letters (Tapscott, 1996). During this time there was a shift away from traditional industry (e.g. agriculture, coal mining) towards the mass production of goods and products (Freeman and Louca, 2001). Increasing efficiency in the manufacturing process was coupled with the drive to improve communication and information systems. The transition from an analogue to a digital economy was facilitated by digital devices. These devices allowed the free movement of vast amounts of information in the shortest time possible. The advantage of digital over analogue information has led to the idea of ‘the digital’ being associated with a number of wider qualities and characteristics (e.g. more precise, accurate, quicker and efficient than analogue) (Selwyn, 2011a).

DigiTech is subsequently associated with dramatically enhanced and improved ways of doing things (Selwyn, 2011a). Areas such as healthcare, travel and education are examples of societal spaces where this ‘new’ progress could/has occurred (Tapscott, 1996). In particular, many discussions around the digital age tended to be informed by a notion that DigiTech represented a distinctively new and improved set of social arrangements in relation to preceding ‘pre-digital’ times and especially so in education (Selwyn, 2011a). This notion will be problematized in the following section where the argument will be made that the hopes and promises of DigiTech to ‘change’ education for the better have largely not materialised. This section will also discuss the nature of the debates around DigiTech’s place in education and the need for further discussion around its position in teaching and learning.

### ***2.4.2 The development and implementation of DigiTech in education***

In the late 20<sup>th</sup> century the introduction of the television, computer and tape recorder provided an electrical dimension to technology and was commonly referred to as Information and Communication Technologies (ICT) (Selwyn, 2011a). The rise of DigiTech was partly due to a drive by educationalists who concentrated on solving the nation’s economic problems through educational reform (Cuban, 2001). The New Labour government at the time, argued that schools were not keeping up-to-date with the increasing technological innovation in the workplace. This prompted reforms (for example the National Grid for Learning – see Selwyn, (2000)) to make schooling more relevant to the ‘outside’ world (Edwards, 2012). The backdrop to the rise of DigiTech in schools was, therefore, a belief that technology could act as a ‘technical fix’ for underperforming and failing schools. These

## Chapter Two: Review of Literature

reforms made explicit that state schools<sup>1</sup> served a fundamental economic purpose, i.e. investment in DigiTech for schools was meant to ensure that they could operate more efficiently, faster and support better teaching and learning (Cuban, 2001). This belief centred on the idea that computing techniques would be required for future careers and, therefore, schools needed to teach these skills as part of the curriculum. These ideas regarding DigiTech's purpose for education helped change expectations of what teaching and learning should be like in classrooms (Sutton and DeSantis, 2016). However, as Selwyn (2011b, p.60) pointed out, the “economic rather than the pedagogic significance of schools’ (digital) technology” tended to shape its implementation in the classroom and continues to do so.

Many pieces of DigiTech can be viewed as a ‘Technology One’, as they were thought to allow educational processes to occur more efficiently. The assumption was that increased availability of DigiTech in schools would lead to increased usage of these tools. Furthermore, it was envisioned that computers would allow students to proceed through learning material at their own pace (Edwards, 2012). This, in turn, was intended to lead into more efficient teaching, learning and better graduates for the workplace. Selwyn (2011b) discusses how the initial attempts to incorporate DigiTech in schools were followed by policies seeking to address issues of pedagogic practice to stimulate a ‘bottom-up’ demand among teachers, parents and school administrators for technology-based learning and teaching. Furthermore, the process did not go as smoothly as anticipated as initial implementation of pieces of DigiTech were hindered with the high cost, unreliability and over-selling of hardware which resulted in a shortage of suitable software (Rowntree, 1974). The increasing spread of DigiTech was accompanied by a body of research and opinions into the pitfalls and benefits of DigiTech use (Underwood, 2004). It is to these debates which I now turn.

### ***2.4.3 DigiTech – good or bad for education?***

The introduction and involvement of DigiTech in education prompted discussions in academia on DigiTech's future purpose or goals for education. This was particularly spurred

---

<sup>1</sup> In the UK, state schools refer to those which government-funded schools which provide education free of charge to students.

## Chapter Two: Review of Literature

by the expensive nature of DigiTech and the drive from government and researchers to question and evaluate whether it was a ‘good’ or a ‘bad’ investment in education. As a result, emergent views on DigiTech and education generally fall between two opposed camps. One presents DigiTech as inevitable progress for education: a neutral tool for thought or an optimistic perspective (Kritt and Winegar, 2007). The other is “cast as Luddite” (Kritt and Winegar, 2007, p.3) which is the view against new technological innovation of any kind creating an pessimistic perspective of the need for DigiTech in education. These opposing sides present two extremes of the argument (for and against DigiTech in education) and represent the fundamental differences in values towards what DigiTech is, how it is used and to what purpose. As Burns (2013) summarises, the temptation is to ask: which camp is right? However, it is more useful to examine the substance of issues raised by each side.

### ***2.4.4 Optimistic perspectives of DigiTech***

The optimistic side of the debate involves a small but significant group of ‘utopians’<sup>2</sup> who see DigiTech as revolutionising education and have voiced this expectation (c.f. Beynon and Mackay, 1992; Burns, 2013; Papert, 1993; Prensky, 2010). Papert (1980) for example, argued that the computer would be a significant part of every child’s life resulting in schools becoming obsolete. This optimistic perspective is also multi-faceted and encompasses not only the opinions of academics but also politicians, policy makers, the media and national agencies. An example of this is the British Educational and Communications Technology Agency (BECTA) who were the lead agency in the UK for promoting the integration of ICT in education and published many reports around DigiTech use in schools. Latchem (2014) argues that governments still regard DigiTech as a panacea and invest large amounts of money into DigiTech despite research that shows a lack of meaningful relationship between DigiTech and areas such as student performance (Organisation for Economic Cooperation and Development, 2015). Despite the apparent uncertainty with predicting possibilities for the future of educational DigiTech, many scholars are not deterred from speculating widely about this field. The tendency for some of these commentators is to speak and write as if education’s digital future was a settled, unambiguous and inevitable matter (Pluim and Gard, 2016). For example, Mohnsen (1995), in her book for using DigiTech in PE, suggested that

---

<sup>2</sup> A term coined to refer those with the belief founded upon or involving idealised perfection.

## Chapter Two: Review of Literature

by 2010 DigiTech would be used seamlessly in the classroom and predicted later on that students “may even possess their own personal trainer in the form of a hologram or robot” (Mohnsen, 2003, p.7). Whilst this claim has been proven false, it seems that many scholars “are reduced to guessing games when it comes to predicting the near future” (Selwyn, 2007, p.31).

Today we see the hyping of DigiTech in the media and DigiTech companies (e.g. Apple, Google) marketing and selling large amounts of devices to schools. This can be illustrated through the ‘one laptop per child’ approach to extend the purported learning benefits of DigiTech to the world’s poorest teachers and students. This approach, as Burns (2013) argues, rests on the belief and hope that DigiTech will improve learning and the ever repeating cycle of both hope and hype (Latchem, 2014).

As a whole, these interests in DigiTech have accumulated to produce a continuous ‘buzz’ relating to what DigiTech in schools is capable of achieving, the benefits of investing in DigiTech and the future of its use. However, this is only one side of the continuum and whilst on the one hand we have optimistic perspectives on DigiTech for education, on the other hand pessimistic or sceptical opinions can be observed.

### ***2.4.5 Sceptical perspectives of DigiTech***

In stark contrast to the utopian view of DigiTech, some scholars openly question the value of DigiTech in education and its ‘false promises’ for the future. Critical views of DigiTech in education (c.f. Apple, 1992; Cuban, 2001; Oppenheimer, 2003; Selwyn, 2015) are increasingly appearing in the educational literature. However, this was not always the case. In many circumstances, DigiTech in education has often been a topic that rarely receives critical thought and attention (Selwyn, 2011a). This is not surprising given the advance of critical approaches to contradict these discourses being “ignored politely, or else shouted down as ‘Luddites’, ‘technophobes’ or ‘naysayers’ by journals and the field (Selwyn, 2011c, p.713).

Scholars such as Reynolds et al. (2003) argued that there is an ‘optimistic rhetoric’ informing educational DigiTech claims. Similarly, Nichol and Watson (2003) suggest that there is a gap between the rhetoric and the reality of DigiTech use in education. This is because pieces of

## Chapter Two: Review of Literature

DigiTech have claimed to be capable of revolutionising education, yet the evidence overwhelmingly suggests that they fail to be feasible and widely adopted in everyday teaching and learning (Latchem, 2014). Researchers who align with this view include Apple (1986) who suggested that the growth of DigiTech in education has helped reproduce inequalities of class, gender and race for many students and teachers. Similarly, Cuban (2001) points out that computers are oversold by policy makers and promoters, and underused by those in education. Oppenheimer (2003) looks more critically at DigiTech's 'false promise' for education and argues that DigiTech in the classroom can get in the way of learning processes and are not cost effective. Selwyn (2010; 2011c; 2014) takes a similarly critical stance and argues that DigiTech is something that can be both trusted *and* distrusted. Critical literature relating to DigiTech use in education is an emerging and growing body of literature (see Bulfin et al., 2015; Habler et al., 2016). Many of these scholars argue that uncritical thought around DigiTech in schools has resulted in many 'jumping on the bandwagon' so to speak, rather than being "*appropriately critical*" (Selwyn, 2014b, p.9).

Critical scholars suggest that we need to avoid imagining DigiTech to be a ready solution to existing educational problems. This has been characterised as a "dance between affordances and constraints" (Ferester, 2014, p.11) and is by no means a recent occurrence in educational discourse. This is clearly illustrated in Cuban's (1986) book around the early enthusiasm for film and wireless radio in education. Perhaps the most notable of these interchanges is the hope and hype of DigiTech to be the 'next best thing' for education. The excitement over the transformative potentials of the interactive whiteboard, for example, dominated educational discussions in the 2000s but was later eclipsed by the excitement of social media (e.g. Twitter and Facebook). Similarly, since their inception in 2010, portable DigiTech such as iPads have been celebrated as the latest 'must have' for education (c.f. Cavanaugh et al., 2012; Geist, 2011; Melhuish et al., 2010). This serves to support the argument made by Selwyn (2011c, p.714) in suggesting that "much of what is written and discussed about educational [digital] technology is...more a matter of faith than is a matter of fact". The cyclical nature of these celebratory and critical accounts reflects the politics of DigiTech use in education and these discussions are predicted to only continue in alignment with technological advances (Ferester, 2014; Selwyn, 2011c).

## Chapter Two: Review of Literature

The characteristics of these discussions on DigiTech and education, suggest that the arguments are far ‘messier’ than the rhetoric of change (whether optimistic or pessimistic) might suggest. The sentiment expressed by Biesta (2007, p.1) is that “...we should not expect that there will be only one answer to what constitutes ‘good’ education” or whether DigiTech is good or bad for education. It demonstrates that there are or should be healthy ongoing discussions about the purpose and direction of such common endeavours as education (Biesta, 2007, p.1).

### ***2.4.6 Researching DigiTech in education***

Whether coming from an optimistic, sceptical or somewhere in-between perspective, it becomes clear that a gap exists between how DigiTech *could* be used in education and the realities of how DigiTech are *actually* used in education (Selwyn, 2014a). Similarly, Fullan (2013) asks why has (digital) “technology dramatically affected virtually every sector of society that you can think of except education?” This difference in the actual and potential use of DigiTech in education is an argument that Pinto (2016, p.9) suggests “haunts educational discourse and practice”.

In light of the putative ‘failures’ experienced with DigiTech in education and the need to find out more information about DigiTech and teaching and learning, many government funded research projects were initiated. Both qualitative and quantitative methods have been used to investigate DigiTech in education and extensive research has been undertaken in this area (Cox et al., 2003; Twining, 2010; Selwyn, 2002). Within educational research literature as a whole, there has been a predominance of quantitative surveys and documenting data of DigiTech use through self-assessment measures (Jones, 2004; Karsenti and Fievez, 2013; Van Driel et al., 2007). An example of this would surveys that have asked teachers to quantify how often they use DigiTech in the classroom or how many students have access to computers in schools (c.f. Prestridge, 2012). Survey-based approaches dominated the literature between the 1970s and early 2000s (c.f. Cuban, 2001). However, due to substantial problems with using the results to quantify the amount of devices or access to inform practice in schools, Twining (2010) argues that this method would seem inappropriate for developing educational DigiTech use. This is because, as McDougall and Jones (2006) argue, DigiTech-focused studies, using survey-based techniques, do not generate the fundamental detail of use

## Chapter Two: Review of Literature

needed to refine and develop theory and practice in education. Subsequently, many researchers have turned their attention to qualitative studies to investigate DigiTech in education and explore its use in greater detail.

These discussions revolve around the idea that a qualitative dimension to educational DigiTech research would allow a focus on gaining greater and in-depth information on what *does* happen (as opposed to predicting what *could* happen) when DigiTech is used in educational settings (Selwyn, 2002). Thus, there has been a shift from predominantly ‘experimental based research’ to a greater reliance on interpretivist approaches to divulge a greater understanding into the complexity of DigiTech’s reality in education. Given the need for greater detail and depth of studies investigating educational DigiTech, there has been much greater support for a differing style of research techniques. McDougall and Jones (2006) contend that research questions around matters of learning and teaching (i.e. pedagogy) in regard to DigiTech are needed for quality research to advance knowledge and inform practice. They add that such studies will generally require longer timelines and more complex data gathering methodologies (McDougall and Jones, 2006). This would seem in alignment with many studies in the literature that have utilised a case study approach to investigate DigiTech practices in schools (c.f. Kopcha, 2012; Sinclair, 2009; Tondeur et al., 2015).

(Seemingly), these studies have attempted to enable aspects of educational DigiTech to be explored in depth (Twining, 2010). However, as Lupton (2015, p.129) suggests, research into how and why digital technologies are being used...requires far more investigation from social researchers”. Such approaches as Selwyn (2010) goes onto explain, do little to explain why DigiTech use (or not) takes place in ‘real-life’ contexts. Thus, gaining a sense of how and why digital technologies are being used in education is underpinned by understanding how these technologies are constructed, shaped and negotiated by a range of actors and interests (Selwyn, 2010).

In focusing on exploring DigiTech use in education, scholars across a variety of educational disciplines have become particularly interested in the areas of DigiTech, pedagogy and education. With a journal dedicated to the topic area (see the *Technology, Pedagogy and Education Journal*), this body of research seeks to focus on teaching and learning using



## Chapter Two: Review of Literature

DigiTech and explores the contribution of DigiTech to a number of educational environments. As Laurillard (2007) contends, precisely because of the richness of possibilities, we have to be careful to focus not simply on the DigiTech but also the pedagogy. Thus, whilst the argument may not be so ‘clear cut’ as to what is inherently good or bad for DigiTech in education, scholars such as Thorpe (2012, p.13) suggest that “if we find the educational achievements stimulated by DigiTech less impressive than their promise, it is in part a reflection of the enormity of the task that faces pedagogy”.

### 2.5 Pedagogical perspectives

Our understanding of pedagogy does not remain static over time (Webb and Cox, 2004). Watkins and Mortimore (1999) assert that conceptions of pedagogy have become more complex over time as the growing body of knowledge about DigiTech and education has become increasingly differentiated. Taking a historical perspective, Rogers (1995) looked at the early adopters of DigiTech innovations and found that innovations that have higher levels of relative advantage, compatibility, trialability, observability and low complexity are likely to succeed over those which possess lower levels of those attributes. Ferester (2014) argues that introducing (digital) technology into education fails to meet any of these requisites. As Derry (2008) and Mama and Hennessy (2013) explain, it is, in fact, unsurprising that DigiTech use has sometimes produced disappointing results in education because it is largely considered in isolation from its wider pedagogical setting.

The argument presented here, and discussed in the following sub-sections, is that when we talk about or introduce DigiTech in education, rarely do we think about it pedagogically. In few of the discussions represented above (both in relation to positive and critical debates) is the pedagogy surrounding DigiTech use even mentioned. Pedagogy is seen as a vital part of education, but there seems to be an assumption that once we have incorporated DigiTech, it will be used pedagogically. The next section will begin by defining pedagogy in relation to PE before this argument is discussed further. Pedagogy is a difficult concept to define as it has been used in many different fields. It is important, therefore, to understand some of the underpinning discussions around the terminology.

## Chapter Two: Review of Literature

### 2.5.1 *What is pedagogy?*

Pedagogy is an uncommon term in English language yet has been paired with many discussions on teaching methods and the organisation of learners (Edwards, 2012). A Google Scholar search of the term ‘pedagogy’ results in over a million results and serves to represent the vast uses of the term in a wide range of subfields. To pinpoint a singular definition of the term that crosses field boundaries and receives universal acceptance is a limitless task. In consequence, the boundaries of this discussion on pedagogy will reside in the field of PE, rather than education more broadly (with due recognition that many of the issues have also been explored in the context of other school subjects). The choice to discuss pedagogy in relation to a PE context will become clear as this literature review develops.

PE in the UK has only recently embraced the term pedagogy. Its increased usage, however, does not necessarily equate with coherent or shared understandings of what the term means (Tinning, 2008; 2010). There is an emerging consensus that pedagogy is the ‘proper’ object of study in the field of educational research and as Kirk and Haerens (2014) argue, it is timely to research pedagogy in specific contexts such as PE. Yet, even in PE, Armour (2011) suggests that identifying and describing a singular definition and understanding of the term pedagogy is a difficult task and, like all multidisciplinary endeavours, pedagogy lacks the comforting (albeit illusory) certainty of a single boundary. Pedagogy means “different things to different people” (Tinning, 1992, p.24) and in different contexts.

The term pedagogy was originally equated with teaching and instruction and paired with the term didactics (Tinning, 2010). Didactics was initially associated with the common definition of pedagogy as the “art or science of teaching” (Watkins and Mortimore, 1999, p.2). The use of this definition, however, has been problematized: its brevity may create its own difficulty since such a definition depends on the readers assumptions about ‘science’ and their conceptions of ‘teaching’ (Watkins and Mortimore, 1999). The term ‘didactic’ was developed and was defined by those such as Amade-Escot (2000, p.1) as the “features of teaching that are specific to ‘knowledge taught’ and the many changes and transformations that knowledge undergoes at the various stages of its selection and teaching”. In most European languages, didactics concerns the practice of teaching and its methods in general and/or related to specific to the subject matter (Amade-Escot, 2006). In other words, didactics is interested in

## Chapter Two: Review of Literature

the way content is structured in the school (subject) context and the significant elements of the teaching process.

Amade-Escot (2006) makes a point of distinguishing between the French speaking word *didatique* and the English language word didactic. *Didatique* is defined as “ the irreducible three way relationship linking teacher, student and a piece of knowledge to be taught and learned” (Amade-Escot, 2006, p.348). Amade-Escot (2006) argued that *didatique* is different from the English conceptions of didactics. Neither pedagogy nor *didatique* have a direct English translation and so many assumptions on the interpretation and application of the terms are made. This statement implies that the ways in which people think about pedagogy and *didatique* are informed by particular knowledge paradigms and ways of seeing the world (Tinning, 2010). Tinning (2008) was keen to avoid this narrow conceptualisation of pedagogy, believing that a broader notion would be of greater value to the field. Thus, the position here is that there can never really be a ‘right or wrong’ definition of the term, but different use of the definition dependent upon our experiences, professional knowledge, backgrounds and worldviews.

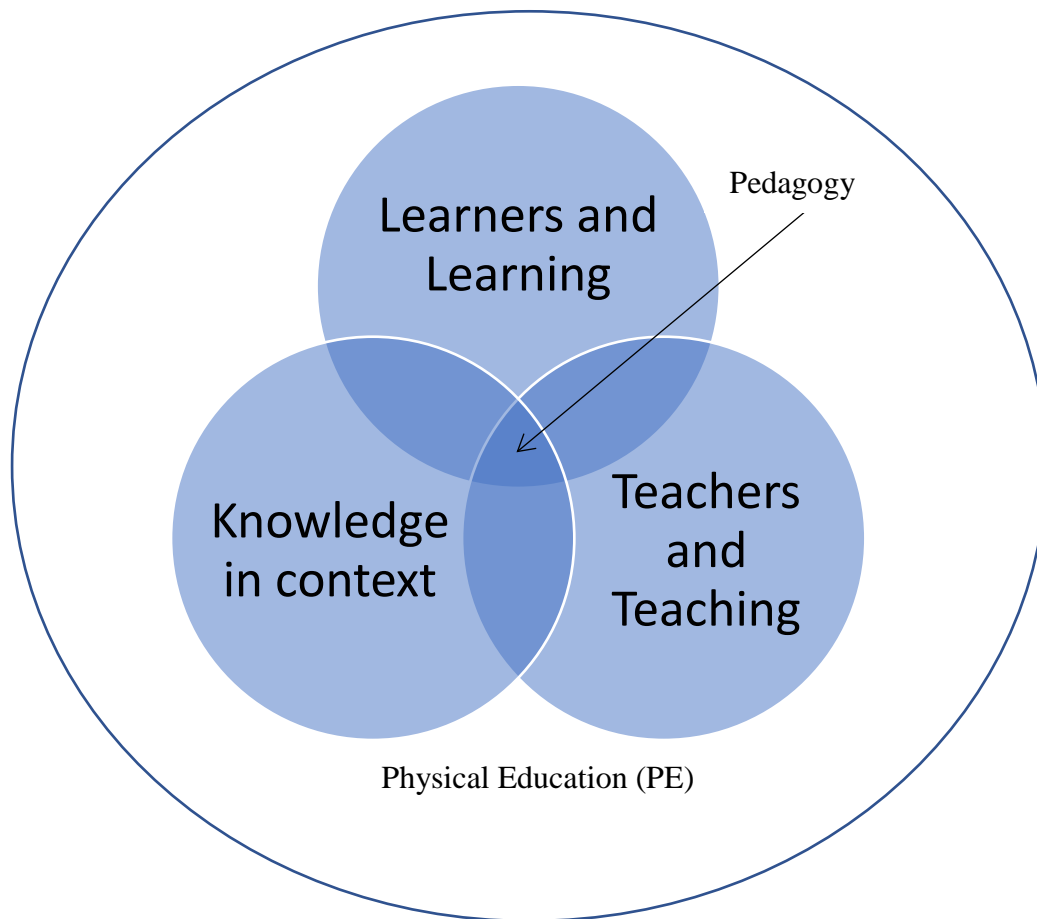
Hamilton (1999) suggests that pedagogy and didactics have an overlapping and intersecting history. However, pedagogy was seen to move away from *didatique* in the late 1900’s and was viewed as process rather than a technique (Tinning, 2010). Research into pedagogy as a process resulted in the educational research community attempting to find the ‘best’ teaching method or ‘right way’ to teach (Tinning, 2010). This is significant because it is argued that it would be “inappropriate to reduce the concept of pedagogy to ‘merely’ instruction” (Armour, 2011, p.16); something more is going on. This line of discussion was initiated in the early 1990’s by Evans (1990) and Tinning (1992) who warned against the ‘scientization of PE’ through viewing pedagogy as a process that could be measured and tested.

For Tinning (2010) *didatique* rather than didactic falls more in line with current conceptions of pedagogy in PE. For example, Kirk et al's. (2006, p.xi) definition of pedagogy as the three key elements of “learning, teaching and curriculum”. Similarly, Armour (2011) recognises this triad of ideas in the conception of sport pedagogy. For Armour (2011) sport pedagogy consists of the interaction of knowledge in context, learners and learning and teachers/teaching. The knowledge in context dimension of pedagogy is the selection of appropriate knowledge to be taught or learnt and is contingent upon a range of contextual

## Chapter Two: Review of Literature

factors such as the national curriculum or cultural factors (Armour, 2011). Learners and learning knowledge of learning theories and the ability to understand children and young people as diverse learners (Armour, 2011). Teachers/teaching models lifelong learning for children and young people and, thus, any pedagogical encounter between teacher and learner is the presence of all the three dimensions interacting together (Armour, 2011). For these PE scholars (Amade-Escot, 2006; Armour, 2011; Kirk et al., 2006), pedagogy is concerned with learning, teaching and the curriculum and can be conceptualised as being where these three areas meet (see Figure 1). Pedagogy, for the purposes of this literature review is, therefore, viewed as the intersection and triadic relation between learners and learning, teachers and teaching and knowledge in context in the context of PE.

2.5.2 Figure 1: A triadic model of pedagogy (Armour, 2011)



This next section will focus on the link between DigiTech and pedagogy and the debates in the literature around the need for more pedagogy-focused studies on DigiTech integration in education and PE. The argument will be introduced around how DigiTech has become so

## Chapter Two: Review of Literature

familiar in education that it sits outside of our critical attention (and research) and, thus, we rarely think about DigiTech pedagogically. Additionally, this section will negotiate the lack of subject-specific research in this area and focus on PE as an under-researched subject.

### 2.6 Pedagogy and DigiTech relationship

In the same way that neither DigiTech, nor the debates about its use, are something ‘new’, the call for a pedagogical, rather than a technological goal for integrating DigiTech in education is not a novel argument (Casey, 2014; Ertmer and Ottenbreit-Leftwich, 2013). Early work by Cuban (1986) and Beynon and Mackay (1992), for example, began to describe the ways computers were being used pedagogically in education. In light of such pedagogical discussion, Somekh and Davies (1991) explored the need for a pedagogy for DigiTech. Since then scholars such as Jonassen (1996) and Watson (2001) have urged us to shift our emphasis from technological tools to pedagogical goals (Ertmer and Ottenbreit-Leftwich, 2013). Pedagogy at the turn of the millennium, began to “find its own voice” (Watson, 2001, p.252) and activated the pedagogical focus of larger government studies. For example Veen (1993) found that teachers’ beliefs about the content of their subject and its associated pedagogical practices greatly influenced their use of DigiTech.

Another example of pedagogical and technological pairing is found in the research reports commissioned by British Educational Communications and Technology Agency (BECTA). In a report to the Department for Education and Skills, Cox et al. (2003) concluded that teachers’ pedagogies and pedagogical reasoning influence their use of DigiTech and thereby pupils’ attainment. In 2004, Webb and Cox's (2004) review of the literature reported that new affordances provided by DigiTech in the learning environment required teachers to undertake more complex pedagogical reasoning in their planning and teaching. In addition, their review showed that teachers’ beliefs about the value of DigiTech for learning and the nature of successful learning environments are important in teachers’ pedagogical reasoning. These research studies began to present “an understanding of the pedagogical principles that are specific to the use of (digital) technology in instructional settings” (Diaz and Bontenbal, 2000, p.2).

## Chapter Two: Review of Literature

The research explored above suggests that greater consideration is needed of fundamental educational issues (i.e. pedagogy and in subject areas such as PE) to improve DigiTech integration (Webb and Cox, 2004; Cox et al., 2003). Like others, I would argue that the cart had been placed before the horse (Watson, 2001). In other words, we have thought about DigiTech (the what) and its potential for education yet we haven't looked at the pedagogy (the how). With the imperative to effectively embed DigiTech into the educational system (Underwood and Dillon, 2011), there is a greater need to explore the factors of knowledge in context, teaching and learning that surround DigiTech.

Dron (2012) argues that perhaps the biggest oversight is because most studies concentrate on the DigiTech, very few spots the elephant in the room: the pedagogy. In this sense, for many it is "as if pedagogy is irrelevant" (Fullan, 2013, p.39). In Watson's (2001, p.251) and Crook et al.'s (2008, p.6) words respectively, we need to "put pedagogy before technology" and "rethink the relationship between technology and teaching". To say "pedagogy must come before technology reflects the wish to consider *how* we want to teach before we consider the technological *means* that we use to accomplish it" (Dron, 2012, p.25). In other words, this outlook is a step towards a different direction for research in DigiTech integration to emphasise the how (pedagogy), not what (DigiTech).

Over a decade on from Somekh and Davies (1991) call for a pedagogy of technology, the gap in the research literature still remains. Okojie et al. (2006, p.68) suggested that, the "intricate relationship between technology and pedagogy has been inadequately explored". Similarly, Whitefield (2012) attests that some researchers ignore, or leave, out pedagogy as a key component when looking at DigiTech integration and teaching (e.g. Gronseth et al., 2010). DigiTech in 2001 was argued to be an "imposed and novel 'outsider' in the pedagogy of schools" (Watson, 2001, p.251) and from the themes covered in this literature review, not much has changed since. Overall, pedagogical thinking in educational institutions has not advanced in parallel with technological advances (Sipila, 2011).

In many ways the "computer and (digital) technology have been seen as something of a saviour economically and pedagogically" (Apple, 1992, p.106). However, this serves to reiterate the argument that while many viewpoints in the literature believe that DigiTech has the ability to change elements of education for the better, these ideas have not come to

## Chapter Two: Review of Literature

fruition. Much of the research on teachers' use of DigiTech in their teaching describes low levels of use and minimal pedagogic change (Somekh, 2008). For example, in Hsu's (2016) study, teachers used a large number of websites for representing and delivering information and, thus presenting content. The emphasis is on teachers' placement of DigiTech rather than shifting their focus towards pedagogy (Prestridge, 2017). Therefore, whilst some believe in the natural capacity for educational DigiTech to solve pedagogical ills, others feel that a tectonic shift needs to occur in the way we debate DigiTech (Casey et al., 2017b).

The Technological, Pedagogical and Content Knowledge framework or model (acronym TPACK) is an increasingly popular model that has been applied in the DigiTech literature to explore the relationship between technology, pedagogy and content knowledge. Originally developed as the technological pedagogical content knowledge (TPCK) framework (Koehler and Mishra, 2009), and based on the work of Shulman's (1986;1987) knowledge bases of teaching, the current TPACK framework was developed by Mishra and Koehler (2006) as an extension of TPCK. TPACK delineates the teacher's knowledge of using technologies, the pedagogical techniques needed to apply technologies appropriately to students' learning needs and knowledge of what makes concepts easy to learn. It looks at how technology can help address these challenges (Koehler and Mishra, 2009). Researchers have embraced the framework in a variety of ways and with its significant growth, TPACK has been used to validate, measure or contextualise effective technology use in schools and in addressing technology integration problems (e.g. Cox and Graham, 2009; Haydn, 2014; Koh et al., 2013). In the PESP field, researchers have also drawn upon TPACK to explore faculty and student experiences of the TPACK framework (Krause and Lynch, 2018) and to analyse PE teachers' use of DigiTech (Chambers et al., 2017; Parker et al., 2017).

Notwithstanding the attention that the TPACK framework has received in the literature in relation to teachers' knowledge of technology, its complexity has prompted diverse scholarly debate (Graham, Borup and Smith, 2012; Voogt et al., 2013). Graham (2011) argued that very little theoretical development of the model has occurred, whilst others have debated that the framework struggles to take into consideration other factors beyond content, pedagogy and technology - such as teachers' epistemic beliefs and values about teaching and learning (see for example, Angeli and Valanides, 2009). Even though some authors have included teacher beliefs in their use of the TPACK framework (c.f. Angeli and Valanides, 2009; Neiss,

## Chapter Two: Review of Literature

2005), Brantley-Dias and Ertmer (2013, p.115) argue that “very little...attention has been given to this critical variable”. Brantley-Dias and Ertmer (2013) further contend that putting the ‘T’ first (i.e. technological knowledge) means that the focus in Shulman’s original constructs of pedagogical content knowledge is lost, as TPACK seems to put technology before pedagogy. Furthermore, Voogt et al. (2013) argue that due to the limited knowledge pertaining to methods or practice that can be used to develop TPACK, the use of the construct can result in a deficit view of teachers that either ‘do’ or ‘do not’ possess the relevant knowledge.

This research seeks to move away from an approach to thinking about technology integration that takes a deficit view i.e. as has been argued with the TPACK framework. Not because it disagrees with the underlying premises or aims of the approach, but rather it seeks to move away from putting technology before pedagogy and does not seek to take a deficit view of teachers’ knowledge.

Despite the large body of work mentioned above, additional research is needed to explore further the relationship between teachers’ pedagogical beliefs and their uses of DigiTech (Ertmer et al., 2015). This, as Casey et al. (2017b) discuss, has led to increased scrutiny in a number of subject areas and disciplinary perspectives, and one in which the PE community has also begun to debate. While the incorporation of DigiTech has been a point of sustained discussion in the PE literature since the late 1990’s (see Gard, 2014), in the area of DigiTech and pedagogy there are clear research gaps (Casey et al., 2017b). It is to these gaps that this literature review now turns.

### ***2.6.1 PE, Pedagogy and DigiTech***

Focusing on DigiTech in PE is particularly important, given the discipline-specific technologies (Bodsworth and Goodyear, 2017; Enright et al., 2017). For example, sport-specific video analysis and health-related software and applications (‘apps’), cameras, active video games and wearable devices that can record, analyse and track human movement have been seen as beneficial to PE (c.f. Palao et al., 2015; Trout and Christie, 2007). Howard et al. (2015b) argue that there is a specific need to examine DigiTech practice in different subject areas. This is because while different subject areas have an effect on DigiTech integration



## Chapter Two: Review of Literature

(Goodson and Mangan, 1995; Hennessy et al., 2003; Howard et al., 2015b), they are only one piece of the DigiTech integration puzzle and one that requires further exploration. Mama and Hennessy (2013) suggest that educators and policymakers need to understand the benefits of DigiTech within particular contexts and educational purposes. Indeed, the different contexts, goals and interpretations of the need and value in deploying DigiTech creates a complex picture (Tearle, 2003). It is, therefore, necessary to explore how and why teachers' DigiTech practices occur in specific subject areas, to better understand how educational goals can be met through DigiTech integration (Ross et al., 2010).

Research has been extensively conducted on the core subjects such as Numeracy, Literacy and Science in relation to the subject specific issues and practices regarding DigiTech integration (c.f. Niess, 2005; Sternberg et al., 2007; Wachira and Keengwe, 2011). Conversely, PE remains a relatively untouched subject area in the literature in relation to DigiTech and pedagogy (Casey et al., 2017a; 2017b, Gibbone et al., 2010). In 2006, Thomas and Stratton (2006) identified the need for PE teachers to understand the elements of teaching and learning with DigiTech over the need to satisfy policy objectives. In a similar vein, Pill (2014, p.9) suggested that it "is relevant that PE pedagogy, like all subject pedagogy, take into account the impact of (digital) technology" and indicated that this was an area that needed to be addressed in research.

Pluim and Gard (2016) suggest that there is value in treating PE in relative isolation when it comes to DigiTech. Kretschmann (2010; 2015) agrees that the teaching philosophies and ideologies of PE teachers may be different from other subject teachers and, especially so in regard to DigiTech integration. This is because PE focuses on human movement and physical activity and therefore, for many, the pedagogical benefits of DigiTech do not spring to mind at first sight (Kretschmann, 2010; 2015). PE, by nature, involves the essential features of body participation and movement. Due to these features, Papageorgaki (2017) argues that PE carries unique potential to deepen pedagogical understanding. Especially, it would appear when questioning how DigiTech may contribute towards these goals. It would, therefore, seem particularly important to focus upon the PE context given that we have very little evidence about how DigiTech is being used pedagogically (Casey et al., 2017a; 2017b).

In light of this research gap, it is important to explore what little has been written in the PE literature in relation to DigiTech and pedagogy. In the next section, I use the three-

## Chapter Two: Review of Literature

dimensional concept of pedagogy (as discussed by Armour, 2011) as a framework to structure the discussion of such literature. In doing so, the teacher and their teaching, the learner and learning and the subject matter/knowledge in context are brought to the fore in relation to DigiTech.

### ***2.6.2 DigiTech and the PE teacher***

Putting the teacher and teaching together with DigiTech at the foreground of this section, involves considering the different choices that teachers make with regard to DigiTech (Quennerstedt et al., 2017). This is a pertinent discussion to have as any debate about the role of DigiTech in PE must have a focus on the role of teachers (Casey et al, 2017b). Teachers are highly influential to students' learning, yet few teachers report that they feel able to incorporate DigiTech into their pedagogical context in purposeful ways (Fullan, 2013). This may be because "what teachers think, say and do with DigiTech has received rather little consideration" (Casey et al., 2017b, p.293). Kretschmann's (2015) study found that about half of the 57 teachers surveyed suggested that they did not have enough pedagogical knowledge and experience of *how* to integrate DigiTech into PE. Other, more recent work such as that by Krause et al. (2017) indicates that, whilst professionals are aware of and interested in using DigiTech in their teaching, they are still unsure about the selection, management and implementation.

In seeking to address the gap in current literature in teachers' knowledge with DigiTech, Casey et al.'s (2017a) recent book uses a pedagogical cases approach to present a case narrative of teachers' pedagogical intentions and processes when using DigiTech. For example, Goodyear et al. (2017a) explored how a range of apps were integrated into a tactical inquiry approach to support students' physical, cognitive, social and affective learning. Quennerstedt et al. (2017) explored how video games have been used as a teaching resource to support the teaching of dance in Sweden, while Gleddie et al. (2017) explored a teachers' use of social media as a tool for professional development. These are important pieces of work as they contribute toward developing a knowledge base to inform contemporary policies and practices (Gibbone et al., 2010). However, whilst it can be seen that there are many opportunities and possibilities for PE teachers, there are also challenges to face in this regard (Krause et al., 2017).

## Chapter Two: Review of Literature

In investigating the ‘realities’ of DigiTech use in PE, Villalba et al. (2017) found that Turkish PE teachers faced many obstacles in their use of DigiTech. Obstacles included the time investment required, PE teacher training, a lack of knowledge for integrating DigiTech in the practice of physical activity, and technical problems. This concurs with the work of Tearle and Golder (2008) who found that whilst there were high level of enthusiasm amongst trainees, tutors and practising PE teachers to make more use of DigiTech in teaching and learning, a widespread lack of understanding of their needs inhibited such use. These prohibitive factors include, but are not restricted to, lack of time (Weir and Connor, 2009), inadequate space, financial concerns (Woods et al., 2008), administrative barriers and teacher preparation (Pyle and Esslinger, 2014). These obstacles were also explored by Gibbone et al. (2010) and Wyant et al. (2015) who found that understanding the contextual factors that influence teachers’ use of DigiTech is a necessary foundation to furthering our understanding of the challenges pertinent to PE as a unique context.

From studies such as these we are made aware of the increasing importance of the teacher and their uses of DigiTech in PE. So much so that it “appears that it is the teacher rather than the technology that influences DigiTech use in schools” (Starkey, 2011, p.24). Given the key role that teachers play when it comes to DigiTech integration, Ertmer (2015) suggests that it is important that we better understand that factors (i.e. a lack of confidence, time and pedagogical understanding) that influence DigiTech use by teachers. That said, much less is currently known about how practices with DigiTech are shaped or change over time (Prestridge, 2017). Furthermore, despite the increasing availability of resources and hardware, many questions still remain among PE teachers (Krause et al., 2017). Gaining a better picture of how and why DigiTech is being used in PE is vital; especially as it is underpinned by understanding of how DigiTech use is shaped and negotiated by PE teachers and is undertaken in conjunction with students and their learning in PE.

### ***2.6.3 DigiTech and the learner in PE***

In considering the learner and DigiTech in PE, the largest proportion of work to date is around students’ perceptions and experiences in relation to pieces of DigiTech such as the video camera. This is unsurprising given the predominance of video cameras in schools

## Chapter Two: Review of Literature

(Casey and Jones, 2011) and the availability of such devices (Palao et al., 2015). Casey and Jones (2011) found that video cameras in PE helped some students to feel less marginalised and enabled them to be more engaged in their learning. Similarly, Palao et al. (2015) found that video and student feedback prompted a significant improvement in students' techniques and resulted in the highest level of quality practice in classes. When combined with cooperative learning, Goodyear et al. (2014a) also found that the use of video camera heightened student engagement. It has been suggested that students respond favourably to the use of video cameras in PE (Harris, 2009) and are a useful aid to learning and maintaining student engagement (Weir and Connor, 2009).

Other pieces of DigiTech explored in relation to students and their learning are wikis which were shown to contribute towards knowledge acquisition (Hastie, Casey and Tarter, 2010). Video games or 'exergames' have also been shown to have potential benefits for students in PE as they improve knowledge, skills, attitudes and behaviours in relation to health and physical exercise (Papastergiou, 2009). Furthermore, when introduced into PE, video games are argued to enthuse students and attract those who are typically not interested in PE (Hayes and Silberman, 2007). Other pieces of DigiTech, such as iPads, have been shown to be valuable when used in conjunction with Sport Ed. Sinelnikov (2012) found that the iPad was a valuable teaching aid, facilitating student interest and engagement in their team tasks and seeming to increase the quality of peer instruction. More recently, Armour et al. (2017a) explored how iPads could be used to engage students and accelerate learning by providing them opportunities to work independently. Looking more specifically at applications that can be found on both iPads and smartphones, Goodyear et al. (2017a) found that mobile 'apps' created new opportunities to enhance students' learning such as maintaining their interest and increasing engagement. Subsequently, there is (as far as we can ascertain from these studies, or, at least on the surface) significant potential for teachers and students in using DigiTech in PE. However, there are potentially some caveats involved when simultaneously grasping the opportunities of DigiTech for students and their learning (Casey et al., 2017b).

DigiTech has the potential to have negative impacts on students' learning about health, physical activity and the body (Casey et al., 2017b). For example, as Öhman et al. (2014) found, exergames can create the idea of specific health and body norms based on a measurable ideal, which can contribute towards students making negative self-assessments

## Chapter Two: Review of Literature

and the potential for self-monitoring (Lupton, 2015; Williamson, 2015). Other pieces of DigiTech such as health promotion and fitness apps can also invoke children to exhibit self-tracking behaviours that may result in negative outcomes (Gard, 2014; Goodyear et al., 2017b). The potentially negative aspects of DigiTech on students' learning is also underpinned in the Youth Sport Trust report 'Class of 2035'. In looking at the potential of PE with DigiTech, the report suggested that there are many possible futures (both positive and negative) for students and their learning in PE (Future Foundation, 2015). They presented four possible visions for what learning may look like for young people, including the 'digitally distracted' and 'side-lined generation' (Future Foundation, 2015). Of course, there is more than one possible future for PE (Kirk, 2010). Thus, it is even more important, that we further explore DigiTech use in PE towards students' learning

### ***2.6.4 DigiTech knowledge in the context of PE***

In Kretschmann's (2010) view, PE lacks importance and reputation when it comes to DigiTech use and implementation. He argues that DigiTech is underrepresented in PE research. As well as the scarcity of research, at a UK policy level, there also remain few official guidelines related to the use of DigiTech in schools. In the United States, for example, PE teachers must "demonstrate knowledge of current technology by planning and implementing learning experiences that require students to appropriately use technology to meet lesson objectives" (National Association for Sport and PE, 2009, p.2). As mentioned in the introduction, in the UK, governmental policy has previously placed DigiTech as an explicit part of the PE GCSE AS and A-level subject content. Yet, the requirement to use or understand DigiTech in the current PE curriculum is not explicit. It is, therefore, important to consider why or how one might use DigiTech to support the curriculum.

Thus, when considering what might be possible for DigiTech in PE there is a need for a multi-layered and complex understanding of teachers and teaching, learners and their learning and the context of PE and the interrelationship between these. Whilst it would therefore seem that the PE literature is beginning to explore the opportunities afforded by DigiTech, there is increasing interest from scholars such as Gard (2014) and Lupton (2015) that builds a picture of PE's ongoing or future investment in DigiTech. Gard (2014) argues that, "rather than presenting school teachers with pedagogical opportunities, DigiTech will

## Chapter Two: Review of Literature

largely cut schools and teachers *out*”. He (2014, p.828) alerts us to the possibility that “pedagogical questions will wane in importance as HPE digitises itself”. In thinking towards the future, he suggests that “knowledge about pedagogical processes and outcomes may play a negotiable role in shaping HPE’s future” (Gard, 2014, p.828). Accordingly, pedagogy will be constantly confronted by teachers and challenges presented by the growth of DigiTech (Sinclair, 2009). As a result, knowledge of the on-going pedagogical process in the context of PE is pertinent to explore as DigiTech’s place in PE is (re)negotiated.

As discussed previously, current literature in the field of educational DigiTech has focused on teacher development and pedagogy (Sheridan, 2016) and teachers' DigiTech use in relation to beliefs about DigiTech, teaching and pedagogy (Hennessy et al., 2005; Miranda and Russell, 2012; Prestridge, 2012). This is mainly due to the given process whereby it is the teacher who decides which methods, pedagogical models, practices and tools are chosen in his/her classroom. In other words, teachers’ pedagogical beliefs surrounding the use of DigiTech (Ertmer, 2005). In the next section DigiTech and the teacher’s pedagogical views are discussed in more detail. Gibbone et al. (2010) stress the importance of such work because if we can better understand the beliefs of PE teachers and what influences their DigiTech use, this can provide useful information for practitioners, administrators and teacher education programmes. This next section starts with a discussion of teachers’ beliefs with regard to barriers and enablers to DigiTech.

### 2.7 Barriers and enablers to teachers and DigiTech

Research that explores the barriers and enabling factors that affect DigiTech use in education has become a popular focus in the research literature (c.f. Hsu, 2016; Kopcha, 2012; Wachira and Keengwe, 2011). Since the early hopes that DigiTech would be a panacea for educational reforms, research has demonstrated that these hopes and DigiTech integration have not been achieved (c.f. Albion and Ertmer, 2002; Bauer and Kenton, 2005; Ertmer, 2005; Hew and Brush, 2006). This creates a potential ‘problem’ in relation to the lack of DigiTech use and has resulted in many authors proposing strategies for eliminating or circumventing (a) the barriers teachers encounter during the process of DigiTech use and (b) teacher views that impede the anticipated ‘transformation’ of modern schooling (Albion and Ertmer 2002; Bauer and Kenton 2005; Kopcha, 2012; Jones, 2004; Ertmer et al., 2012).

## Chapter Two: Review of Literature

Ertmer is one of the leading scholars in this area and publishes extensively on teacher beliefs and barriers/enablers to DigiTech use. Whilst the term ‘barrier’, in its original sense, is described as something that stops people making progress, Ertmer (1999) contended that educational DigiTech barriers exist in two main forms: first and second order barriers. First order barriers are extrinsic to the teachers such as lack of resources, time or technical support (Ertmer, 1999; Prestridge, 2012). Such barriers would appear to have been reduced, due to many teachers and students gaining access to the computers, the internet, and the increasing amount of professional development (Albion and Ertmer, 2002; Ertmer, 2015; Prestridge, 2012). However, as discussed in the above section on DigiTech and the PE teacher, these are also relevant to the PE context and remain in many schools.

Second order barriers, on the other hand, are internally located and can be identified as teacher beliefs about DigiTech and teaching (Ertmer, 1999; 2005; Hew and Brush, 2006). These barriers are thought to pose a greater obstacle to DigiTech use than first order barriers, as they are harder to identify, manage and control (Ertmer, 1999; Dexter et al., 1999). Despite developments in the research literature to investigate different barriers and extensive funding and efforts over the last century into DigiTech investment, little has changed in relation to how teachers *teach* with DigiTech (Ertmer, 2015, emphasis added). Arguably, teachers’ use of PowerPoint, word processing software and the Internet in their teaching practices, sits in alignment with traditional (e.g. University and secondary school) teacher-directed instruction, rather than changing it (Cox et al., 2003; Cochrane et al., 2013; Ertmer, 2015; Prestridge, 2012). However, we are reminded that teachers can be forgiven for failing to think pedagogically about DigiTech and instead simply using it in ways that they have been shown or told they must use (Casey et al., 2017a).

Given the research and progress in addressing first order barriers, scholars have begun to investigate second order barriers (i.e. intrinsic factors such as teachers’ beliefs about DigiTech use). Research into teachers’ beliefs about DigiTech has spanned a number of subject areas (c.f. Albion and Ertmer, 2002; Hammond, 2011). A common trend in the research literature suggests that understanding teachers’ beliefs is important if we are to explain the uptake of DigiTech and improve DigiTech use (Ertmer, 2015; Kim et al., 2013; Hammond, 2011; Mama and Hennessy, 2013; Anderson and Maninger, 2007; Prestridge,

## Chapter Two: Review of Literature

2012; Hennessy et al., 2005). Teacher beliefs regarding DigiTech use have been discussed in relation to areas such as pre- and in-service teachers (Abbitt and Klett, 2007; Anderson and Maninger, 2007; Haydn, 2014), exemplary or proficient teachers (Ertmer et al., 2012; Hammond, 2011; Haydn, 2014; Pierson, 2001; Ryba and Brown, 2000), self-efficacy or confidence in abilities (Abbitt and Klett, 2007; Ertmer and Ottenbreit-Leftwich, 2010) and cultural beliefs (Ertmer and Ottenbreit-Leftwich, 2010; Papacharissi et al., 2013). A well-established strand of research in the field of educational DigiTech is, therefore, seeking to identify associations between the dispositions to use DigiTech and ‘variables’ such as teachers’ beliefs in different contexts (Hammond and Alotaidi, 2016).

The importance of specific teaching contexts (i.e. different subjects, year groups, curriculum etc.) is illustrated in many investigations addressing the experiences of teachers self-identifying as ‘exemplary’ or ‘expert’ DigiTech users. Ertmer et al. (2001) reported how exemplary teachers believe that DigiTech use reflects the teachers’ beliefs about teaching and learning, but were also influenced by their specific contexts (for example making decisions to use DigiTech based upon the perceived requirements of their job role). Haydn (2014) found that the views of practitioners classified as ‘expert’ at using DigiTech, tended to favour subject specific approaches (i.e. analysing movement as relevant to PE teachers, but not to history teachers). These subject specific approaches that influence teachers’ DigiTech use are pertinent as they have been regularly identified as an under-researched area (c.f. Hennessy et al., 2005; Howard et al., 2015a; Perrotta, 2013). The lack of subject specific information may subsequently be acting as a further ‘barrier’ to advancing DigiTech integration discussions.

In order to fully appreciate the nature of DigiTech used by teachers in different subject areas, Perrotta (2013, p.321) posits that “a more in-depth and possibly qualitative insight would be required” to develop a more rounded picture of the contexts that surround teachers’ DigiTech use. Sheridan (2016, p.15) similarly argues that “closer ties are required between different subjects and the enactment of practice...to expand beliefs and improve teaching and learning practices”. In particular, Perrotta (2013, p.326) highlights the use of qualitative data from observations and interviews that would allow a focus on the more discursive and “lived world” to investigating this area.

This has begun to occur in PE. Wrench and Garrett (2012), for example, have utilised interviews to examine PE teachers’ identities and found that particular pedagogical practices



## Chapter Two: Review of Literature

are adopted from teachers' experiences in a multitude of areas. Wrench and Garrett's (2012) conclusions (although not directly addressing DigiTech) suggest that by working with PE teachers' narratives, we can strengthen understandings of how they come to act as they do and explore further possibilities around teacher pedagogies in PE. By focusing on teachers' beliefs in specific subject context, such as PE, a more detailed knowledge and understanding can be provided that thinks more carefully about how teachers encounter DigiTech in their specific subject cultures and the 'job' of being a teacher (Selwyn, 2011c). These interactions with PE teachers are important as "experiences of school life and PE...shape views on what constitutes good pedagogical practice" (Curtner-Smith et al., 2008, p.99) and give a broader perspective on the subject specific factors that influence DigiTech view and use.

### 2.8 Teacher beliefs and relationships around pedagogy and DigiTech

Early research by those such as Dexter, Anderson and Becker (1999) and Hadley and Sheingold (1993) documented how teachers with different beliefs used DigiTech in different ways (beliefs in the value of reflection, teacher agency and supportive professional culture). Since this early work many studies are continuing to enhance our understanding of teacher beliefs in relation to pedagogy and how this plays a role in DigiTech use in classrooms (c.f. Ertmer et al., 2012; Kim et al., 2013; Ottenbreit-Leftwich et al., 2010). The significance of teacher beliefs in relation to DigiTech has been shown by many research studies to play a part in impacting upon one's practice (e.g. Prestridge, 2012). This has resulted in a developing picture of the factors related to the pedagogical beliefs teachers hold in relation to DigiTech.

Ottenbreit-Leftwich et al. (2010) discussed how value beliefs refer to a teachers' judgement regarding the importance of an approach or tool in achieving a certain goal or outcome. In other words, how a teacher might value DigiTech as a relevant tool for achieving certain learning outcomes (Ottenbreit-Leftwich et al., 2010). Positive beliefs and attitudes have been shown to encourage a greater integration of DigiTech in classrooms, whereas negative attitudes discourage it (e.g. Jimoyiannis and Komis, 2007). For instance, the work of Ertmer (2005) and Mama and Hennessy (2013) demonstrates that some teachers, despite limited access to DigiTech, still try to use the resources available in a pedagogically effective way

## Chapter Two: Review of Literature

compared to others who make little attempt to incorporate DigiTech pedagogically. Mama and Hennessy (2013, p.381) argue that “the essential difference between these two groups of teachers lies with their appreciation of DigiTech’s role in teaching and learning”. As such, it is important to explore why teachers appreciate DigiTech and how this relates to their views of teaching and learning.

Niederhauser and Stoddart (2001) for example, illustrated that some teachers, even when exposed to a wider range of DigiTech activities and approaches, choose those that will help them accommodate their own perspectives on teaching and learning. Subsequently, this work implies that the teacher’s view of pedagogy affects their practice with DigiTech and is important to explore further. More recent work such as that by Tondeur et al. (2016a) sought to explore the link between teachers’ pedagogical beliefs and their educational uses of DigiTech. Their systematic reviews of qualitative findings reported that there are five key areas in regard to pedagogical beliefs and DigiTech. The first finding suggested that the relationship between pedagogical beliefs and DigiTech comprises a bi-directional relationship. In other words, teaching with DigiTech is an iterative process where beliefs lead to action, which in turn lead to the development of reconstructed beliefs (Tondeur et al., 2016a). Secondly a better understanding is needed of the interrelated factors that potentially impact teachers’ beliefs and DigiTech use, such as pedagogical beliefs, acting as a barrier and as a support to some teachers. Thirdly, a multi-dimensional approach to addressing the relationship between pedagogical beliefs and DigiTech use. This is because as findings four and five suggest, there needs to be a better understanding of the role of broader factors influencing pedagogical beliefs, such as those needed to benefit from professional development opportunities and the school context.

In other recent research, Prestridge (2017) examined the shaping of teachers’ pedagogical orientation for the use of DigiTech. She found that teachers used digital games based on how they usually teach, and that the introduction of teaching games fostered a change in teachers’ pedagogical beliefs. Subsequently, Prestridge (2017) concluded that in exploring pedagogy and beliefs about teaching, learning and context with DigiTech, there are a number of factors contributing towards the pedagogic use of DigiTech. These include the teacher and their beliefs, the school and the nature of student learning.

## Chapter Two: Review of Literature

Whilst many of these pedagogical studies provide information that is useful for enhancing knowledge in education, this thesis argues that they have a particular limitation. These are: many have tended to focus upon presenting findings in the form of a barriers or problems to DigiTech (Jones, 2004; Kopcha, 2012; Underwood and Dillon, 2011). This debateable weakness tends to focus on teachers' beliefs and barriers to DigiTech use. Arguably, this focus has become an issue in the literature regarding DigiTech integration and how it is perceived (Jones, 2004; Kopcha, 2012; Underwood and Dillon, 2011). Watson (2001) argues that most initiatives exploring DigiTech in schools focus on the apparent reluctance of teachers to use DigiTech, relating this to a "deficit model of teachers who are characterised as technophobic, or too traditional in their teaching style, or reluctant to adopt change" (p.253). Underwood and Dillon (2011) contend that teachers are often seen as a barrier, not a force of change. Moreover, teachers are stereotyped as 'Luddite'<sup>3</sup> (Underwood and Dillon, 2011), often 'blamed' for failing to see the 'obvious' benefits of DigiTech for the classroom (Perrotta, 2013, p.315), or labelled as "the problem" (Orlando, 2015, p.52). Of course, this is not a new occurrence. Teachers and teacher educators have come under enormous scrutiny in relation to factors such as student achievement (O'Sullivan, 2006). These failures, as O'Sullivan (2006, p.367) discusses, have been "attributed in part to poor teaching and teacher education programs that fail to prepare teachers for the realities and challenges of contemporary schools". Teachers are subsequently expected to change their knowledge, beliefs and professional culture accordingly (Ertmer and Ottenbreit-Leftwich, 2010). This characterises much of the literature in the field which refers to the continued disengagement by teachers in the uptake of digital resources (Orlando, 2015). This perspective presents serious challenges for both teachers and teacher educators to keep up to date with emerging technologies that contribute towards a teacher's pedagogy.

The traditional approach in evaluation has been to try to 'fix' the system by looking for problems, doing a diagnosis and finding solutions (Hammond, 1998). Schools are regularly decried as 'broken' (Selwyn, 2015) and that current practice needs changing in order to solve the problem. As such, whilst the use of DigiTech in schools is influenced by a range of factors (i.e. resources, support etc.), in the perspectives of some, the primary enabler of

---

<sup>3</sup> Luddite – a popular retort for someone struggling to operate their 'new' DigiTech or refusing to use the latest technology. Similar to a technophobe.

## Chapter Two: Review of Literature

innovation or change in DigiTech use is the individual teacher who is expected to utilise the benefits of DigiTech in the classroom (Perrotta, 2013). Rapid DigiTech developments have been a challenge for many teachers who are tasked with developing their comfort with contemporary DigiTech, whilst at the same time, utilising a suitable pedagogical strategy (Eow et al., 2010).

This focus on problems or the issues as to why DigiTech integration is not more widespread, presents preconceived descriptions that call upon teachers to ‘fix’ the problem. This perspective, as Perrotta (2013) discusses, tends to view teachers’ use of DigiTech as a matter of individual agency and the barriers of the school/system structure. Viewing the teacher as individually responsible for changing and developing their practices with DigiTech thus, becomes played out in school environments associated with educational DigiTech and how to address the lack of DigiTech integration (Orlando, 2014). The main weakness of this approach, and others like it, is the set of assumptions around how and why desired change is most likely to occur (i.e. the ‘type’ of teacher or their inability to see the ‘benefits’ of DigiTech). This is not to discredit those assumptions or theories as to how to approach or investigate a phenomenon. Rather, these sorts of investigations could become more constructive if counter-balanced with other more positive, constructive discourses.

When discussing change broadly in secondary school PE, Locke (1992) questions whether the dominant model in PE in secondary schools is ‘broken’. He argues that just removing some of the most salient barriers (such as a lack of planning, time and resources), does not necessarily empower teachers to become partners in change or reform (Locke, 1992). Others have taken a similar view. As the title “looking beyond what’s broken” suggests, Enright et al. (2014) argue that alternative perspectives need to be adopted in PE and sport pedagogy literature, to re-calibrate the field’s preoccupation with problems and deficit. A negative portrayal of the teaching profession runs the risk of narrowing or simplifying the ways in which we can imagine change happening (Enright et al., 2014). In areas such as pedagogy and DigiTech this would also seem to be an area of scholarship that is lacking.

The implications of framing research agendas in terms of solving a deficit or a problem, may not be helpful in understanding teachers’ pedagogical practices or beliefs about DigiTech. This current approach to research has resulted in an “unproductive and unhelpful cycle of provision and blame” (Orlando, 2015, p.51). As mentioned previously, often unrealistic

## Chapter Two: Review of Literature

discussions on the utopian views of DigiTech for education have driven a lot of research that has focused on specific problems or failures with DigiTech integration that impede DigiTech's 'progress'. This line of engagement with DigiTech integration may result in a research focus deficiency discourse that is neither motivating nor beneficial to change in DigiTech use. As Underwood and Dillon (2011) argue, we need to present more of a positive picture of a profession which is cautious but constructive. This needs to be "accompanied by research focused on pedagogical interactions and the knowledge needed to support them" (Webb, 2011, p.13), rather than on factors which many feel they cannot control. As such this structure is also important to consider. Selwyn (2007) attests that we could be heading toward a future for educational DigiTech in which 'the more things change; the more things stay the same'. Whilst it is acknowledged that there are multiple forms of expertise and practices that characterise a teachers' approach to DigiTech integration, the position argued here sits in alignment with both Underwood and Dillon (2011) and Perrotta (2013, p.315) to move beyond the "discourses of deficiency" that characterise research on teachers' pedagogy and DigiTech in context such as PE.

### 2.9 Conclusion

This literature review has drawn upon historical and current research in relation to DigiTech, pedagogy, PE and teachers' views. Throughout the review the key themes have been presented around the need for a better understanding of how PE teachers' view and use DigiTech in their practice and the contributing (pedagogical) factors as to why DigiTech is used. Furthermore, the argument is presented that research has mostly focused on the barriers of DigiTech integration and on viewing teachers as a problem. The interpretation of the literature discussed above is, therefore, to be cautious of a barrier-focused approach to teachers' DigiTech practices and to move away from a focus on documenting the factors that are seen to inhibit progress; focusing instead on those factors that may enable and support a teachers' DigiTech use. Consequently, it is considered that a change in the way we 'frame' our understanding of these experiences may allow the field to take a step forward in understanding DigiTech in PE practice.

An alternative to this perspective and one way in which these research gaps could be addressed is through the use of a strengths-based approach to looking at DigiTech and pedagogy in PE (Enright et al., 2014). In working towards such an approach, the argument

## Chapter Two: Review of Literature

presented in the next chapter looks towards the use of an AI perspective. In exploring this approach, the chapter presents AI as a potential vehicle to re-frame agendas away from the focus on barriers to DigiTech integration and as a means to understand PE teachers' practical experiences and views of DigiTech.

This literature review has ultimately contributed towards the development of my research objectives and research questions. The main contributing idea is that, "research into how and why digital technologies are being used...requires far more investigation from social researchers" (Lupton, 2015, p. 129). In this thesis, I set out to explore and develop our understandings of PE teachers' views, experiences and practices with DigiTech. More specifically, I seek to understand the pedagogical use of DigiTech from the teachers' perspective. The aims of this thesis are, subsequently, to explore (1) the views and experiences of PE teachers regarding DigiTech use, and (2) the factors and experiences that influence how and why PE teachers use DigiTech. The overall aim is to stimulate professional debate and broaden understandings of teachers' developing use of DigiTech and the complex configurations that operate around their views and use.

Through the research questions outlined below, I set out to examine how and why DigiTech is being used in PE by teachers and the rationale behind its use (i.e. the factors that influence practice with DigiTech). The research questions, therefore, are centred on PE teachers' experiences and views of DigiTech, PE teachers' use of DigiTech and the rationale behind their use.

This research is guided by the overarching research questions of:

***(RQ1) How do PE teachers view and use DigiTech in their practice?***

Explored under this research questions are the sub questions of:

How are these practices developed and/or sustained across their careers?

How does an individual's views and experiences of DigiTech shape the use of DigiTech in the school context?

***(RQ2) Why do PE teachers use DigiTech in their practice?***

Explored under this research questions are the sub questions of:

## **Chapter Two: Review of Literature**

What are the factors that prompt PE teachers to use DigiTech?

What role does the school context play in shaping teachers' DigiTech use?

These questions serve as the focus of my inquiry, analysis, discussion and conclusions. AI and case study methodology are used as one way to explore this overarching statement and the research aims/question. These approaches will be explored further in the next chapter. In doing so, the aim is to appreciate how and why PE teachers view and experience DigiTech and increase our understanding of how it shapes their practice. By looking at not only the individual teacher but also the broader perspectives of the school, the purpose is to gain a bigger picture of how and why these practices occur and what factors influence the use of DigiTech in PE teaching.

# Chapter Three: Conceptual Framework

### 3.1 Introduction

This chapter outlines the conceptual framework that has informed this research. The chapter presents a rationale for the use of an AI to guide the research process. This chapter begins with a brief incursion into the work of David Cooperrider around AI. This is followed by explaining the approach, including the criticisms levelled at it, and its applications before highlighting the potential benefits of utilising AI. This chapter will conclude by detailing how AI was interpreted and applied in this thesis.

### 3.2 Appreciative Inquiry

AI is not well established in the educational DigiTech or PE and sport pedagogy literature and it is, therefore, important to unpack this construct further. The term ‘appreciative inquiry’ was developed as a consequence of the doctoral work of David Cooperrider (Cooperrider, 1986). Working in organisational behaviour, Cooperrider’s thesis utilised a case study methodology to propose an action-orientated approach to organisational inquiry. The ‘problem’ in Cooperrider’s research area was that the conventional forms of action research had largely failed as an instrument for advancing social knowledge and had, therefore, not achieved its potential as a vehicle for human development (Cooperrider, 1986; 2013). In order to re-address this problem, Cooperrider argued for an “enriched, multi-dimensional mode of action research that seeks to be theoretically generative” (Cooperrider, 1986, p.ii). This mode of action research was proposed to advance beyond the conventional problem-solving frame (characterised by many action research approaches) to include an appreciative dimension. Thus, AI was conceptualised as a form of inquiry that was “based on co-appreciative modes or questioning, valuing, knowing, choosing and experimenting” (Cooperrider, 1986, p.300) and would allow different insights into organisations. The key concept of AI and, therefore, what made it different to traditional forms of action research is that it was articulated as a method that would build generative theory. Generative theory is an emphasis on challenging the prevailing assumptions regarding the nature of social life (see Gergen, 1978 for a full discussion). This approach was intended to complement and increase the generative potential of action-research. The word generative, in this sense, relates to the



## Chapter Three: Conceptual Framework

capacity to reframe dialogue and challenge assumptions to provide alternatives towards social action or understanding (Gergen, 1978).

The term ‘appreciative inquiry’ was more formally used by Cooperrider and Srivastva (1987, p.129) who presented the construct as a qualitative research process and as a “conceptual reconfiguration of action research”. Their position was that action research used a problem-solving approach to creating change, which acted as a constraint on its contribution to knowledge (Cooperrider and Srivastva, 1987). In organisational development, action research was seen as a process model to apply in order to help a group or social system to solve real problems (Frohrnan et al., 1976). This constraint was that knowledge, and the sense of experience gained from it (i.e. empiricism), was focused on a deficiency mode of thought. Because of this they argued that action research resulted in a “romance with action at the expense of theory” (Cooperrider, 1986, p.iii). In other words, the traditional views of action research were focused upon the failings or shortcomings of an organisation or phenomena as a means to develop knowledge/change (action) over theoretical work. Action research, they argued, had not achieved its potential as a vehicle for human development and social transformation (Cooperrider and Srivastva, 1987).

Whilst they acknowledged the literature in respects to the worth of action research, they felt that it failed to address ‘second order’ change. Cooperrider’s (1986) discussion of second order change was taken from the work of Watzlawick et al. (1974) who identified second order change as something that applies to what appears to be the solution. It usually appears in unexpected or ‘commonsensical’ areas which Cooperrider (1986) discussed as areas such as the change of organisational paradigms, norms, or ideologies. Second order change techniques (i.e. AI) are positioned as attempting to produce a solution and placing it in a different frame (Watzlawick et al., 1974). Although Cooperrider (1986) does not discuss this term further, it would seemingly imply that AI appears to be a solution to areas not addressed by action research and therefore is reframing the approach to change.

To explain the term AI and to begin understanding AI further, it is important to unpick the deeper meanings of the words as defined by Cooperrider and colleagues. The word appreciate is seen as “valuing; recognising the best in people and in organisations” (Cooperrider and Whitney, 2005, p.7). It is “to fully know of” and “to perceive those things that give life to

## Chapter Three: Conceptual Framework

living systems” (Cooperrider et al., 2008, p.1). Inquiry, in this context, means “the act of discovery, exploration, examination, looking at, investigation, and study” (Cooperrider and Whitney, 2005, p.7). It is also seen as “to question...to be open to new potentials and possibilities” (Cooperrider et al., 2008, p.1). AI is, therefore, an enriched or “second dimension” view of action research that goes beyond the traditional problem-solving approach (Cooperrider and Srivastva, 1987). Whilst Cooperrider (1986) discussed AI as a generative theory building method, he later wrote that AI was not a methodology (Watkins and Cooperrider, 2000) but “more than a method or technique” (Cooperrider and Srivastva, 1987, p.12). This development of ideas reflects the appreciative mode of inquiry as a means that goes beyond questions of epistemology in that it is a way of “living with, being with and directly participating” with the organisations and people we are studying (Cooperrider and Srivastva, 1987, p.12). AI would, therefore, seem to be a construct that is more of an orientation of philosophy guided towards uncovering the strengths of an organisation, rather than a reduction to a singular method or technique.

What makes AI different from action research is its asset-based or strengths-based approach to initiating positive change. Instead of focusing on problems and what is not working and why, AI asks organisations to discover what (or has previously) worked particularly well and then to envision what it might be like if the “best of what worked” occurred more frequently (Preskill and Tzavaras Catsambas, 2006). AI exists as a “tool for recalibrating the lenses through which we experience a phenomenon” and to create opportunities for future change built on past and present strengths (Harrison and Hasan, 2013, p.67).

Since its origin 30 years ago, AI has developed from an academic theory-building approach to a practical and powerful framework and process for organisations and communities (Coghlan et al., 2003). Despite AI’s relative unestablished status in the educational literature, it is fast developing into a framework, research perspective, and methodology employed internationally for organizational development (Fiorentino, 2012; James et al., 2014). Research in this area has explored the use of AI in spaces such as educational institutions (Bergmark and Kostenius, 2009; Harrison and Hasan, 2013; Kozik et al., 2008; Ryan et al., 1999), community psychology (Boyd and Bright, 2007), tourism (Raymond and Hall, 2008) and nursing (Carter, 2006; James et al., 2014). Notwithstanding AI’s association with action research and participatory research agendas, the appreciative philosophy has proven pertinent

## Chapter Three: Conceptual Framework

to a number of different research studies to inform study's direction (Egan and Lancaster, 2005). Narrative, ethnographic (Ryan et al., 1999; Schall et al., 2004) and case study research have all been used and informed by AI. Due to this diversification, AI has been described in a myriad of ways and it would be inaccurate to say that AI is conducted in a universal fashion (Bushe, 2011; Cooperrider and Whitney, 2001).

Researchers and practitioners utilising AI have, however, developed several core principles that serve as a foundation for understanding the philosophy behind the construct. These principles prove useful as a means to unpack some of the underpinning ideas of AI (Preskill and Tzavaras Catsambas, 2006). Table 1 below shows these five core principles of AI a summary of their meaning.

*3.2.1 Table 1: Appreciative inquiry principles*

Principle	Summary	Discussion
Constructionist Principle	Reality is socially constructed and knowledge is created through language and experiences with others.	Cooperrider (2013) explains that AI is not a static concept, but an ongoing co-construction of reality. Cooperrider (2013) added that inquirers are also engaged in forms of social construction as we become reflexively aware of how our topics can frame the world and how our assumptions and choice of methods help frame the world we later 'discover'.
Simultaneity Principle	Change begins from the moment a question is asked and questions are powerful in inquiring into the way people think and act.	Inquiry and change are not viewed as not truly separate moments but simultaneous (Cooperrider et al., 2003). This principle is reflective in the importance of the appreciative interview as a key process of discovering knowledge (Coghlan et al., 2003; Michael, 2005). The AI interview is at the heart of the approach as it helps to create new data to highlight experience, valuing and strengths that can be collectively shared (Cooperrider and Whitney, 2005). Conversations and stories are,

### Chapter Three: Conceptual Framework

		therefore, important to AI as they seek to create generative conversations away from failure to open up new possibilities towards success (Ludema, 2002).
Poetic Principle	Our choice of what we study determines what we discover.	The <i>poetic principle</i> shows similarities with the simultaneity principle and constructivist principle in as much as the belief in interpretations of stories is continually being influenced and constructed by people in and outside of an organisation. It is a narrative that is co-authored by the participant and the researcher from data site selection to the final product (Preskill and Tzavaras Catsambas, 2006).
Anticipatory Principle	Our image of the future shapes the present.	The <i>anticipatory principle</i> is the belief in valuing the images of the future which guide us in determining how we achieve future goals. This principle is centred on humans projecting and discussing ideas ahead of themselves and understanding that these future thoughts may influence current ideas.
Positive Principle	Positive questioning leads to positive change.	The <i>positive principle</i> is the belief in futuristic thoughts that are directed towards strengths rather than weaknesses or sole focus upon negative elements. This links in with the simultaneity principle in the importance of positive questioning.

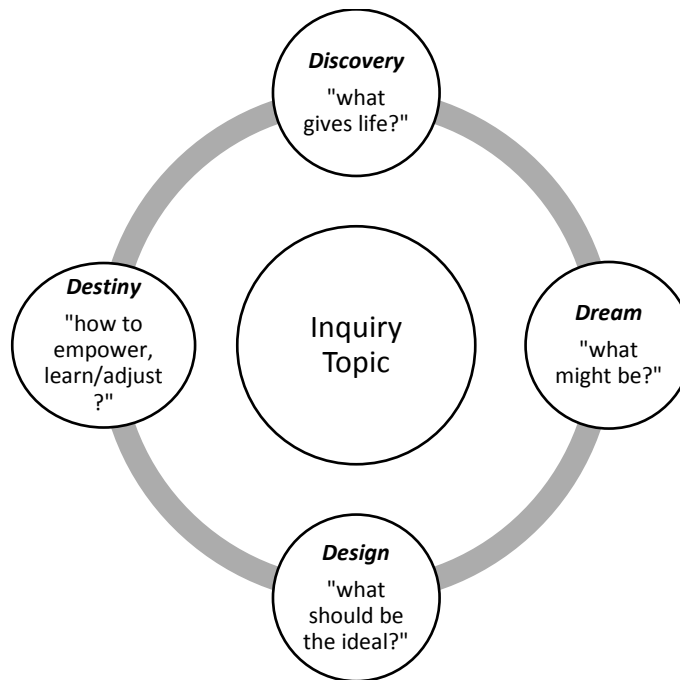
Source: (edited table from Whitney and Trosten-Bloom, 2010; Preskill and Tzavaras Catsambas, 2006).

The uniqueness of AI lies in the *positive principle* and highlights the importance of documenting the strengths of an organisation. The key argument is that AI is not just focused on the positive but incorporates both critical and negative elements to ‘appreciate’ an organisation. Whitney and Trosten-Bloom (2003, p.78) describe how the “principles of AI

## Chapter Three: Conceptual Framework

point to one simple message– AI is about conversations that matter”. The operation of these principles has been well developed in the literature (i.e. Watkins and Mohr, 2001; Whitney and Trosten-Bloom, 2003) with various models of the AI process or application being described. The most popular model is Cooperrider and Whitney's (2001) ‘4-D’ (discovery, dream, design and destiny) cycle. The four main principles of the AI model are described and shown in Figure 2.

3.2.2 Figure 2: The 4D model



At the centre of the cycle is the inquiry topic, or the affirmative topic choice (i.e. the organisation, system or subject area to focus upon). This selection is key to AI as it allows for an area, topic or organisation to be identified and framed through the investigation (Ludema and Fry, 2008). The purpose of the ‘discovery’ phase is to search for, highlight and illuminate those factors that ‘give life’ to the organisation. The task is to improve understanding through sharing stories about times when qualities such as integrity, empowerment or technological innovation were at their best and analyse the forces and factors which made them possible (Cooperrider and Whitney, 2004; Ludema and Fry, 2008).

The second phase is to ‘dream’ about what could be. This section is aimed towards participants imagining themselves, their group or community at its best and attempt to identify what it could be in the future (Ludema and Fry, 2008; Cooperrider and Whitney,

## Chapter Three: Conceptual Framework

2001). The third phase is to '*design*' the future through dialogue crafting ideas and discussion around proposals for change (Cooperrider and Whitney, 2001; Ludema and Fry, 2008). Often, this process is facilitated by small group discussions (Bushe, 2011) and could, for example, be to address power relations, improve networking or resources. The final phase '*destiny*' is an invitation for participants to create new targets, gaps to fill and objectives towards transformation (Cooperrider and Whitney, 2001; Ludema and Fry, 2008). Scholars have utilised this cyclical model as a means to frame their methodologies and questions in an AI manner (c.f. Carter, 2006; Harrison and Hasan, 2013). Hammond and Royal (2000) explain that AI is, therefore, the challenge to consider affirmative stories of professional practice to understand both the past and present elements of that practice.

### 3.3 Field in development

As discussed in the above section, AI has been developing and growing rapidly in organisational development (c.f. Lewis et al., 2016; Grieten et al., 2017). However, in the field of education, limited research exists in relation to AI. Although AI was originally written in the context of organisational development, its potential in educational research has been seen (c.f. Ryan et al., 1999; Bergmark and Kostenius, 2009). Those few studies that have been conducted in educational settings show the potential of an approach still in its infancy (c.f. Carnell, 2005; Harrison and Hasan, 2013; Yballe and O'Connor, 2000; Willoughby and Tosey, 2007). Harrison and Hasan (2013) for example found that AI played an important as a means of examining deficit-grounded support for higher education, whereas Ryan et al., (1999) found the inquiry process provided a deeper understanding of a school's mission and goals towards school reform.

AI has been used as a conduit to investigate a variety of educational avenues particularly in combination with the case study methodology (Clarke et al., 2006; Willoughby and Tosey, 2007; Tschannen-Moran and Tschannen-Moran, 2011). The opinion taken by Clarke et al. (2006, p.407) is that:

“taking a positive view is a fruitful way to prompt educators to reflect on and develop their practice because teachers and teacher educators bring a wide range of ideas that

## Chapter Three: Conceptual Framework

provide a powerful basis for developing understanding of the complexities of classroom practice”.

Building on these qualitative case studies, Tschannen-Moran and Tschannen-Moran (2011) and Willoughby and Tosey (2007) concluded that more research is needed in education which uses AI to build upon these strengths. This is because the case study methodology allows the researcher to look at different cases of practice and to explore a small proportion of cases such as the particularities of classroom practice (Clarke et al., 2006).

In conjunction with the case study methodology and, as outlined above when discussing the simultaneity principle, the interview process is seen as vital to gaining new understandings of a topic area. This is exemplified in the work of Michael (2005) who used an AI approach to guide her interviews in order to provide a more nuanced understanding of a national governing body organisation. This study differed from the traditional AI process in that it focused on a mini-version of the discovery phase to frame the interview. When seen in this light, the mini-version of the discovery phase ensured that the questions included in the interview protocol were focused on the key element of the discovery phase: discovering the best of the organisation. The findings from this study highlight how the interviewees were eager to tell their stories, spoke more openly, were less defensive and the approach offered a dynamic and unrehearsed source of information (Michael, 2005). This approach was also replicated by others such as Raymond and Hall (2008) who used AI in tourism research as an interview tool to provide new understandings of their topic and field area of tourism research.

Whilst these studies build a picture of how AI is used to investigate school practices and school reform, it would appear that it has rarely been used in relation to how DigiTech is used in schools. With educational DigiTech taking an increasing role in schools and within practice, it would seem that AI could also be applicable to investigating more specific aspects of school practices such as DigiTech. In highlighting the gap in educational DigiTech's potential and actual use, Tearle (2003) argues that “perhaps there was, and still is, a lack of appreciation or understanding of the complexity of the process and culture shift required to achieve that potential” (p.567). Therefore, there is a gap in the current educational DigiTech literature to benefit from some of the progressions made by some of these empirical papers.

## Chapter Three: Conceptual Framework

In exploring educational DigiTech further and, more specifically the field of PE and sport pedagogy research, AI (and other strengths-based approaches) is also an emerging area of study. In the PE and sport pedagogy (PESP) literature, Enright et al. (2014) argue that many scholars have overly focused on what is 'broken' or failing and, therefore, in need of fixing as a means to highlight problems in the field. This deficit-orientated approach, in their eyes, is an important area to redress as it provides researchers with a *priori* descriptions of the world and how the change should be enacted. Enright et al. (2014, p.912), by contrast, draw upon AI as a "potential intellectual resource for new agenda setting in PE and sport pedagogy" and as a means to generate stories about success and strengths.

Similar to AI, O'Connor et al. (2014, p.202) explored how learners involved in an authentic inquiry-based process called 'Take Action' that aimed to utilise strengths through an inquiry process in order to explore their lived experience of physical activity in young people. They found that teachers and students involved in the inquiry process found the approach engaging and authentic but, ultimately, they lacked the foundational knowledge that would have allowed them to reconstruct new ideas in ways that would fully engage with the approach. Whilst these scholars remain reflexive of the limited or measurable effect of such approaches to enact change in their topic area, this scholarship reflects a movement in the field of PESP towards a strengths-based approaches and alternative frameworks through which to inform new research agendas that "move beyond a deficit, or 'fix-it' perspective" (McCuaig and Quennerstedt, 2016, p.1).

Cooperrider and Whitney (2005, p.2) emphasise that "positive approaches to change are surprisingly not the norm" in many field areas. In exploring PE teacher education, Tinning (1991), argues that pedagogy has long been defined as a problem in (PESP) teacher education and solutions have been sought/articulated to solve it. He argues that this 'problems based' discourse and the "process of problem setting" (Tinning, 1991, p.1) has had considerable influence on practice and how we consider topics such as pedagogy. Enright et al. (2014) and, similarly, Tinning (1991), do not discount or discredit any of the scholarship that has focused on documenting barriers or problems. As Enright et al. (2014, p.915) summarise, they instead present an alternative perspective to PE research with a view to "counterbalancing the field's preoccupation with problems and deficit".



### Chapter Three: Conceptual Framework

As reflected in Tinning's (1991) sentiment, this argument is not new. Bunker (1994, p.460) called attention to pitfalls in the field of PESP and emphasised concerns over those who "pay attention to the 'problems' rather than the possibilities". More recently, Fiorentino (2012, p. 223) posed the question of: what if we begin to look for the strengths in our field, rather than our problems?" She further hypothesises what would happen in the field of PESP if instead of viewing problems we saw "the glass half full", so to speak, and focus on pockets of excellence and innovations that have proven successful?" (Fiorentino, 2012, p.220). In seeking to answer such questions, Fiorentino (2012) and Enright et al. (2014) consider AI as a potential means through which to address the longstanding focus of the field on 'problems'.

In utilising AI in PESP, Pill (2014; 2015) used the approach alongside a case study of two coaches use of Game Sense (a games based teaching approach) pedagogy. He argues that AI enabled his research to provide "imaginative capturing of the rich grounded educational experience of the teachers" and engage "with the positive experiences of the teachers' practice" (Pill, 2014, p. 15). This, in Pill's (2015, p.15) eyes, was because the approach focused on "achievement rather than problem solving". Pill (2014) further documented that the AI process did not deny critical processes but allowed the teachers to open up to possibilities, consideration of problems and the discussion of concepts such as power relations and multiple identities. Thus, AI proved a useful approach to exploring PESP teachers and their pedagogical experiences. In other PESP literature, Hill et al. (2015) articulated similar benefits when using AI. Hill and colleagues used an AI guided case study to investigate the construction and maintenance of the body in a dance community. Their approach resulted in the participants being able to show appreciation of what shaped their positive dance community through the interview processes.

A more recent example of AI in PESP is that of Gray et al. (2017). They used AI to understand (dis)engagement in PE from both a teacher and student perspective. AI enabled the teachers to re-articulate and re-enact their practice and learning towards more meaningful and empowering programmes for their disengaged pupils. In commenting on their use of AI, Gray et al. (2017) suggest that whilst there has been very little educational research carried out using AI, the approach can add an important means of understanding and potentially enhancing PE pedagogy.

## Chapter Three: Conceptual Framework

In the educational literature Willoughby and Tosey (2007) have explored a case of school's implementation of AI, whereas Calabrese (2006) used an AI case study to build social capital in a school and university partnership. Calabrese (2006) found that an AI case study created a productive approach for building trust and sharing knowledge that benefited both the school and university. Similarly, Willoughby and Tosey (2007) found that as the case study methodology is particularly useful for studying educational innovations for evaluating programmes and for informing policy. In a similar vein, the case study approach has been utilised within PESP as an effective methodology to employ alongside AI (Hill et al., 2015; Pill 2015). Although the use of AI and DigiTech research has not become commonplace in educational research in general (and is yet to be found in PE and sport pedagogy literature) these research studies above reflect the developing interest and applicability of AI to uncover new knowledge in both educational field areas and under-researched topics.

### 3.4 How critical can AI be?

Despite AI's successful use in many areas of organisational development and progressively more so in (physical) education, the construct does not stand outside of critical attention in the literature. Indeed, the claim to focus on the 'positive' seems to pose some questions; what is positive? What happens if we only focus on the positive? A common concern with AI is with the focus on positive stories and experiences, that at first glance, the approach seems to invalidate or ignore the negative experiences of participants (Bushe, 2011; Egan and Lancaster, 2005). Building on these points, Rogers and Fraser (2003) ask whether AI risks distorting reality with its emphasis on the positive. In a similar light, Carter (2006) argues that critics of AI could rightly challenge AI researchers for wearing 'rose tinted glasses'. In other words, to only see the positive whilst being oblivious to the negative.

Whilst scholars remain wary of the ability of AI to be critical, scholars such as van der Haar and Hosking, (2004, p.14) argue that the process of AI is supposed to be on 'possibility' and 'appreciating' which includes the "negative stuff". Commenting on this inclusion of the negative elements of reality, van der Haar and Hosking (2004) argue that to insist that only positive elements are discussed could hinder the openness of the process, and, therefore the realities that can be 'made'. Given the constructionist premise of AI, van der Haar and Hosking (2004) argue further that it is important for AI to understand that what is "positive"

### Chapter Three: Conceptual Framework

is also seen as variable to local construction. For one to subsequently rule out critical reflection (which may be experienced as negative by one person) would be contradictory of the multiple realities and understanding of AI. This view is supported by Grant and Humphries (2006, p.403) who emphasise that “appreciation may also mean to know or to be conscious of...” and is subsequently much more complex than a dichotomy focus on what is ‘good’ or ‘positive’ and what is ‘bad’ or ‘negative’. For example, when commenting on qualitative inquiry and educational practice, Eisner (1991) reminds us that there is not necessarily a relationship between AI and liking something. He states that:

“To appreciate the qualities of wine, a book, or a school means to experience the qualities that constitute each and to understand something about them. It also includes making judgments about their value. One can appreciate the weaknesses of an argument, a teacher, or a poem as well as their strengths. Nothing in connoisseurship as a form of appreciation requires that our judgments be positive. What is required (or desired) is that our experience be subtle, complex, and informed” (Eisner, 1991, p.68-69).

In other words, appreciating a topic and inquiring about it means we seek to understand more about them. One can appreciate a topic area through both strengths and weaknesses. Another way of constructing this viewpoint is not that AI should be positive or affirmative, but, it should have a ‘generative capacity’. Put differently, the capacity to open-up multiple social realities and can facilitate potentially critical processes. Bushe (2007, p.5) illustrates this concept through his argument for ‘generative conversations’.

“If someone wants to talk about what they don’t like... telling them “no we can’t talk about that, this is an AI” is likely to turn people off. But instead of asking them to elaborate on and explore what they don’t like we can ask them what is missing, what they want more of... that is creating the gap between what they want and what they see. This line of questioning is more likely to be generative”.

As such, AI is seen as a re-framing or elaboration on conversations that are generative, rather than starting with a problem. This is not to say that the current way of seeing the world is wrong; alternatively, it is to help realise that we can be limited and sometimes constrained by

## Chapter Three: Conceptual Framework

our inability to see large and more expansive realities (Watkins and Cooperrider, 2000). Fitzgerald et al. (2010) remind us that focusing on ‘the positive’ can have the paradoxical effect of bringing up what is ‘negative’ into awareness and draws AI researchers back to the generativity of the approach rather than its focus on the positive (Bushe, 2010). This is because as Cooperrider (2013) suggested that AI can happen across all circumstances and not just the so-called positive moments.

This section has explored some of the critiques of the approach and attempts in the literature to address these criticisms. The key feature of the argument is seeing the generative potential of the approach and, bringing to the fore that in seeking to appreciate something one does not ignore the negative. The following section will examine how AI is being interpreted and applied for the purpose of this thesis.

### 3.5 Personal interpretation

The discussion in the previous sections reflect a multitude of ways in which AI is described, interpreted and utilised in research. It has been called a philosophy, an approach, a method, a process and a ‘way of being’ (Stavros et al., 2016). In essence, no matter how AI is defined it can be said to mean many different things. There are no firm rules, “no right or wrong method” or “perfect process” (Watkins and Cooperrider, 2000, p.6) as each approach emerges in a different way (van der Haar and Hosking, 2004). Cooperrider et al., (2003, p.x) stated that AI was not a fixed method or ‘tool kit’ and as a result many scholars have tailored their research to include this strengths-based approach. Because of this tailoring, there should always be a conversation on defining the purpose of how and why AI will be used (Stavros et al., 2016).

In this thesis, AI is viewed in alignment with scholars such as Watkins and Cooperrider (2000) and Enright et al. (2014) who view it as a philosophy rather than a specific set of techniques, methods or methodology. From this perspective, AI is viewed as an orientation grounded in strengths rather than weaknesses (Enright et al., 2014). In other words, an “approach to PESR research” (Armour, 2014, p.854 emphasis added). This perspective is underpinned by the belief that every culture, and every person in that culture, has strengths

### Chapter Three: Conceptual Framework

that can be amplified (Cooperrider et al., 2008) and that AI provides a means in which to value teachers' views and (in this case) teachers' uses of DigiTech.

An AI philosophy can take varied paths and forms in research and one of its strengths is that it can be adapted to a particular culture, context and environment (Preskill and Tzavaras Catsambas, 2006). The AI philosophy differs between each case and local particularities and the "thought style" of the narrator (van der Haar and Hosking, 2004, p.10). As stated by Hill et al. (2015, p.4) whilst AI is not a technique or method "there are methods and questions which are more aligned with the approach". By this, the authors are referring to the interview method and the positive questioning process. However, given the philosophical premise of AI it is subsequently driven by the researcher's beliefs and interpretations.

In exploring the interpretation to be used in this thesis, AI, therefore, guides my negotiation of understanding PE teachers' experiences and practices with DigiTech. In doing so, it embraces a type of knowing that deliberately moves away from a 'deficiency' perspective and towards a strengths-based approach to explore and understand (in this case) teachers' practice and use of DigiTech. In some ways this is a different means in which to approach a topic area than I have been used to or have been accustomed to. It involves me consciously becoming aware of and seeking to re (direct) my approach towards these strengths.

I argue that some teachers have distinct understandings of the everyday uses of DigiTech as pedagogical resources and such knowledge can offer insight into our understanding of DigiTech and pedagogy (Orlando, 2015). The aim of using this approach in this thesis is, therefore, to commence thinking about teachers' DigiTech use or aspiring use from an AI philosophy so that we may initiate a discursive shift from documenting the barriers to DigiTech integration.

It is hoped that this research will contribute towards a deeper and more nuanced understanding of the relation between practices and experience. DigiTech-related practices can, therefore, be made 'thinkable' in ways that recognise the strengths, capacities and knowledge of PE teachers, whilst also acknowledging the broader subject-specific conditions that influence DigiTech integration. For example, the research question of 'what are the factors that prompt PE teachers to use DigiTech?' shifts from deficit discourses related to a

## Chapter Three: Conceptual Framework

teacher's lack of knowing and doing, to an orientation where the primary concern is the factors that prompt and support their practices. The next section will discuss how AI will be applied in this thesis.

### 3.6 Practical application

As mentioned in the above section, the focus for this thesis is to view AI as a philosophy which guides and frames and exploration of teachers' views and use of DigiTech. This approach acts as a lens in which to investigate how and why teachers have decided to use DigiTech in their practices and why they continue to do so. However, in acknowledging the need to tailor AI to the topic of choice, this study will utilise an AI case study approach. In being used in conjunction with a case study methodology, AI and its underpinning principles are used as a framework to inform the research process in general and the development of the research questions/interview. Thus, the research and interview questions were devised with the AI approach in mind (discussed further in the methodology chapter). Furthermore, as outlined by Pill (2015) the distinctiveness of AI is where it starts (i.e. its underpinning approach) and not the "final themes that arise from the consideration of the data" (p.16). Thus, AI questions are the "launch pad and not the destination" of the research (Pill, 2014, p.16). In conjunction with the work of Pill (2014) and Hill et al. (2015) the themes discussed later in the findings chapters of this thesis are not devised around the 4-D model (see page 65). The starting point, so to speak, is driven by the desire to uncover and appreciate 'what works'. However, the outcomes of the findings are concerned with how and why these teachers believe that DigiTech works for them and are focused upon pedagogy. Whilst this orientation is driven towards an initially positive and appreciative perspective to the research, the participants (having not become accustomed to such an approach) will undoubtedly consider the problems or pitfalls as well as the possibilities. It is, thus, important to not ignore these aspects of the research but explore what works or may be possible.

Similar to the approach adopted by Michael (2005), this thesis focuses more specifically on the discovery phase of the AI model or framework. This is because the use of AI in this way suits the research aims of discovering and highlighting not only the views and experiences of the teachers, but also the factors that influence how and why they use DigiTech. This lies in contrast to some of the later stages of the model which focus upon seeking to identify

## **Chapter Three: Conceptual Framework**

strategies for change. Given the ability to tailor the approach based on the research focus, using AI in this way allows me to tailor the philosophy towards the aims and outcomes of the research. Through the informed approach above, this thesis aims to take a step forward in enriching the body of knowledge in the field (Enright et al., 2014). Most importantly, the ability to adapt the philosophy is applicable to the research questions and aims which reflect a desire to explore PE teachers' experiences and practices with DigiTech and to provide a 'picture' of what experiences and practices have facilitated (and could facilitate) this development.

In discussing case studies, Thomas (2016, p.44) maintains, the case is "not a method but a design frame – a scaffold for research". Within this scaffold one "may use other design frames under the umbrella of the case study – in this sense we are talking about frames within frames" (Thomas, 2016, p.38). Figuratively, Thomas's (2016) 'frames within frames' analogy is used at this juncture to describe the use of the AI case study employed for this study. AI serves as a frame in which the case study is conducted. It frames the case study in the sense that it guides and underpins the approach. This is referred to and explained in more detail in section 4.3.

### **3.7 Conclusion**

This chapter has introduced the concept of AI as a conceptual framework used to guide the research study. It has described the central tenets of this approach and how it has been interpreted and developed in research. Furthermore, a discussion was held in relation to questioning the criticality of the approach and ways to address this perspective. For the purposes of this thesis, it was argued that AI is viewed as a philosophy which guides the research process and interview questions. More specifically, this thesis focuses on the discovery phase in line with the research aims and questions.

The next chapter will detail the methodology and how it endeavoured to address the research aims and questions.

## **Chapter Three: Conceptual Framework**



# Chapter Four: Methodology

## 4.1 Introduction

This chapter outlines the research process, methodology and methods used in this research. The aim of this chapter is to describe the development of the study from initial conceptualisation to write-up, and to ensure that the research process is transparent. Whilst this chapter is presented chronologically, and could therefore be viewed as a linear process, in reality the development of the study was a much more complex and iterative process. In order to present the different stages of inquiry in a coherent manner, the chapter is organised into five different sections. The first section explains and justifies the social constructivist research paradigm that guides the research; particularly through a discussion of the paradigmatic, ontological, epistemological and methodological ideas. The second section discusses the methodological principles underpinning the thesis through the use of a case study approach. The third section introduces the method of analysis in relation to a constructivist approach to grounded theory. The fourth section discusses the methods of data gathering and analysis that comprised the research process. The chapter concludes by considering issues of judgement and the interpretation of findings.

## 4.2 Justification of the social-constructivist research paradigm

Within social research, the gathering and analysis of data are shaped by a set of beliefs. These beliefs or “worldviews” (Creswell, 2009, p.6) are called paradigms and they underpin the process of inquiry. Paradigms are shaped by three fundamental questions: i) what is the nature of being (ontology)?; ii) what is the relationships between the researcher and knowledge (epistemology)?; and; iii) how should the inquirer go about finding knowledge (methodology)? Together, ontological and epistemological assumptions form the philosophical parameters that guide appropriate methodological practices (Markula and Silk, 2011). Consequently, these philosophical beliefs influence the research project and are reflected in the research decisions and, subsequently, the methods chosen.

Paradigm is a term used to describe an individual’s theory of how they believe social life is constructed (Sparkes, 1989). Sparkes (1989) suggests that a person’s paradigmatic perspective is formulated as a consequence of their life history and, thus, it has already been

formed prior to designing research questions or identifying ‘problems’. Subsequently, the way we shape our research questions are underpinned are guided by the way we see and understand the world. Consequently, paradigms “matter because they tell us something important about the researcher’s standpoint” (Lincoln, 2010, p.7).

It was the work of Thomas Kuhn (1962) that brought the concept of paradigm to the fore and led scholars such as Lincoln and Guba (1985) to suggest that there were two prominent and competing paradigms: positivism and naturalistic inquiry. Naturalistic inquiry, (later re-termed ‘constructivism’ (Lincoln and Guba, 1994), and positivism were two perspectives that presented different viewpoints. Overtime, paradigms have diversified into many different perspectives. For example, post-positivism, critical and post-modernism (Markula and Silk, 2011). It is, however, beyond the scope of this section to discuss the individual nuances of each, or to engage in a “paradigm debate” (Bryman, 2008, p.12) as to which paradigm is ‘the best’. The critical point is that all paradigms have their limitations and each paradigm's logic is chosen based on the perspective of the researcher and the research purpose. For simplicity, in this discussion, the two diverse ends of the paradigm spectrum will be discussed, namely positivism and constructivism<sup>4</sup>.

Those who hold a positivist paradigmatic perspective believe that there is a universal truth that exists (Guba and Lincoln, 1994; Markula and Silk, 2011). In contrast, for those holding an interpretivist/constructivist perspective, the nature of reality is relativist or subjective. In this sense, interpretivists believe that realities exist in multiple forms and, therefore, an individual’s understanding of reality is viewed to be relative to their context and experience (Guba and Lincoln, 1994; Markula and Silk, 2011).

An overview of the interpretivist paradigmatic perspective suggests that the goal of any such inquiry is to grasp or understand the meaning of social phenomenon and seeks first-person, subjective experience (Schwandt, 1998). Interpretivists are ideographic and consider social agents as autonomous (Gray, 2014). More specifically, constructivism is described as “a more recent vintage than interpretivist thinking” (Schwandt, 1998, p.235) with related but somewhat different concerns to those of interpretivism. Constructivists, contrary to the

---

<sup>4</sup> Constructivism is also commonly known under the term interpretivism (Denzin and Lincoln, 2003) but both these terms are often used interchangeably in the literature.

## Chapter Four: Methodology

interpretivist view, hold that what we take to be knowledge and truth is the result of perspective. In other words, knowledge and truth are created, not discovered by the mind (Schwandt, 1998). Constructivists, therefore, believe that human beings do not find or discover knowledge but (re)construct knowledge in light of new experiences (Schwandt, 1998).

Goodman (1984) was the philosopher primarily responsible for defining the contours of constructivism. Describing constructivism as pluralistic and pragmatic, Goodman (1978, p.6) uses the term “remaking” to describe the constructivist idea that one does not simply have a different interpretation of the same world, but we all experience different versions of it. In other words, based on our different experiences and beliefs, our interpretations are both our own and a product of our environment or social world. Social constructivism is a strand of constructivism which focuses the attention outward onto the world of shared, social constructions of meaning making and knowledge (Schwandt, 1998). Thus, rather than focusing on the individual and their processes, Gergen (1978) contends that social constructivism focuses on the collective generation of meaning as shaped by the conventions of social processes.

A common critique associated with social constructivism is its ability to serve multiple purposes. Schwandt (1988), for example, questioned how knowledge can be available to individuals whilst also being shared and transmitted to others. Andrews (2012) explains how the criticisms levelled against social constructivism suggests that due to this belief in multiple realities, nothing can ever be known for definite. One way in which this problem has been addressed is to emphasise the social construction of knowledge and not to claim that either the inquirer or actor is the final ‘holder’ of understanding. This position denotes a refusal to adopt any permanent standards by which truth can be universally known (Lincoln et al., 2011). Arguments about ‘truthfulness’ are therefore subject to community *negotiations* and a pragmatic approach to obtaining reality (which is never fixed) (Lincoln et al., 2011). Emphasis is, therefore, placed on representation and negotiation of an individuals’ vicarious experience and not the reproduction or discovery of social phenomenon. Representation, in this sense, implies that it will be from the perspective of the researcher and acknowledges reflexivity of the researchers’ influence in the research process.

## Chapter Four: Methodology

In exploring the differing paradigmatic standpoints from a general perspective, this research aligns with constructivist perspective in that the general focus is on the process by which human meanings are created, negotiated, sustained and modified. The goal is, subsequently, to seek to interpret and understand the participants' perspectives and assume that there are multiple 'truths' that differ between individuals. In other words, there is not 'one' or universal view of how and why DigiTech can or should be used in PE. However, in specifying this viewpoint further, the term 'social constructivism' is employed to describe this paradigmatic stance. This thesis contends that instead of a sole focus on the individual and the meaning that they create through their interactions with others, our focus must also incorporate that of the social world which shapes our constructions of meaning and knowledge. This paradigmatic perspective and rationale will be explored and discussed further through a discussion of ontology, epistemology and methodology.

### **4.2.2 Ontology**

Social scientists approach their subject via implicit or explicit assumptions about the nature of the social world and the way in which it may be investigated (Burrell and Morgan, 1979). Questions of an ontological nature concern the essence of the phenomena under investigation. Subsequently, ontology refers to the very nature of 'being' or existence. The key question regarding ontology is what constitutes the nature of the subject matter being researched, and therefore, what there is that can be known about it (Guba and Lincoln, 1994). Social scientists are thus faced with considering "whether 'reality' is a given 'out there' in the world, or the product of one's mind" (Burrell and Morgan, 1979, p.1).

From a general constructivist perspective, the ontological question regarding reality is the product of the human mind and occurs in the form of multiple, intangible, mental constructions. These are specific in nature to each individual (although elements are often shared amongst individuals and across cultures (Guba and Lincoln, 1994). The form that reality takes is, therefore, dependent on what the individual constructs to be 'true'. From a positivistic perspective, the nature of reality is assumed to be objective and external to the holder and is 'obtainable'. Reality is, therefore, seen as 'real' and can be obtained as facts or laws that are true in all circumstances.

Based within the social constructivist paradigm, this thesis is built around the belief that there are multiple ways that reality can be constructed and there is not one objective truth that can be obtained. Thus, the nature of reality is multifaceted and, is therefore constructed by individuals and their on-going interaction with the social world. More specifically, multiple realities can exist and depend on factors such as social, political, cultural or economic experiences. For that reason, seeking to inquire about, and understand PE teachers' multiple views and uses of DigiTech, one must not only understand and interpret the meaning that these teachers possess, but also acknowledge that these understandings are situated in and shaped by different contexts.

### ***4.2.3 Epistemology***

From considering ontology and the view of reality, epistemology questions the nature of the relationship between the researcher and knowledge. In other words, epistemology considers how we can go about acquiring knowledge (Jones, 2015). From an epistemological position, a positivist perspective comprehends that because a 'real' reality is assumed, the knower must be objective and detached from the known in order to be able to discover it. Put differently, the researcher and the investigated 'object' are assumed to be independent entities, and the investigator can study the object without influencing it or being influenced by it (Guba and Lincoln, 1994).

Conversely, from a constructivist perspective, epistemology is influenced by the ontological view that there are multiple realities that are constructed by different individuals. Subsequently, the investigator and the object of investigation are assumed to be involved in a process of inquiry into how reality is constructed by the individual. In light of this, the researcher and the object of investigation (i.e. thoughts, emotions, perspectives) are assumed to be interactively linked so that the 'findings' are created as the inquiry proceeds (Guba and Lincoln, 1994; Jones, 2015). Knowledge is, therefore, co-constructed between the researcher and the participant (Guba and Lincoln, 2005) and involves a process of interpreting and understanding the realities of the participant.

## Chapter Four: Methodology

Considering the social constructivist position of this thesis regarding questions of epistemology, this research is philosophically underpinned by the idea that knowledge is an expression of the individual and is subject to construction through a variety of social processes. In unpicking this viewpoint further, social constructivists hold that there is not one reality out there to be discovered but, instead that there are multiple realities and means for knowledge to be obtained. The belief informing this study is that what can be known about a teacher's understanding of DigiTech is multifaceted and this knowledge is dependent on a variety of factors. In order to seek to understand the teacher's knowledge, one must inquire and seek to interpret and understand the meaning that they hold through a process of co-constructing knowledge.

The social constructivist perspective that underlines this research is also in alignment with the underlying philosophies of knowledge that underpin AI. AI is often held to be a social constructivist approach (Cummings and Worley, 2001) where reality is viewed not as a singular, fixed, 'something', but as multiple and ongoing local constructions (van der Haar and Hosking, 2004). Taking this into consideration, multiple realities are not to be understood as individual subjective knowledge but rather local and cultural constructions that occur (van der Haar and Hosking, 2004). This viewpoint, van der Haar and Hosking (2004) argue, warrants not one expertise, but multiple forms of local knowledge whereby the practitioner is part of the appreciative process. Subsequently, "as a form of constructivist epistemology, AI leads to qualitative research where inductive logic is used to interpret specific experiences and the meanings that arise" (Pill, 2015, p.803). Therefore, the philosophical perspective of social constructivism sits in alignment to that of AI and its beliefs.

### ***4.2.4 Methodology***

Guided by ontology and epistemology, methodological questions consider how the inquirer goes about finding knowledge (Guba and Lincoln, 1994). Methodology refers to the process in which data are produced and provides a rationale for the methods used to collect data.

From a positivistic perspective, gaining knowledge of the 'truth' or 'one reality' is pursued objectively (Sparkes and Smith, 2014). In finding out about this reality, positivists tend to favour experimental approaches (Sparkes and Smith, 2014). From a constructivist

perspective, an individual's construction of reality and knowledge can be elicited and discovered through a process of interaction between the researcher and the participant (Guba and Lincoln, 1994). Knowledge is therefore co-constructed between the researcher and participant and inquiry involves a social process which is subjective.

Considering the social constructivist premise, this research is guided by its desire to better understand the multiple views of PE teachers regarding the use of DigiTech. This occurs through co-constructing knowledge and interpreting the teachers' views of reality. It, therefore, involves seeking to understand the teachers' subjective experiences through social inquiry. As such, the use of qualitative methodologies were considered to be in keeping with the aims of this thesis as they allow a research strategy that has an emphasis on the qualities of entities and on processes and meanings that are not experimentally examined or measured (Denzin and Lincoln, 2003). Qualitative researchers subsequently emphasise the socially constructed nature of reality and seek answers to questions that stress how social experiences are created and given meaning (Sparkes and Smith, 2014).

### 4.3 Case study approach

Case studies focus on a single unit or small number of cases that are studied in depth (i.e. through different methods or time). Findings are based around understanding how and why something might have happened or why it might be the case. The rationale behind the use of the case study methodology is that by focusing in on one case (or small number of cases), and looking at them from a variety of angles, you can get closer to understanding the 'why' and 'how'. In investigating such questions, advocates of this approach suggest case studies allow unique features to be seen; features that may otherwise be lost in larger scale data (e.g. surveys) and which add to the understanding of the phenomena in context (Cohen et al., 2007).

Yin (2014, p.16) describes a case study as "an empirical inquiry that investigates a contemporary phenomenon (the 'case') in depth and within its real-life context". Case studies are, thus, especially pertinent "when the boundaries between the phenomenon and the context may not be clearly evident" (Yin, 2014, p.16). In other words, a case study is conducted

because the researcher wants to understand a real-world example and assumes that such an understanding is likely to involve important contextual conditions pertinent to the case.

Stake describes a case study as “both a process of inquiry about the case and the product of that inquiry” (Stake, 2003, p.136). While for Merriam (1988, p.9) the case study “is an examination of a specific phenomenon such as a program, event, a person, a process, an institution, or a social group”. Merriam discusses how the:

“qualitative case study can be defined as an intensive, holistic description and analysis of a single entity, phenomenon, or social unit. Case studies are particularistic, descriptive, and heuristic and rely heavily on inductive reasoning in handling multiple data sources” (Merriam, 1988, p.16).

Whilst varying in focus and description, these definitions reflect the specific nature of the case study methodology in relation to the topic of inquiry or the ‘case’ to be investigated.

### ***4.3.1 Why case study and how are case studies viewed in this thesis?***

Yin (2014) and Merriam (1988) argue that case study research is preferred when: (a) the type of research questions concern how and why questions; (b) the inquirer has little control over the events being studied; (c) the focus is on contemporary and real-life phenomenon; (d) the boundaries between the phenomenon and context are not clear and; (e) it is desirable to use multiple sources of evidence.

*Research questions focused on ‘how’ and ‘why’* are seen as questions likely to favour the use of the case study approach (Yin, 2014). This is because they are more likely to be ‘explanatory’ in nature and are likely to lead to a case study due to their focus on a phenomenon occurring over a period of time rather than mere frequencies or incidents, i.e. asking questions in the vein of ‘how much’? or ‘how many’? Consequently, the case study methodology allows me in this study to focus on how and why PE teachers view and use DigiTech. Furthermore, given the nascent area of



## Chapter Four: Methodology

DigiTech use by PE teachers, the phenomenon is in need of deeper explanation and insight which, in turn, involves seeking information on how and why it is occurring.

*The extent of control over events* is an important and appropriate focus for selecting a case study methodology (Yin, 2014). Due to studying events in a ‘real life context’ the researcher has little control over events as they occur independent to the researcher. Case studies are applicable when the researcher wants to understand and focus *on a contemporary phenomenon in a real-life context* (Yin, 2014). Focusing on a real-life context thus distinguishes case studies from experiments or purely historical research. The defining features of a case study fit this research and the research questions. This is because the main research questions are enquiring as to how and why PE teachers view and use DigiTech.

It is important to consider that one also needs a “means of interpreting or placing it [the case] in a context” (Wieviorka, 1992, p.160). Therefore, whilst a case study involves looking at particular features of the case in its completeness, it needs to also consider its place in history and context. Case studies are further considered appropriate when the *boundaries between the phenomenon and the context are not clear*. This thesis investigates teachers who are bounded and heavily influenced by the school context in which they are situated. Case study helps to distinguish the boundaries between a teacher’s practice, the context, experiences and tensions that influence and encompass the space in which this practice is situated as they use multiple methods to explore these areas (Armour and Griffiths, 2010).

The value of case studies comes to the fore when it is *desirable to use multiple sources of evidence* to explore the phenomenon. This is sometimes referred to as triangulation. The term triangulation in case study research is, however, not generally held as a means to explain research that deploys different methods in order to validate findings. Triangulation is more appropriately viewed as the combination of multiple methods, practices and as a strategy that adds “rigor, breadth, complexity, richness and depth to any inquiry” (Denzin and Lincoln, 2003, p.8). Subsequently, looking at the phenomenon from several perspectives provides different angles to approach the topic and explore understanding. A rounder picture of the topic can be developed but it is acknowledged that this is a “thoroughly partial understanding

of the topic area” (Richardson, 2000, p.14) as there will always be more to know. Nonetheless, my sub questions present a complex and detailed means in which to study the topic area from a variety of ‘angles’ (for example by focusing on different areas such as the school context and experiences inside and outside the school), hence being conducive to conducting a case study approach.

### **4.3.2 Case design**

The primary reasons for conducting this study were to explore and develop an understanding of PE teachers’ experiences of and their practices with DigiTech. Thomas (2016) argues that a subject becomes a case *of* something when you can explain the analytical frame through which you might be viewing it. The analytical frame or object of the study is, therefore, PE teachers use of DigiTech. PE teachers sampled in this study are subsequently a case *of* teachers who are users or aspiring users of DigiTech.

This thesis uses what Stake (2003) termed ‘collective case study’ (sometimes termed ‘multiple site’ case study – see Yin, 2014). This involved examining the research questions in different contexts using similar methods of data gathering and analysis. The use of a collective case study allowed for the exploration of cross-case comparisons in order to understand the phenomenon in greater depth and from a variety of perspectives. The advantages of adopting such an approach is that it allows the researcher to explore the similarities and differences between cases (Baxter and Jack, 2008; Stake, 1995). Therefore, collective case studies allows the wider exploration of research questions and theoretical evolution which are more intensely grounded in several cases (Baxter and Jack, 2008).

### **4.4 Grounded theory method**

Grounded theory emerged in the 1960’s through the work of Glaser and Strauss (1967). Since then, the tradition has developed in different directions (Holt et al., 2012). There are at least three variants of grounded theory in common use: Glaserian (see Glaser, 1992), Straussian (see Strauss and Corbin, 1990) and constructivist (see Charmaz, 2000). While there is much disagreement about many respects of grounded theory (i.e. its guiding principles, ontological/epistemological stance, see Weed (2016) for a fuller discussion) they share the same basic principle of creating explanatory theories based on data gathering in the field.

The purpose of grounded theory is to create ideas that explain social phenomena with the aims of producing an explanation of findings that are ‘grounded’ in the data (Holt et al., 2012). Data gathering and analysis proceed simultaneously and each informs and streamlines the other (Bryant and Charmaz, 2007). Due to their differences in philosophical underpinning, each grounded theorist interprets and utilises the methods in different ways. Given the social constructivist paradigmatic stance of this research the constructivist approach to grounded theory will be the focus of the following discussion.

### ***4.4.1 Constructivist grounded theory***

Constructivist grounded theory has been developed by a number of authors (e.g. Charmaz, 2000; Mills et al., 2006; Sabiston et al., 2007). The prominent author in the constructivist approach to grounded theory is Kathy Charmaz. Charmaz's (2000) use of the term ‘constructivist’ acknowledges subjectivity and the researcher’s involvement in the construction and interpretation of data (Charmaz, 2014). Charmaz (2006) posits that constructivist grounded theory stresses social contexts, interactions, sharing viewpoints and interpretive understandings. She explains how instead of endorsing assumptions of an objective external reality, constructivist grounded theory starts with the assumption that social reality is multiple and constructed (Charmaz, 2014). Charmaz (2014, p.14) discusses how the constructivist stance to grounded theory “aligns well with social constructivists...who stress the social contexts, interactions and interpretive understandings”. This is because social constructivists aim for an interpretive understanding of the studied phenomenon; one which accounts for context but sees the participants’ voices as integral to the analysis and its presentation (Charmaz, 2008). Subsequently, the constructivist approach to grounded theory is in alignment with the underpinning philosophical beliefs in this thesis.

Taking this viewpoint as a philosophical underpinning, Charmaz (2014) posits that grounded theory is a method that provides a frame for qualitative inquiry and guidelines for constructing it. Thus, the strength in conducting such an approach is that it is not a set of prescribed procedures which to follow but, a flexible set of analytical guidelines (Charmaz, 2006). It, therefore, provides guidelines for the qualitative ‘bricoleur’ to apply to their own study (Piantanida et al., 2004). Charmaz (2006, p. 10) argues that “like any container in which a different content can be poured, researchers can use basic grounded theory

guidelines such as coding and memo-writing...in many ways”. Furthermore, she suggests that researchers can adopt and adapt the principles as they are a set of “tools to use, rather than recipes to follow” (Charmaz, 2014, p.18). As a result, the next section in this chapter distinguishes the application of a constructivist approach to grounded theory as a method of analysis.

### 4.4.2 *Developing grounded theory*

From a more general perspective, constructivist grounded theory is used in this thesis as an approach to data analysis. It is viewed as a “constellation of methods” or “family of methods” (Bryant and Charmaz, 2007, p.11). For consistency, and in line with the philosophical underpinnings of this research, the term grounded theory method is used to refer to the method, whereas the term grounded theory refers to the results of using that method (Bryant and Charmaz, 2007). Charmaz (2014, p.15) views five actions as evidence of a grounded theory study. These are listed and interpreted for this thesis in Table 2.

4.4.3 *Table 2: Constructivist grounded theory actions and application*

Charmaz’s (2014, p.15) actions	Interpretation/Application
Conduct data gathering and analysis simultaneously in an iterative process.	Data were gathered, transcribed and initially coded (also alongside memo writing) in a repeated and iterative cycle. Interview schedules were adapted and constructed based on on-going analysis.
Analyse actions and processes (open and focused coding) rather than themes and structures.	Initial and open coding used gerunds <sup>5</sup> to focus the researcher on the actions and processes occurring.
Use comparative methods.	Where possible, the use of similar methods of data gathering were used across cases. For example, interviewing similar members of staff such as senior leadership team members and IT managers.

---

<sup>5</sup> A gerund is a verb which functions as a noun (i.e. resisting, understanding, considering).

## Chapter Four: Methodology

Draw on data in service of developing new conceptual categories.	At all stages of the research process data was drawn upon and served as the driving force in the development of concepts. In this sense, theoretical concepts of themes were not applied to the research and the development was driven by analysis.
Develop inductive abstract analytic categories through systemic data analysis.	Actions and processes constructed from the data analysis were proposed towards the end of the research process and as mentioned above not applied or tested prior to data gathering. Meaning was derived from the data in a systematic process, i.e. following initial and focused coding processes.

These five points will be discussed further throughout the methods section as a means to reflect the grounded theory method followed and will be discussed more specifically under data analysis.

### 4.5 Research design

The research design and methods of data gathering were informed by the research questions, the aims of this study and case study methodology. The ‘cases’ which were of particular interest to this study, were PE teachers who used DigiTech in their practice. As such PE teachers were recruited for the study based upon their self-identified use and aspiring use of DigiTech (this is explored further in the sub-sections below).

The rationale behind the use of the case study methodology is that by focusing in on the case, and looking at it from a variety of angles, you can get closer to understanding the ‘why’ and ‘how’ (Thomas, 2011). As such, a number of qualitative methods were used to explore the teachers’ views, uses and rationales underpinning their use of DigiTech. In conjunction with the case study approach, multiple methods were deployed to explore the ‘cases’ in depth. Using multiple methods to collect data allows the researcher to achieve a broader and in-depth understanding of their research questions (Flick, 2002;

## Chapter Four: Methodology

Fontana and Frey, 2008). Within this study, I used a number of different methods - such as AI interviews with teachers and members of their school (including IT network managers, headteachers, senior leadership team members and other PE teachers), lesson observations, field notes and document analysis - in order to look at the teachers' uses of DigiTech from a number of angles. I believe that this helped to facilitate a broader understanding of how and why DigiTech was used than would have been the case with only one method of data gathering. This is because it allowed me to compare data from different methods and inform my questions with different perspectives.

The data sources were coherent with the AI approach that guides this study. From an AI perspective, interviews form the basis or the discovery phase and are often the impetus for further inquiry (Enright et al., 2014; Michael, 2005). This is because they allow dialogue and questioning around strengths, resources and capabilities (Cooperrider and Whitney, 2005) and allow the researcher and participant to explore these areas in depth. Furthermore, these methods are consistent with the paradigmatic stance of this research as they are data gathering methods that seek to obtain the subjective understanding and allow the researcher and participant to co-construct knowledge.

### *4.5.1 Overview of the research process*

Data gathering started in May 2016 and continued until May 2017. This 12-month phase involved a number of iterative research processes. Table 3 shows a visual representation of the research process which is discussed in more detail throughout this chapter.

### *4.5.2 Table 3: The research process*

	Pilot study	Phase 1	Phase 2	Phase 3
Dates	March/April 2016	May - Oct 2016	Nov 2016 - March 2017	March - May 2017
Data gathering	Recruitment Survey/ Pilot Interviews	AI interviews (x4)	School visits – lesson observations, document gathering, field	AI Interviews with teachers (1-3 per teacher).

			notes and interviews with colleagues.	
--	--	--	---	--

### ***4.5.3 Initial teacher recruitment***

In an effort to recruit participants for this study, information was disseminated through social media (mainly Twitter but also through LinkedIn), flyers at PE events (see Appendix iv) emails to UK partnership schools/PE teachers and personal contacts. This was mainly directed at a UK audience, however, due to the global reach of Twitter this was received by many teachers outside of the UK. Recruitment was directed and initiated through a survey created on Survey Monkey. Survey Monkey is a free-to-use, online survey that allows users to collect both qualitative and quantitative data. This survey was used to provide potential participants with information about the research and to see whether they wanted to take part in the study. These questions were developed to give both the potential participant sufficient information to discuss the study further and to see whether they would be willing to take part in a pilot study. None of the data gathered in this survey were used in the main study and was utilised solely for recruitment for the pilot/main study. The data from the survey was used to contact the teachers (through a platform of their choice e.g. email, FaceTime, Skype or phone) to discuss the study, to provide further information, to answer any questions and discuss the teachers' involvement in the study for the purposes of the pilot/main study.

### ***4.5.4 Pilot study***

Prior to the main data gathering phase, a pilot study was conducted with seven teachers from both the UK and overseas. Verbal consent to participate in the study was obtained and audio recorded in line with Loughborough University ethics procedures around conducting interviews online. Once consent was obtained, an online interview was arranged. This was organised at a time and platform chosen by the participants. Participants were reminded of their rights to withdraw/end the call at any point.

Each interview lasted approximately 1 hour and was recorded using a dictaphone for reflection purposes. Two of the participants agreed to be interviewed twice resulting in a total of 10 interviews. The interviews were not transcribed verbatim but were listened to and

notes/memos created to inform the main study. Additional questions or rephrasing or questions was also noted. These notes and memos were used to highlight key themes, areas that needed expanding upon, how participants responded to questions and where participants thought the questioning could be improved.

The purpose of this pilot study was, therefore, multifaceted. The aims of the pilot interviews were to provide me with an opportunity to make adjustments and revisions to the main study interviews (c.f. Kim, 2010). In this sense, a key focus was to clarify the AI interview questions (see Appendix v). This was particularly important in this study given the nuanced nature of the emergent research design. In this case, the pilot study was particularly helpful with assessing the suitability of the interview (Holloway, 1997) and to help me as a novice researcher to assess and prepare my interview techniques (Kim, 2010). Similar to Sampson's (2004) reflections, the main benefit of the pilot study was that it allowed me to develop my research lines of inquiry with confidence and to refine and develop my interview questions given the AI framework.

### ***4.5.5 Sampling***

As discussed earlier in this chapter, this study utilises Charmaz's (2014) approach to constructivist grounded theory. The adoption of the grounded theory method influenced decisions regarding sampling and data gathering as well as informing data analysis. As Morse (2007) discusses, the main types of sampling methods involved with grounded theory are convenience, purposeful, theoretical and theoretical group sampling. The case study teachers in this study were purposively sampled based on self-identified use and aspiring use of DigiTech. Purposive sampling (also synonymous with theoretical sampling, (see Charmaz, 2006) was drawn upon as the best method of selecting 'cases' (i.e. the teachers) for this study. The rationale behind the selection was to choose cases that are relevant to the research questions. In essence, this sampling strategy focuses "in selecting information-rich cases for study in depth" (Patton, 2002, p.230) and for "building in variety and acknowledging opportunities for intensive study" (Stake, 2000, p.446). Purposive sampling, therefore, was applicable to the research questions and aimed to select teachers who were users, or aspiring users of DigiTech.



## Chapter Four: Methodology

The four teachers in this study were chosen because (a) they represented a range of uses and aspirational uses of DigiTech, (b) they were willing to share their insights through research, and (c) they lived in accessible UK geographical locations. Additionally, they represented a range of years in terms of implementation, teaching experience and roles. *Patrick* and *Dillon* were selected because of their current and developed use of DigiTech. Thus, on a spectrum of use both Dillon and Patrick could be described as being over what Goodyear and Casey (2015) call the initial point of implementation (or ‘honeymoon period’). This provides a contrast to both *Harriet* and *Alice*. *Harriet* and *Alice* can be categorised as ‘ad hoc’ and more aspiring users of DigiTech.

Despite the ambition to follow the logic of purposive sampling throughout the study, the reality of recruiting teachers for this study (as detailed further below) meant that the application of purposive sampling was constrained by the limited number of teachers self-identifying as either users or aspiring users of DigiTech. For example, despite significant interest in the study (through social media engagement and discussion) recruiting PE teachers in the UK who used DigiTech in their practice was a difficult process. From the literature review, it was apparent that there is little information about how and why DigiTech is being used in PE teaching (Lupton, 2015; Casey et al., 2017a). The dearth of volunteers may be because of a difficulty in identifying these teachers and their practice but may also be reflective of teachers who do not necessarily self-identify as users of DigiTech but are, in fact, users. Subsequently, the reality of the recruitment resulted in a sampling strategy that could be deemed ‘pragmatic’ rather than purposeful in its purist sense. An acknowledged limitation of this research therefore was the lack of accessibility to the teachers who used or aspired to use DigiTech in their practice and/or who were available to be involved with the study for a substantial period of time. As a result, sampling, towards the end of the study, was dictated by availability and the accessibility of cases. This reflects the ‘messiness’ of the research process and one which is experienced by many qualitative researchers (Bryman, 2016).

### 4.6 Participants and Settings

#### 4.6.1 Teachers

Selected on the basis of their self-identified use or aspiring use of DigiTech, four teachers participated in the study. The teacher's decision to use DigiTech was voluntary and they were given the option to withdraw from the study at any time. However, it is important to note, that whilst all these teachers either used or aspired to use DigiTech, they varied in their experiences as PE teachers in their uses of DigiTech, their role in the school, and their departments. Literature has shown that "different practitioners have used digital technologies for different reasons and each has come from different starting points and is working towards different end points" (Casey et al., 2017a, p. 252).

#### 4.6.2 Patrick

##### Use of DigiTech

At the time of the study, *Patrick* had been teaching PE at Newton for 10 years and had been head of department for 4 years. *Patrick* had remained at the same school since qualifying as a teacher. *Patrick's* use of DigiTech in his teaching had varied over time but was now a regular part of his everyday teaching. *Patrick* had a strong belief in the value of DigiTech, developed his ideas through Twitter and shared his ideas with others at his school.

##### School setting

Newton school is a community college (11-18 years) in a small town in the North East of England. Newton is a co-educational school with a large proportion of White British students and a small proportion of students for whom English is an additional language (EAL). It also has a high percentage of students eligible for pupil premium. Newton has a PE department of 9 full time PE teachers and previously held previous Sports College Status<sup>6</sup>.

PE is a compulsory subject at Newton and students have an allocated hour a week on their timetables. Programmes for compulsory PE are structured through a multi-activity approach

---

<sup>6</sup> Sports college status was awarded by the government to maintained schools. Schools that applied for specialist status received additional funding and were expected to enhance their provision and raise the standards of PE and school sport.

and the National Curriculum. This comprised of ‘main activities’ (i.e. Rugby, Netball, Basketball), ‘additional activities’ (i.e. Dodgeball, Ultimate Frisbee and Tchoukball) and fitness activities (i.e. HITT, Circuit Training and Boxercise).

Newton’s vision and college priorities are underpinned by the use of DigiTech to support teaching and learning and outstanding progress. Each pupil in year 7 had been given an iPad with the aim of eventually rolling this out to all pupils. This sits in conjunction with each department having a set of iPads and every staff member having their own device.

### 4.6.3 *Dillon*

#### **Use of DigiTech**

At the time of the study, *Dillon* had been teaching PE for 9 years and had been head of department for 2 years. *Dillon* had remained at this school since his NQT year. Similar to *Patrick*, *Dillon’s* use of DigiTech had changed over his 9 years of teaching, most noticeably since he was introduced to DigiTech through his head of department. The use of DigiTech, for *Dillon* and his department was described as an embedded part of their practice. *Dillon* additionally used Twitter as a means to gain ideas about teaching and was keen to look to DigiTech to create new teaching approaches.

#### **School setting**

*Dillon* is the head of the PE department at Wurburton school. Wurburton school is a co-educational Church of England Academy School (11-18 years) situated in the East Midlands where around a quarter of its students are from White British background. The remainder are from a range of black and minority ethnic (BME) backgrounds, the largest of which are those of Pakistani heritage. Over a quarter of the students have EAL and a larger than average proportion of students are eligible for pupil premium. Wurburton also has a large proportion of students with special education needs (SEN) and has a special unit to assist these students.

PE is a compulsory subject and students have an allocated hour a week on their timetables. Programmes for compulsory PE are structured through a multi-activity approach comprised of main activities (i.e. Rugby, Netball, Basketball) and fitness activities (i.e. HITT, Circuit Training and Boxercise). For examination PE, Wurburton delivered both BTEC and A-Level

PE programmes. Wurburton is part of a multi-academy trust<sup>7</sup> and is a multi-site campus. The school previously held technology specialism status. Whilst the school does not have any current DigiTech initiatives in place, the PE department have invested in DigiTech devices such as iPods, a TV screen and iPads/stands.

### 4.6.4 Alice

#### Use of DigiTech

*Alice* has been teaching physical for 12 years and has been in her current role at Lutterford for just over a year. She had previously taught at other schools where DigiTech had been a larger focus of her role/teaching. *Alice* reported that her use of DigiTech is sporadic but is dependent on her teaching style and the type of sport she is delivering.

#### School contexts/setting

*Alice* is a full time PE teacher at Lutterford, an Academy school (15-18 years) situated in the outskirts of a city in the East Midlands. Similar to Wurburton, the college is part of an Academies Trust and has 9 full time PE staff. Lutterford previously held technology specialism and has a large proportion of students from BME groups, many of whom have EAL. The school has a lower than average percentage of students on pupil premium.

PE is a compulsory subject and students have an allocated 2 hours a week on their timetables. Programmes for compulsory PE are structured through a multi-activity approach comprised of main activities (i.e. Rugby, Netball, Basketball), more ‘alternative activities’ (i.e. Ultimate Frisbee and Orienteering) and a variety of fitness activities (i.e. ‘BodyPump’ and Yoga). Students cover 10 different activities and select their choice of sports in year 11. Examination PE involves A-Level and OCR Cambridge National in Sports Studies (Level 2 and 3).

The school had recently piloted an iPad scheme to look at the different uses of iPads within departments and invested in the idea of rolling iPads out to all students. Whilst this scheme

---

<sup>7</sup> A multi-academy trust (MAT) is a single trust responsible for a number of academy schools (in this case three other schools). The MAT consists of the members and the trustees.

has not yet come into effect the school is looking to enhance its use of DigiTech and develop its potential effect to enhance learning.

### **4.6.5 Harriet**

#### **Use of DigiTech**

*Harriet* has been teaching PE for 2 years. *Harriet* is a full time PE teacher (but also taught some English lessons) and had spent her teaching career at the school. This was *Harriet's* first teaching position. *Harriet* is interested in DigiTech and has brought in her own devices to supplement the equipment of the school. The use of DigiTech has been sporadic but is a tool that *Harriet* is aspiring to use more regularly.

#### **School contexts/setting**

Birchwood is in an Academy school (11-18 years) situated in a small town in the East of England. The school is co-educational and is part of an Academies Trust. Birchwood has a large proportion of students from White British backgrounds and has a high proportion of students eligible for pupil premium. Birchwood has a small PE department consisting of 2 PE teachers, both who teach dual subjects (Geography and English) respectively.

PE is a compulsory subject and students have an allocated 2 hours a week on their timetables. Programmes for compulsory PE were structured through a multi-sport approach comprised of (i.e. Rugby, Netball, Basketball). Due to the size of the school and the limited budget available to them the school does not have a technology focus. However, both members of the PE department have sourced resources from other departments to help develop their own practice and the PE lessons of the student.

### **4.7 Data Gathering**

The emergent design of qualitative research means that the strategies for data gathering used in this study emerged throughout the process and were not finalised from the outset. As a result, the strategies for data gathering were open and revised depending on the context. The rationale behind this approach was that the greatest potential for discovery and meaning could evolve throughout the research process. Data were gathered using a variety of

## Chapter Four: Methodology

qualitative methods (see Table 4). These included interviews with teachers, headteachers and senior leaders, lesson observations, field notes and document analysis. These methods are discussed in detail below and are critically discussed in relation to what they involved, their pitfalls and how they were adopted for this study.

4.7.1 Table 4: The data gathering sources

<b>Data Source</b> ( <i>Labelling used in results chapters 5,6,7 and 8</i> )	<b>Description of Data Source</b>
1. 4 AI interviews ( <i>Interview 1, 2, 3 and 4</i> )	Teachers participated in four themed interviews (via Skype or FaceTime) (see section 4.7.2 below for interview details and Appendix v for interview guide).
2. Colleague interviews ( <i>labelled i.e. Headteacher, Male PE Teacher</i> )	I visited the school to speak to interview colleagues (Headteacher, a senior leadership team member, IT Manager and PE Staff) on DigiTech and the selected PE teacher at their school.
3. Post-visit interviews ( <i>Interview 5, 6 or 7</i> )	The teachers were interviewed after my visit to the schools to ask additional questions.
4. Lesson Observations ( <i>Lesson Observation</i> )	Data were gathered using field notes. The researcher observed the lesson without participating.
5. Field notes ( <i>Field notes – context</i> )	Notes about informal discussions with teachers, key incidences or comments that took place during my time in the school.
6. Document gathering ( <i>Document – document title</i> )	Documents were gathered from a variety of sources. These included documents such as resources, development plans, posters, schemes of work and videos.

### 4.7.2 Interviews

The method of interviewing is a pivotal source of data in social science research and was crucial to this study. Conceptualised as a “conversation with a purpose” (Holloway, 1997, p.94) interviews are important to understand the perspectives, feelings and perceptions from the participants. Interviews were an important opportunity for me to gain an understanding of how and why PE teachers were using or attempting to use DigiTech. Yet, interviews are also a central component of the AI approach (Enright et al., 2014) and a method of discovery into what work best (Cooperrider and Whitney, 1999; Ludema, 2002).

This method of data gathering has both advantages and disadvantages. The rationale for using interviews in this study was that they could provide a means to obtain ‘rich’ qualitative data that could be directly observed, as information is gained from the participant’s perspective (Sparkes and Smith, 2014). In case study research, interviewing can be particularly beneficial because it allows participants to talk about their own experiences in their own words and, therefore, afford new insights into the topic of investigation. Stake (1995, p.64) suggests that interviewing “is the main road to multiple realities” as each interviewee provides different stories. This is congruent with the epistemological base of this research (i.e. the belief that there are multiple realities that are constructed by different individuals). Interviews were also pertinent for me in order to engage in co-constructing an understanding of the teachers’ practices with DigiTech. Whilst I was asking the teachers questions and using their answers to edit my future questions, I endeavoured to provide them with opportunities to discuss areas they felt were of relevance to the study and for them to ask questions of me.

As well as the considered strengths of interviewing as a method of data gathering, it does have a number of weaknesses to be considered. The interviewers’ often unconscious reactions may encourage or influence the participants’ answers (Gratton and Jones, 2010). In light of such events, I attempted to use appropriate probes and neutral body language to reduce such influence. Poorly constructed interview questions and participants giving answers that the researcher is expecting are other reported criticisms of the interview method (Jones et al., 2013). In order to counteract this, an interview guide was developed based on the research questions and aims of the study to provide structure, direction and focus to the interview. This was developed, as mentioned above, through a pilot study. Similarly, the interviewees

were reminded that there are no right or wrong answers to the questions and all interview conversations will be anonymised.

### **Phase 1: 4 AI interviews**

Building on this understanding, and given the AI philosophy underpinning this thesis, the starting point for interview design were four, one-on-one, semi-structured interviews. These were conducted individually with teachers in an effort to gain in-depth information about their experiences, views and ideas of DigiTech. These interviews were conducted online at a time and location and platform chosen by the participant. All interviews were recorded on a dictaphone and transcribed as soon as possible after the interviews had taken place to further my own understanding of the research findings and to inform future interview schedules (as suggested in Grounded Theory i.e. data gathering and analysis forming an iterative process whereby analysis informs further data gathering).

Each interview has a specific focus and approach. These four interviews covered a range of themes and the focusing on the following broad areas:

**Interview 1:** Explored each teacher's DigiTech use outside of the school and their views of DigiTech (linking to the discovery phase of AI). This explored topics such as the role of DigiTech in their lives, what they use DigiTech for and what value they see for DigiTech.

**Interview 2:** Explored each teacher's school context and their use of DigiTech in school. This interview explored the development of their DigiTech use, experiences and factors that influenced their use of DigiTech and how DigiTech is used by them and the department.

**Interview 3:** Explored the position of DigiTech in each teacher's practice and how they viewed DigiTech as a teaching approach. This interview explored the teacher's view of PE and the role of DigiTech in their delivery of PE.

**Interview 4:** Investigated how the teacher's practices could be further developed and sustained and explored any questions that needed further clarification.



## Chapter Four: Methodology

The questions were open-ended which allowed the respondents to answer in a manner they deemed most relevant and appropriate to their own experiences. They were designed to promote conversations around participants' views and experiences of DigiTech. Elaboration and clarification probes were used throughout each of the interviews (e.g. can you explain what you mean by X or can you tell me a little bit more about X) in order to ensure comprehensive descriptions were elicited and to ensure the interviewee could confirm and build upon the interviewer's understanding of their views (Gratton and Jones, 2010). These approaches allowed me to prepare questions which were related to the research questions and explore the understanding of the teachers' perspectives (Fontana and Frey, 2008). The overall approach and interview questions were similar for each teacher to ensure a level of consistency. However, since interviews and observations are interactive and are shaped by the context and the situations in which they take place (Tjora, 2006), additional questions were often included. These varied amongst the teachers and were dependent on previous conversations and interviews with other teachers in this study. This enabled me to generate an understanding of each teacher's pedagogical context and specific events that had taken place. The interviews lasted between 43 and 138 minutes, with the average interview time being 75 minutes.

### *4.7.3 Colleague interviews*

In addition to the participating teachers, additional colleagues also participated in interviews. These interviews were conducted with headteachers, senior leadership team members, IT managers and members of the PE department across cases. These interviews were conducted in person at the school using a semi-structured interview format. The purpose of interviewing these colleagues was to gain a more rounded understanding of the use of DigiTech at the school and to get the viewpoints of other significant members of the school on the teachers' use of DigiTech. Furthermore, the views of the colleagues were sought on how DigiTech was being used in PE and their opinions of the practices occurring with PE (including the PE teacher taking part in the study). Given the social-constructivist approach that guides this thesis, there was an acknowledgement that the views of teachers are understood as a result of a complex amalgam of teachers' personal life experiences and their interactions with the broader social structures of departments and schools such as colleagues (Armour and Jones, 1998). Therefore, the method of interviewing colleagues from each school site allowed me to

explore the context in which the practice was situated. This is also a crucial method to be used under the case study methodology in it allows for teachers' use of DigiTech to be explored within its context.

On most occasions, I would interview the member of staff at a specific time and place using a semi-structured interview. Interview questions forming a guide were developed prior to the interview. However, when time wasn't available due to the 'busyness' of schools and teachers' extraneous responsibilities to complete all interview questions, I would conduct a shorter interview. Each respondent was interviewed once, but on two occasions a participant was interviewed twice over two separate visits due to time constraints. Interviews lasted between 12 and 85 minutes with an average interview time of 35 minutes. All interviews were recorded on a dictaphone and were transcribed as soon as possible after the interviews had taken place to further my own understanding of the research findings and to inform future interview schedules with the teachers.

### ***4.7.4 Post visit-interviews***

Following my visits to the schools, a second phase of interviews were conducted with each of the four teachers. The purpose of these semi-structured interviews was to explore the teachers' views and use of DigiTech in light of both my enhanced understanding of their context and the opinions of colleagues at the school. These interviews explored a variety of questions that focused around observations, answers provided in previous interviews that needed further clarification or I felt needed to be explored in more depth. For example, one participant had mentioned in a previous interview that the decision to use DigiTech was sporadic based on choice of teaching style. I had also observed this in her teaching and recorded this in field notes. This was an area that I had probed in other interviews, yet I still did not feel I had a complete understanding of what the participant understood by this. These post-visit interviews provided an opportunity to explore this in more details.

Due to the inductive nature of the research process, these interviews were tailored to the individual teacher rather than using a structured format for all teachers. Each teacher was invited to participate in these post-visit interviews; each teacher was interviewed at least once. That said, one teacher opted to be interviewed twice and two teachers three times. The

interviews lasted between 25 and 95 minutes in length with the average interview time of 60 minutes.

### ***4.7.5 Lesson observations***

Lesson observations are deemed useful because they allow researchers to get close to social practices and everyday situations (Öhman and Quennerstedt, 2012). In this way, observations allow for first-hand impressions of ongoing practices that cannot be achieved by other methods (i.e. interviews) which encompass second-hand reports of the same practice. Observations focus the researchers attention on aspects of the social context and regularities of practice (Ulichny and Schoener, 2010). Observing a single subject, however, shifts the attention to the way the particular individual enacts her profession and why (Ulichny and Schoener, 2010). In conjunction with the characteristics of the case study methodology, the method of observing PE lessons allowed me to observe the phenomenon (i.e. the teachers' use of DigiTech) in its contemporary context and therefore was a suitable method of data gathering in line with my research questions.

Teachers determined the class for observation (i.e. theory or practical) and the age group. Classroom observations varied between schools (and are detailed in the Table 5 below). They were all conducted by myself and were all undertaken as a non-participant observer (Öhman and Quennerstedt, 2012). In this sense, I was made known to the students (and introduced by the teacher) but remained outside of the activities/teaching and did not actively participate in the lesson. This particular method of observation was chosen as it allowed me to remain close to the situation being observed but also to take notes and observe what is occurring. However, the observer remains separate to the practice so that the teachers can be observed 'naturally' in their everyday settings (Öhman and Quennerstedt, 2012). It is acknowledged, however, that the effect of the researcher as observer in the setting cannot be viewed as a purely natural occurrence and can, therefore, have an effect on how participants may act (Öhman and Quennerstedt, 2012). In order to reduce the effect of my presence in the classroom I agreed with the teacher to follow their normal procedure when having an observation (i.e. introducing the observer and explaining their reason for observing).

## **Chapter Four: Methodology**

As the observer, I noted the details of the activity and class, alongside the elements of practice, i.e. what was occurring in the lesson (i.e. skills, practices, classroom arrangement, conversations, lesson objectives, use of resources, teaching styles used feedback etc.). Initially, it was difficult to decide what data were important to record and what was not important. This is referred to by Lofland and Lofland (1995, p.71) as “mucking about” or the messy phase of observing practice. The purpose of this observation was not to grade or evaluate the teacher and therefore no judgement criteria was used to assess the lesson. The intention was to observe PE teachers during their practice – not to evaluate but to see other teaching strategies and styles that could provide insight (Ellison and Woods, 2016). This approach also sits in alignment with the AI approach underpinning this study, in that the focus was on understanding and appreciating practice rather than critiquing or evaluating the weaknesses of practices. Teachers were invited to view the notes at the end of the lesson and, in some cases, this was discussed in small informal discussions.

4.7.6 Table 5: Details of lesson observations

Teacher (School)	Number of observed classes	Class Details	Class Size	Activity and Location	Details of observation	Lesson Length
Patrick (Newton)	1	Year 7 (boys) – mixed ability set	22	Core PE- Dodgeball (indoor, tennis courts)	Field notes	1 hr 40
Dillon (Wurburton)	3	Year 12 (mixed) Double lesson	14	BTEC theory lesson (Computer room)	Field notes	1 hr 40
		Year 8 (mixed) – mixed ability set	26	Core PE – Handball (indoor, sports hall)	Field notes	50 mins
		Year 9 (girls) – mixed ability set	23	Core PE – Basketball (indoor, sports hall)	Field notes	50 mins
Alice (Lutterford)	4	Year 10 (girls) – mixed ability set	24	Core PE – Ultimate Frisbee (outside, astro turf)	Field notes	50 mins
		Year 10 (girls) – higher ability set	24	Core PE – Netball (inside, sports hall)	Field notes	50 mins
		Year 10 (girls) – lower ability set	26	Core PE – Netball (inside, sports hall)	Field notes	50 mins
		Year 10 (mixed) – mixed ability set	23	GCSE – Trampolining (inside, sports hall)	Field notes	50 mins
Harriet (Birchwood)	1	Year 8 – (girls) mixed ability set	28	Core PE – Health and Fitness (inside, sports hall)	Field notes	50 mins

Table 5 details the variety of different lessons observed at each site. Due to the demands and comfort of each teacher, these varied from 1-4 lessons observed. These observations were supported by field notes (see below) with the intention of gaining a deeper understanding of what is said and done to gain a contextual insight into DigiTech practices.

### ***4.7.7 Field Notes***

Taking field notes is an important part of qualitative research as it allows the researcher to record reflexive accounts alongside observations. Recalling conversations, events or practice may be difficult after the observation has occurred and thus taking notes in situ allows the researcher to record their observations (Jones, 2015). Mulhall (2003, p.311) argues that “recording events as they happen [or after] means that the memory of the researcher is fresh and details are not lost”. This ensures that they can be transcribed and recorded to be expanded upon at a later stage (Jones et al., 2013). In addition to recording details of what is directly observed, field notes can also detail a researcher’s thoughts, questions and conceptual reflections (Wolcott, 2009).

In this study, field notes were used during lesson observations, during and after school visits and after interviews or informal conversations. These were kept in a notepad in written note format alongside memos which were also written in a research journal and recorded on NVivo software, see section 4.8. In addition to written field notes, voice recorded memos were made to help me reflect on school visits or conversations. The notes and recorded audio files were stored in NVivo software. The purpose of this form of data gathering was to enable me to record my thoughts such as anything which stood out or to record any connections between previous interviews.

### ***4.7.8 Document gathering***

A variety of documents were gathered for this thesis. Documents gathered while in the field are useful sources of data as they contain additional knowledge about the group being studied (Jones and Holloway, 2013). A large proportion of these documents are characterised as extant documents. Extant documents are materials gathered by the researcher and are documents in which the researcher has not played a part their construction (Charmaz, 2014). In this study these included, but were not limited to, (a) DigiTech brochures, (b)

improvement/intervention plans, (c) school vision statements, (d) learning resources created by the teachers, (e) teacher PowerPoint presentations (f) posters (g) and curriculum maps (see Appendix vii for further document details). The gathering of such documents helped in augmenting evidence from other sources (i.e. interviews and observation), offering historical understanding of the context and in providing examples of practice. Furthermore, the documents (such as improvements plans) provided supplementary information about participants, departments and the school's positioning and context of the teachers to expand upon in interviews.

### ***4.7.9 Data management and storage***

All files were anonymised and then stored/managed on NVivo (version 10) software. NVivo is an example of a piece of computer software used to manage and analyse qualitative data. Originally the decision to use NVivo was centred on the organisation benefits afforded by the software. This is because NVivo can accommodate a number of data types (i.e. audio file PDF/Word documents etc.). I had previously used NVivo and had knowledge of the tools. However, I soon realised after considering the research literature around NVivo and grounded theory (i.e. Bringer et al., 2006; Hutchison et al., 2010; Johnston, 2006) that when used appropriately, NVivo could help facilitate many of the key characteristics of the grounded theory such as ensuring coding is grounded in the data and the iterative nature of the analysis.

The functions used in NVivo and an explanation of the analysis process are displayed in detail through the analysis video found via a hyperlink or accessed by a memory stick attached in Appendix vi. Further details of the data analysis which expand on some of the point raised in the video are explored in the section below.

## **4.8 Data analysis**

Data analysis followed guidelines from a constructivist approach to grounded theory. Charmaz's (2014, p.15) five criteria as evidence of using grounded theory as a form of analysis were followed. These are discussed in turn below.

1. Conduct data analysis simultaneously in an iterative process.

2. Analyse actions and processes (initial and focused coding) rather than themes and structures.
3. Draw on data in service of developing new conceptual categories.
4. Develop inductive analytic categories through systemic data analysis.
5. Use comparative methods

In this study data analysis occurred alongside data gathering. After initial data gathering and transcription, I read the transcripts (and other data sources) multiple times. I also made notes in the form of memos, recorded reflections and noted initial ideas and patterns in the data. This iterative process informed subsequent stages of data gathering (i.e. interview questions) and analysis. NVivo facilitated the iterative process of grounded theory as it allowed me to create links between nodes, memos, and data sources and for ideas to be generated and easily accessed throughout the research process. Thus, both data and ideas are interwoven in one, digital space.

Once the data were stored on NVivo, I began the next stages of coding. Coding entails labelling bits of data to detail what the text indicates which, in turn, is used for conceptual development (Charmaz, 2014). The aim of the coding process is to illuminate action, provide context and show emerging processes. This stage, therefore, involved identifying and labelling key points of interest within the data (for example the view of DigiTech as ‘a means to an end’). This occurred across cases and data sets. In this sense, this process involved a process of constant comparison, where data and labelled categories were compared. My data analysis was supported by the use of memos (discussed further below) which facilitated the iterative process because it encouraged my future data gathering and idea generation.

### ***4.8.1 Initial coding***

Consistent with a grounded theory emphasis on the iterative nature of the process, the codes I used in the analysis were constructed from my reading of the data rather than emanating from an earlier coding framework. The first phase of initial coding involved “mining” for analytical ideas to pursue in further data gathering and analysis (Charmaz, 2014, p.114). This entailed me labelling the text and actions from it. In analysing the emerging actions and



processes in the text, I coded with gerunds<sup>8</sup> as a means to focus the analysis actions and processes. Line-by-line coding with gerunds gives the researcher actions to explore, spurs making comparisons between data and suggests emergent links between processes (Charmaz, 2014). This is recommended by Glaser (1978) and Charmaz (2014, p.120-121) and was utilised in this research as a way to encourage me to think about the processes occurring in the data rather than mere description. For example, the gerund code of '*establishing consistency*' was used over '*consistency*' as a means to reflect the process of bringing DigiTech to a firm or stable basis but was not something that had yet been achieved by all the participants. Using participants own words in initial code names (known as '*in vivo*' coding) is also encouraged as a method of staying true to the data (Charmaz, 2014; Glaser, 1978). Thus, I used some initial codes such as '*taking the plunge*' to refer to direct statements made by the participants. An example of coding using gerunds is shown in Figure 3.

4.8.2 Figure 3: Example of initial coding using gerunds

Needing to take risks	202	P: but it's a real shame though in my opinion that it my world we
	203	have to take risks to see whether it will work and I think my
Viewing some staff as risk adverse	204	education colleague friends don't necessarily, they are a bit risk
	205	adverse and actually we've, have we tried it? I've had
Having the risk of failure	206	conversations with people where you go, I don't want to do it just
	207	in case, but have you tried it and they go away and try it and it
Removing fear of failure	208	does work but it's the risk of failure and I want to remove that fear
	209	its like people don't need to, in life things go wrong we pick up
Learning from mistakes	210	our pieces and we move on and we learn from it as long as we
	211	can learn from it and not make the same mistake again, great.
Stopping forward movement	212	But if we are just fearing that something could go wrong well then
	213	we are never going to move the organisation forward.

I would read through the data before highlighting a piece of text to be coded. The labelling of text was coded in the channel on the left. In some cases, this was conducted on paper or on Microsoft Word before being uploaded into NVivo. This ensured that a record of the coding process was stored and managed. Whether conducted on paper or using software, this initial

<sup>8</sup> A gerund is a verb which functions as a noun, in English ending in *ing*. For example: Resisting, appreciating or resuming.

coding process involved a similar process. The only difference is that NVivo creates nodes which provide storage areas for references to coded text (Bazeley and Jackson, 2013). Therefore, every time I identified an initial code from the data, a node was created to represent it and the relevant piece of text that pertained to that concept was stored at that node.

To facilitate the theoretical development, grounded theorists are encouraged to always think about the codes they are identifying (Hutchison et al., 2010; Charmaz, 2008). Charmaz (2014) poses a number of questions to think about during the initial coding process such as: what do the data suggest? Pronounce? Leave unsaid? By thinking about questions such as these, grounded theorists can begin to move beyond thick description to a micro-analysis of their data (Corbin and Strauss, 2008). Memo writing was used to help contextualise my early interpretations or processes to facilitate my analytical thinking. Memo writing is essential to grounded theory and is a fundamental route in ensuring the researcher's data engagement that results that are 'grounded' in the data (Lempert, 2010). In this study, memo writing occurred during both coding phases and involved two processes: code note memos and analytical memos. The first memo, 'code note memos', involved writing a memo based on a/or multiple initial codes, defining this node (see Figure 4). On some occasions, these memos contained further questions that I deemed could be useful to explore in future data gathering (see Figure 5). These were stored in NVivo and linked other memos, documents and codes.

### 4.8.3 Figure 4: Example of code note memo

Code name: **Identifying schools use as different to personal**

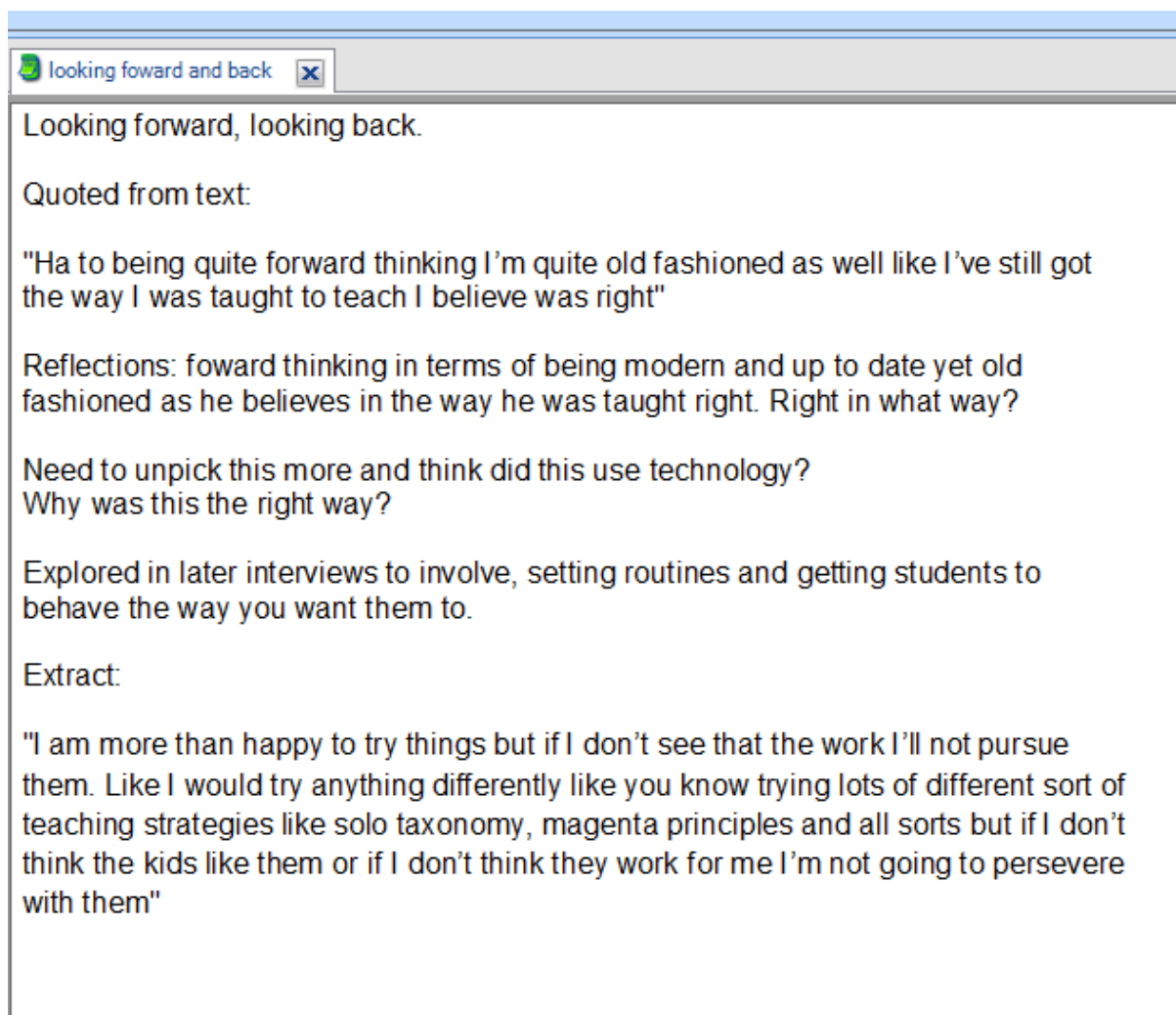
**Counting as two separate contexts**

Discusses how use of tech in training and in a school context is different to that of a personal context. "very very different". Home use mainly reflecting entertainment and contact. Not really using Twitter that much either – more for professional purposes. Own personal use does not influence school use in any way.

Mentions that inside and outside use of tech are "count as two separate things"

These memos provided me with a valuable space to explore emergent ideas that were grounded in quotes from the data and allowed my initial codes to be explored in greater depth. The second memo practice, ‘analytical memos’ involved a more organic process of developing ideas and the data. These are described by Bringer et al. (2004) as higher order memos for evolving analysis which occurs at a more abstract level. Memos, “especially early ones, are speculative and may lack coherence and connection to one another” (Lempert, 2010, p.247). Thus, these types of memo writing are more of an adaptable narrative tool where my interpretations were explored in greater depth (Charmaz, 2006). Figure 5 provides an example of an analytical memo.

4.8.4 Figure 5: Example of analytical memo



This process of memo writing aligns with the social constructivist paradigm underpinning this thesis, through the use of extracts from the data to aid my interpretations whilst also

drawing upon my own analytical thoughts. However, at all times these memos were grounded in the data and often included quotes or extracts of data. The advantage of using NVivo with the memo process was that it provided an audit trail that allowed me to link memos to other memos, transcripts or pieces of text quickly. This was useful in allowing me to constantly compare data with my emerging ideas - a key aspect of grounded theory.

Once data were initially coded, the next stage was to compare the codes with the data and identify any common or similar codes. This stage involved looking at the codes and data at a broader level and involved combining numerous initial codes into more focused and broader coding (i.e. within, across and between cases). This is explored in the section below.

### ***4.8.5 Focused coding***

The second phase in analysing data through a constructivist approach to grounded theory is a more focused coding approach. This process allowed me to elicit both points 3 and 4 from Charmaz's (2014) criteria.

Focused coding differs from initial coding as it involves concentrating on what the researcher defines as the most useful initial codes, those that occur frequently and those that have most significance (Charmaz, 2014). In other words, focused coding meant using and/or refining certain initial codes that I felt had more meaning, theoretical reach, direction and centrality within the data and treating them as core of the nascent analysis. In the context of this thesis, focused coding involved devising a code that subsumed numerous initial codes. These focused codes were tentatively selected based on their usefulness, frequency of occurrence, and those that I felt had more analytical significance in line with my research questions. As detailed by Charmaz (2014) these focused codes are used to examine large batches of data and revised. Through comparing data with the codes, the process of constant comparison and refinement allows these codes to be refined further. Furthermore, this constant comparison ensures that the focused codes are grounded in the data. Due to the iterative nature of this process it allowed me to return to the codes and data to analyse further. This process was repeated until no new themes or subthemes were identified.

To help in the refinement of focused codes and theme development, another technique used in the development of grounded theory is the use of models of diagrams (Holt et al., 2012).

## **Chapter Four: Methodology**

NVivo facilitates this process as it allows the researcher to access a variety of different model building tools (i.e. model, tree map and which allow codes and relationships to be presented diagrammatically). Whilst NVivo has its own modelling feature to present emerging codes and themes visually, models used in this thesis were created in Microsoft Visio. This piece of software is a diagramming and vector graphics application that allows the user to create their own diagrams and flow charts. This helped me to provide evidence of analytical my emerging thoughts (as many versions were refined over the analysis process) and define and refine my themes.

### **4.9 Ethical considerations**

This research was conducted under full ethical clearance from the Loughborough University Human Ethics Committee. Ethical clearance was granted in January 2016 before the research was undertaken and involved completing an ethics checklist and risk assessment in line with University procedures (see Appendix iii).

In the case of conducting interviews in an online format, the Loughborough University 'Guidance notes for investigators using electronic methods or social media for research' was followed. Participants received the information sheet electronically and also discussed the research in the Skype/FaceTime call. The confirmation of consent was recorded verbally and where possible also in written format. Participants were made aware that they could end the call at any point and that they were happy for the call to be recorded.

During the fieldwork element of the study, it became apparent that the opportunity to undertake additional interviews would be advantageous. An addendum was subsequently added to our ethical clearance to undertake further interviews with the participants. Participants verbally confirmed they were happy to take part in further interviews and also were given an updated information sheet and consent form to sign. All four teachers agreed to take part in further interviews.

### **4.10 A relativist approach to judgement**

As this section will demonstrate, while there is need to consider how the 'quality' of qualitative research is judged, there is much conjecture surrounding the appropriate

## Chapter Four: Methodology

terminology to employ to explain oneself. In light of such debates, I set out to briefly explore the differing positions of both ‘criteriological’ (Sparkes and Smith, 2009) and relativist approaches before offering up the relativist approach as appropriate consideration of judgement for this thesis. Within this approach the following list of criteria of the substantive contribution, width, meaningful coherence and transparency are deployed as appropriate terms in self-positioning the quality of this work.

In exploring validity and quality in qualitative research I have been drawn to the work of scholars such as Burke (2017), Smith and McGannon, (2017) and Sparkes and Smith, (2009). In engaging with the literature in this area, these authors (amongst others) describe the two overarching positions that have been adopted by qualitative researchers in the field of sport and exercise. Chief amongst these has been the criteriological approach whereby positivist views of what constitutes rigor in quantitative research is applied to discern whether a qualitative study is of any value (Sparkes and Smith, 2014). From this perspective, the quality of a study is judged against a set of external and universal criteria in the search for an objective reality and truth (Burke, 2017). The most commonly cited criteria pertains to that of Lincoln and Guba (1985). However, this work has now come to be seen as flawed by not only the authors themselves (Guba and Lincoln, 1989; Lincoln, 2010) but also a number of qualitative authors in the sport and exercise field (Smith and Caddick, 2012; Sparkes and Smith, 2009).

In summarising their critiques, Lincoln and Guba’s (1985) criteria have been largely criticised for being incompatible with the guiding ontological and epistemological assumptions of qualitative research. For example, using member checking as a means to test the truthfulness of research findings comes from the perspective that there is an objective truth to be obtained (see Sparkes and Smith, 2014 who further expand on the problems associated with this approach). As contested at the start of this chapter, this contradicts the social constructivist paradigmatic tenants underpinning this thesis. Furthermore, both Lincoln and Guba (1985), and the more recent work of Tracy (2010), set out universal criteria that are fixed which, in and of themselves, is problematic as it calls upon the researcher to judge any piece of qualitative research in “pre-ordained and set ways” (Burke, 2017, p.333). In this sense, many ‘new’ and different ways of researching can be judged as invalid from the outset as they fail to meet all the criteria. As such, we need to move past Lincoln and Guba’s (1985)

criterion and adopt a different approach to validity. How, then, might informed judgements on research quality be conducted?

An alternative position to evaluate qualitative research is the relativist approach (Sparkes and Smith, 2009). This approach also uses a set of criteria to ascertain the quality of qualitative research. Thus, on the surface it may seem comparable to that of Lincoln and Guba (1985) and Tracy (2010). However, what distinguishes this perspective from that of a criteriologist is that the criteria are applied in a way that is both contextually situated and flexible and, therefore, not universally applied (Sparkes and Smith, 2009). The relativist approach is subsequently adopted for this thesis as it fits with the ontological and epistemological perspectives held under the social constructivist approach. Considering this viewpoint, the belief held is that judgement criteria should be tailored to each individual study (Sparkes and Smith, 2009). In this way, 'quality' is internalised within the experiences and background of the researcher as well as the underpinning assumptions of the study, rather than being something to be tested (Amis and Silk, 2008).

Below I discuss the relativist approach to judgement which can be summarised as criteria not applied in a universal manner but, drawn from an ongoing list of characterizing traits that are appropriate for this study (Sparkes and Smith, 2009). As Sparkes and Smith (2009) argue, this approach does not mean that 'anything goes' but rather rejects applying a universal list of criteria for judging qualitative research. This allowed me, as the researcher, to consider the nuances of AI, case study and grounded theory method used in this thesis and offer suggestions of how to evaluate them. For this thesis, the list included the following criteria: the substantive contribution, width, meaningful coherence and transparency (Smith and Caddick, 2012; Tracy, 2010). These are explained in the sections that follow. In addition, the study aimed for naturalistic generalisations: that is, "producing qualitative work that resonates with, provokes actions in or stimulates curiosity among readers" (Smith and Caddick, 2012, p.69).

In considering the substantive contribution of this work the reader should question whether this piece of work contributes to our understanding of social life? Does it extend our understanding of pedagogy and DigiTech in PE? More specifically, significance is used as a means to examine how existing concepts (in this sense AI and pedagogies of technology)

## Chapter Four: Methodology

make sense in new and different contexts. In doing so, the study sought to build on past research to provide new conceptual understandings that can be used by future researchers.

Judging research quality by width pertains to the comprehensiveness of evidence. This dimension refers to the quality of the data gathering methods as well as the analysis (Smith and Caddick, 2012). In this sense, this term is similar to that posed by Tracy (2010) as rich rigour whereby there are data supporting the claims made by the researcher. Meaningful coherence refers to the way different parts of the interpretation create a complete and meaningful picture (Smith and Caddick, 2012). Furthermore, it attends to whether the research study achieves what it purports to be about, uses methods and procedures that fit its stated goals and meaningfully interconnects literature, findings and interpretations with each other (Tracy, 2010). An example of meaningful coherence would be for example using a constructivist approach to grounded theory which relies on the same paradigmatic assumptions that underpin this thesis.

Transparency refers to whether the research process is made transparent through for an example an audit trail (Smith and Caddick, 2012). In this thesis, an example of transparency using an audit trail includes using a video to explain the analysis process. Without the use of this medium it would be very difficult for the reader to get a sense of how the analysis had been conducted (given that analysis involved computerised software). Furthermore, other critical colleagues, such as those at conferences, my supervisory team, and friends provided a sounding board for reviewing my work. This practice was not intended, however, to ensure that the work is checked towards a single truth but, rather, to aid in interpretations, analysis and critical reflections regarding my work.

This research aimed for naturalistic generalisations: that is, “producing qualitative work that resonates with, provokes actions in or stimulates curiosity among readers” (Smith and Caddick, 2012, p.69). It is, therefore, through the process of foregrounding the views of my participants (which has been particularly supported by the use of grounded theory) I have sought to produce work that is relevant, interesting and one that other readers find useful to reflect upon their own context and experiences.



In proposing the criteria above, I do not wish to infer that these are the only criteria that can be used for passing judgement. Rather, these are the list of criteria that are self-identified to be considered when reading this thesis and offer a perspective of the approaches to judgement that are in alignment with the paradigmatic stance of this research.

### 4.11 Conclusion

The aim of this chapter was to describe the development of the study from initial conceptualisation to write-up and to ensure the research process is transparent. The first phase of this chapter explained and justified the social constructivist research paradigm that guides the research. This was discussed in relation to the beliefs of the researcher to explore the multiple and subjective realities of the teachers. The second phase of this chapter, discussed the methodological principles underpinning this study, namely through a collective case study approach. The third phase introduced the method of analysis in relation to a constructivist approach to grounded theory. The final phase discussed the participants and setting before detailing the methods of data gathering, analysis and representation. This chapter concludes by considering issues of judgement and interpretation of findings.

Throughout my discussion on the methods I have shown that this study explored four teachers' views and use of DigiTech. Using Charmaz's (2014) coding steps and the process of constant comparison, three conceptual themes were constructed that captured the experiences of the participants in the study and grounded in the data. *'Developing an embedded culture'*, *'establishing routines'* and *'keeping tasks simple'* were constructed and form the main section headings for the four case study chapters that follow. Whilst these three themes are discussed separately, it is noted that these themes are not entirely independent of each other and, in many ways are inter-related.

Each of the four case study chapters is organised into two main sections. The first section presents findings from the data analysis. The findings are discussed alongside discussions of the literature specific to the case. Each case is unique and is a descriptive case study in its own right. In the data analysis, several layers of themes were constructed under each of these main themes and are more specifically discussed within each case. These main themes, and their associated sub layers, are discussed in the first part of the chapter. In foregrounding the

## Chapter Four: Methodology

discussion of each teacher's case study chapter, Table 6, 7, 8 and 9 present an overview of the types, function and application of the DigiTech used by each teacher. These are discussed and referred to in more detail throughout each chapter.

Whilst the main categories are repeated and discussed in each case study chapter, they are presented in different orders based on their perceived significance for each teacher. The first theme discussed is the most significant to be generated from the data analysis for that teacher, with the last being the least significant. In this sense, whilst each chapter will present the categories running across the data it will be tailored and discussed differently based on the experiences of each teacher. After each theme is discussed the case study chapters will conclude with a summary of the findings.

## Chapter Five: Patrick

### 5.1 Introduction

This chapter unpacks the views and experiences of Patrick, and others in his school, regarding DigiTech use. The findings are presented in an effort to understand the factors and experiences that influence how and why Patrick has developed his use of DigiTech in his teaching. Three themes which were constructed from the data analysis are presented in the following order: *‘developing an embedded culture’*, *‘establishing routines’* and *‘keeping tasks simple’*.

Prior to discussing each theme, the table below represents types of DigiTech (i.e. apps or devices) used by Patrick, what functions were used and how it was used. Not all of these individual pieces of DigiTech are discussed in the following chapter; they represent the diversity and range of uses.

5.1.2 Table 6: *DigiTech/apps, functions and how they were used by Patrick*

Case Teacher	Type of DigiTech (App/Device)	Functions/Description	How it was/has been used
Patrick	Coach's Eye and Hudl (app)	Performance analysis application that can allow playback of captured footage in real time, slow motion and frame-by-frame. Video clips can be annotated and placed side-by-side alongside other videos.	<ul style="list-style-type: none"> <li>Students filmed games/practice and verbally annotated video clips.</li> <li>Students adopted analyst roles to observe and analyse lesson content.</li> <li>Videoing of skills and compared to a 'perfect' model.</li> </ul>
	Socrative (app)	Question and answer app for teachers to ask set questions and quizzes.	<ul style="list-style-type: none"> <li>Patrick created mini quizzes for in class and homework.</li> <li>Both open and multiple-choice questions aided by photos and videos.</li> </ul>
	Showbie (app)	App used to create a platform for students to share work, annotate document/pictures and teachers to mark and give a variety of feedback (e.g. formative/summative and written/oral).	<ul style="list-style-type: none"> <li>Patrick uploaded resources and provided feedback (audio/written) on work.</li> <li>Students uploaded work and could also provide both audio and written responses to feedback.</li> </ul>

## Chapter Five: Patrick

QR code/ reader (app)	<p>(QR) Quick response codes are device readable codes that allow users to quickly access information that is stored online but accessed by scanning the code.</p> <p>The QR code app reader allows the codes to be scanned and the associated link opened.</p>	<ul style="list-style-type: none"> <li>Patrick created QR codes to help students quickly access homework, resources or key websites.</li> <li>These were displayed on walls or on resources.</li> <li>App used by students to scan and therefore access content on students' personal devices.</li> </ul>
Padlet (online)	Online message board where users can post and have discussions on a virtual message wall.	<ul style="list-style-type: none"> <li>Used by Patrick to post questions and videos for students to answer.</li> <li>Students posting answers and discussion points.</li> </ul>
Google Forms (online)	Online platform used to create and deliver online assessment.	<ul style="list-style-type: none"> <li>Used by Patrick to create online registers.</li> <li>Conducting online assessment questions that can be marked through Google.</li> </ul>
Comic Life (app)	App that allows the user to create unique resources that looks like a comic book.	<ul style="list-style-type: none"> <li>Used by Patrick to create revision guides, teaching cards/resources and flipped learning mats.</li> </ul>
Twitter (online and app)	A micro-blogging social media platform which allows users to interact with each other through messages, links and other media, called 'tweets'.	<ul style="list-style-type: none"> <li>Used by Patrick as a tool to gain ideas and resources. Used to connect with like-minded practitioners, post questions and practices.</li> <li>A source of Patrick's professional learning network.</li> <li>Used by Patrick to assess learning in lessons and provide revision prompts.</li> <li>Creation of department page to post student activities.</li> </ul>
Pocket (app)	An app that allows you to save links and multimedia to view at a later stage.	<ul style="list-style-type: none"> <li>Patrick used this app to keep track of new ideas or resources seen online/Twitter.</li> </ul>
YouTube (app)	A video-sharing website that allows users to upload, view, rate and share videos.	<ul style="list-style-type: none"> <li>Used by Patrick to create a department channel where videos were uploaded of students' performances.</li> <li>Used by Patrick to find exemplar videos relevant to lessons.</li> <li>Used by Patrick to upload performance analysis videos created on other apps.</li> </ul>

## Chapter Five: Patrick

BookCreator (app)	An app used to create iBooks using a range of resources.	<ul style="list-style-type: none"> <li>• Making revision booklets and resources for BTEC practical sport.</li> </ul>
Camera (app)	App used to take photos and videos.	<ul style="list-style-type: none"> <li>• Used by teacher and students to take static images and videos of students' performances.</li> </ul>
iMovie (app)	Movie/video making application. Allows you to upload videos from camera roll and add text/effects. Then can save or upload to YouTube.	<ul style="list-style-type: none"> <li>• Creating movies and evidence of learning.</li> </ul>
Notability (app)	App used to take notes and annotate over documents.	<ul style="list-style-type: none"> <li>• Teacher provided (audio and written) feedback on work.</li> <li>• Teacher access to students notes.</li> <li>• Students can create digital notes.</li> </ul>
Explain Everything (app)	Interactive whiteboard app that creates slides of information that are narrated over.	<ul style="list-style-type: none"> <li>• Used by Patrick to annotate, animate, and narrate images and documents to create a screencast video.</li> <li>• Students creating their own videos.</li> </ul>
Keynote (app)	App used to create interactive presentations (similar to Microsoft PowerPoint).	<ul style="list-style-type: none"> <li>• Used by students to present work in theory and practice lessons.</li> </ul>
PicCollage (app)	Create a collage of images and text into a document.	<ul style="list-style-type: none"> <li>• Used to create posters and teaching resources.</li> </ul>
Google Drive Docs (online)	Create and edit web-based documents, spreadsheets and presentations.	<ul style="list-style-type: none"> <li>• Used to plot assessment data and organise documents.</li> <li>• Used to store revision documents for students to access.</li> </ul>
Facebook (online and app)	Social media app that allows the user to connect with others and post messages.	<ul style="list-style-type: none"> <li>• Used to update PE Facebook page sharing activities occurring in the department.</li> </ul>
Edmodo (app)	A virtual classroom for the user to interact with others specifically on work.	<ul style="list-style-type: none"> <li>• Teacher feedback on work.</li> <li>• Created quizzes, polls and debates.</li> <li>• Setting homework and assignments for students to submit online.</li> <li>• Create links with other classes and set reminders that students receive on phone.</li> </ul>
Popplet (app)	Used to create online resources and mind maps.	<ul style="list-style-type: none"> <li>• Used by students to link text, pictures and videos which are either printed/downloaded or shared via social media.</li> </ul>

	iPad (device)	Apple device used to download apps, store information and take pictures.	<ul style="list-style-type: none"> <li>Used by teacher to record students, store and create work, access the internet.</li> <li>Used by students (1 on 1) to complete work, download apps and access applications.</li> </ul>
	Heartrate monitors (device)	Devices used by students to monitor and record heart rate – data accessed on an associated application.	<ul style="list-style-type: none"> <li>Used to record and analyse students' heart rates to aid learning.</li> </ul>

### 5.2 Developing an embedded culture

At both an individual and department/school level, a culture around the use of DigiTech was established, developed and embedded. For Patrick, this was one of the main factors that promoted his use of DigiTech. In essence, the school adopted DigiTech into its ideas, customs and behaviour and, thus, made it part of its culture. DigiTech was embedded and formed a consistent part of teaching and learning. Supported by investment in DigiTech (mainly through staff and student iPads), this culture involved embedding the use of DigiTech into every aspect of the school. DigiTech was planned and incorporated into school policy and mapped against school values (priorities), expectations and teaching and learning approaches. For example, in a document giving an overview of their recent iPad project, the school stated that it developed their own “i-Pedagogy” (Document – iPad plan). This was built around the use of “top apps” and ‘Bloom’s Taxonomy’<sup>9</sup> to allow “staff and students at whatever their starting point to plan, adapt and participate in high learning” (Document – iPad project overview). Subsequently, the culture of DigiTech use in the school was underpinned by pedagogy and considering what pieces and uses of DigiTech could be applied to these approaches. The school worked with staff to provide structured and research-informed training to ensure that staff were equipped with the skills to view and use DigiTech as a teaching and learning strategy.

*We moved to technology as a teaching strategy and we went down the road of interactive whiteboards, data projectors and things like that. We saw them [iPads] as*

---

<sup>9</sup> Using Bloom’s (1956) taxonomy of educational objectives (i.e. remember/understand, apply, analyse, evaluate and create) the school mapped different apps and the ways they could be used towards these objectives.

*much more of a teaching and learning tool and we bought some class sets, put them in some key departments and monitored their use. We've kind of done it at every level so we've done whole staff CPD, we've done departmental CPD, and we've done CPD targeted at individual staff. (Headteacher)*

In turn, the PE department/school culture instilled into teachers' learning and practice ensured that a culture was developed that stressed DigiTech's importance, links to wider school goals and expectations and ideas around use. This joined up thinking allowed the school to embed a culture around parents/students supported investment in iPads, bringing the devices to every class and using the DigiTech for purposeful learning. Walking around the school, I could see that the use of the DigiTech was evident, and I saw many posters or displays discussing DigiTech use. Embedding DigiTech in this way allowed both staff and students to work through, and see the use and benefits of, DigiTech.

For Patrick, the culture around the use of DigiTech was consistent with his own approaches to DigiTech. Both Patrick and the school were interested in the use of DigiTech for teaching and learning. Both engaged with the research, the practices of other schools and educational initiatives which could support teaching and learning. This involved being forward thinking and considering how the work with the iPads in the partnership primary schools could be supported and extending when students reached secondary school. The culture was therefore embedded to support skills students developed in their previous learning institutions and to maintain an approach to learning that they were familiar with.

The different aspects of the embedded cultures instilled by both Patrick and the department are discussed further below. Individually, Patrick identified that he developed his own culture around the use of DigiTech which was *driven by his interest, keeping up to date and being forward thinking* with DigiTech. From a department/school perspective, the culture developed around the use of DigiTech was '*sharing as developing*', '*playing and learning with through DigiTech*', '*trying out ideas*' and '*consistency in strategies*'.

### 5.2.1 *Driven by interest*

Patrick indicated that he developed an interest in DigiTech at an early age; one that has endured throughout his teaching career. DigiTech was a tool used to “interact and play with friends” (Interview 1) and it remains a specific area of interest because he sees his own children using and developing through DigiTech. Patrick’s interest in DigiTech was a self-identified factor that promoted his use of DigiTech in his teaching. Patrick’s personal interest in DigiTech was also identified by his colleagues as a factor that promoted his use of DigiTech in his teaching. An assistant curriculum leader (the member of staff involved in assisting the physical education curriculum) felt that Patrick “likes to be on technology within school and outside school for his own enjoyment”. However, Patrick was not driven to use DigiTech solely by his self-interest. Patrick explained how:

*It is important to find out what the students are interested in and how you can use that and bring it into teaching. (Interview 1)*

Fullan and Langworthy (2013) noted that DigiTech can enable deep relationships between teachers and students due to similar learning interests. Such engagement with mutual interests represents the emergent role of a teacher’s pedagogical capacity to help students find and build on their interests and allow students to explore their own interests through the use of DigiTech (Fullan and Langworthy, 2014).

Of particular significance to Patrick’s interest was his ability to not see DigiTech in terms of a barrier or a challenge that could not be overcome.

*I try not to see them [DigiTech] as barriers, of getting in the way. It helps when you have got an interest as well because when you’ve got an interest in something, a natural interest, you tend not to see things as barriers as much. (Interview 4)*

Whilst teachers face several barriers when integrating DigiTech into their practice (see Kopcha, 2012), being able to deepen their knowledge within specific areas of interest (i.e. DigiTech) would seem to suggest that one is more likely to pursue with the practice of interest even when faced with obstacles. Patrick equated this view of barriers as surpassable and hence, driven by his interest, devised strategies to overcome them. This supports the



work of Snoeyink and Ertmer (2001) who found similar results indicating that when teachers saw the value in DigiTech, they were more likely to use it even when barriers existed. However, Patrick's perspective also extends those findings of Ertmer, Ottenbreit-Leftwich and York (2006) who suggested that, because of their confidence, or previous successes with DigiTech, exemplary DigiTech using teachers (defined by Ertmer et al., (2001) as those teachers who employ DigiTech in learner-centred/constructivist environments as opposed to traditional teacher-directed environments) are able to devise more ways to overcome obstacles.

Patrick's interest was further supported by the school who acknowledged the importance of a member of staff's interest in the value of DigiTech for teaching and learning.

*Patrick has been really involved in it [DigiTech] but that's because he's interested in it. He's shown an interest and he's led developments across PE. We are very much about giving people opportunities if they are interested in something. (Headteacher)*

Patrick's interest drove his use of DigiTech but he was also influenced by the engagement and interest of his students and support from the school. Furthermore, Patrick's interest in DigiTech allowed him to sustain his practice when faced with obstacles and felt he was supported and developed in ways that aligned with the school's developing culture of DigiTech use.

### **5.2.2 Keeping up to date**

Linked with Patrick's interest in DigiTech was his desire to 'keep up to date' with the latest DigiTech and pedagogy. Similar to the case study teacher in Armour et al.'s case (2017a), Patrick demonstrated a professional responsibility to find new ways to support learning.

*I feel like you've got to keep up to date, not only with what technologies there are but actually what students are interested in as well. From a teaching point of view, it is important to see what's out there and see what you can use to improve your practice. Also, if it improves my practice it should improve their [the students] learning. (Interview 3)*

Patrick's main source for keeping up to date was through Twitter (see Table 6).

*Twitter has probably been the most powerful tool because you've got a lot of people who are sharing ideas. I think there is just this giant network of people sharing ideas and so it's sort of free CPD. (Interview 5)*

This use of Twitter as a source of professional information seems increasingly common for PE teachers (c.f. Goodyear et al., 2014b; 2017c). In the work of Gleddie et al. (2017) the case study teacher used social media as a tool for engaging in purposeful continuing professional development (CPD). More specifically, the teacher's pedagogical approach to DigiTech use was based both on access to social media and his efforts to drive his own to improvement (Gleddie et al., 2017). As Patrick expresses, "I always want to be better" (Interview 3). Patrick's pedagogy of technology is, therefore, supported by the ideas and networks provided through social media. This occurs in a way whereby DigiTech supports but does not define his pedagogy. Erwin (2016) posits that new ideas posted on social media can prompt other professionals to improve their practice and provide a quick, free and effective way of gaining information. However, many teachers do not progress beyond the initial stages of social media use and the use of social media can become more about external recognition rather than teaching and learning (Carpenter and Krutka, 2014). For that reason, an important part of the pedagogical process for Patrick is to become a critical consumer of information and consider the teacher, their teaching and their context.

*I'll like an idea and they look great but you know when you actually get down to the practice part of it or implementing it doesn't quite work as well. So, I'll always tweak it to create my own to match my students. I think it's the same with technology. You have to look at something and then put your own stamp on it when it's time to deliver. (Interview 3)*

This was a regular and embedded part of Patrick's use of DigiTech and one that was identified by other colleagues as a practice that was useful in sharing his developing ideas and building up the learning process with DigiTech in the department. Therefore, whilst Patrick used Twitter to keep up to date, he has not been driven by DigiTech, nor did he adopt

DigiTech without considering his own context. Twitter was used as a tool to serve the purpose of gaining ideas that were in alignment with Patrick and his students' interests and for professional networking. However social media content needed to be critically consumed and applied to Patrick's context to ensure that the pedagogical ideas would suit both teaching and learning in his school.

### 5.2.3 *Being forward thinking*

Part of Patrick's, and also the school's, embedded approach to DigiTech was the idea of '*being forward thinking*'. For Patrick, this term is described as:

*Happy to try new things, happy to change, happy to trial and then if things aren't working, happy to say why. (Interview 2)*

Drawing upon the work of Bindl and Parker (2011), being forward thinking involves preparing not only to avoid pitfalls and failure but to achieve growth and success through innovation. This sentiment was echoed by an assistant curriculum leader described Patrick's forward-thinking nature:

*Very proactive. Thinking this is where we are at now but where can we go next? As opposed to this is where we are, this is working so we will just stick with this. It's always right, what can we do, what is the next step?*

Patrick's approach was described by a senior leadership team member as "thinking a bit more outside the box". By considering and working through potential barriers to his use of DigiTech, Patrick viewed DigiTech, and his developing use of DigiTech as an on-going learning process. This involved being receptive to trying new ideas and then reflecting upon their use. This culture of forward thinking was also exhibited on a departmental and school level. A colleague of Patrick described the school as being "innovative" (Male PE teacher 3) and "always pushing for different teaching and learning ideas and philosophies" (Male PE teacher 3). On a department level, the headteacher described how this developing culture had been instigated by the work conducting in the PE department.

*PE has led the way on lots of the things that we've ended up taking on and developing in teaching and learning. They are quite a forward-thinking department in lots of ways. (Headteacher)*

Being forward thinking was also viewed in partnership with sharing practice (both positive and negative) as a form of learning and development. Overall being forward thinking was seen by both Patrick and the school as pertinent in developing their use of DigiTech and exploring its use for teaching and learning purposes.

### **5.2.4 Sharing as developing**

The school's culture of sharing as a form of development was an important element of their developing use of DigiTech for teaching and learning. Sharing as a form of development was also seen as an important part of Patrick's development of DigiTech use. This approach involved sharing and developing both teacher and student knowledge of DigiTech. The student roles of 'digital leaders' had been created whereby Year 7 students (who had previously had access to iPads as their partnership primary schools) were given a recognised leadership role. Students received training from Apple, were available to support staff and students in lessons. They also gave 'teachmeet'<sup>10</sup> style presentations as part of the staff's CPD programme. This exemplifies how the knowledge of students was seen as useful in order to support and develop practice with DigiTech. Furthermore, this leadership position gave some students a more active role in the learning process. As shown in this case, this is because information can be shared amongst teachers as a means to inform the development of DigiTech use in the classroom. Students were required to explain "what they had been doing [with DigiTech], why they were doing it and then reflect on the use to improve next time" (a senior leadership team member). As shown by Leijen et al. (2008), the process of students reflecting about the teaching and learning behind the use of DigiTech can facilitate learning through DigiTech. For example, they found that web-based DigiTech can provide support for students to learn how to reflect and using DigiTech can make learning processes more visible through the on-line analysis of activities.

---

<sup>10</sup> A 'teachmeet' is an organised informal meeting (in the style of a conference) to share practice and innovations. Participants volunteer to give presentations and discuss an idea that might enhance classroom practice.

Regular and mandatory CPD for teachers involved “sharing good [DigiTech] practice at every level” (Headteacher). This CPD had a strong pedagogical focus. In many sessions, CPD involved the consideration of the learning outcomes and goals for the lesson/activity before staff discussed what type or use of DigiTech might support their goals. The culture embedded in these sessions was that sharing ideas was a learning process and involved trying out ideas that may not always work as intended.

*We knew this was something really different. It [the use of DigiTech] might go wrong and some days it will be harder than others and it's just about sharing with each other to develop our confidence and develop our practice. (A senior leadership team member)*

The idea of building upon the positive elements of the evolving practice with DigiTech and creating reasonable and achievable standards for success, were key elements in developing a culture towards DigiTech use. This culture was also exhibited by the PE department and the knowledge sharing/community feel was something I felt was evident in the department. For example, sitting in the PE department staff room, colleagues were continuously asking questions of each other and sharing ideas of practice.

*If things didn't work we had a culture, we had a relationship amongst everybody to be brave enough to say actually we don't like this, it doesn't work. We'd all come up with a new idea and implement it. (Interview 2)*

Having a culture whereby sharing practice was seen as a learning process, for staff members such as an assistant curriculum leader, meant that DigiTech ideas could be enhanced and each individual could spend less time researching because everyone was pooling ideas together. In addition, Patrick shared his experiences with his department.

*Patrick comes up with suggestions, ideas and giving us some strategies of how you can use different apps. Talking about how you can inform your planning or show progress to form your assessment. (Male PE Teacher 3)*

In other words, Patrick shared ideas that he had tried and tested not just ones that seemed useful or had potential. For the PE department, this created a supportive and productive environment to develop and support practice with DigiTech. Sharing as a form of development was therefore an important part of the embedded culture in the school. It enabled teachers and students to share their knowledge and students to have an active input into the teaching and learning process.

### ***5.2.5 Playing with and learning through DigiTech***

A part of sharing ideas as a form of development and on-going learning was having the space and time to play with, and learn through, DigiTech. This was an important part of the embedded culture for Patrick, his department and the school. Somekh (2008) discusses how the initial processes in the pedagogical adoption of DigiTech involves exploring the affordances of new tools and developing the necessary skills through exploratory play. This was a factor that enabled staff to become more confident in their use DigiTech for teaching and learning.

*Staff workload was considered along with time taken to both learn how to use the iPad in lessons and plan suitable and engaging activities. Playing with a device does not take away from learning nor waste staff time. (A senior leadership team member)*

The idea of ‘playing with DigiTech’ and learning from it was something that had been pertinent to Patrick and his developing use of DigiTech from a young age. He had bought several sports computer games as a young teacher to learn the rules of a game so that he could take this knowledge into his teaching (see also Barker et al., 2017). As identified by Somekh (2008), most highly skilled users of DigiTech describe themselves as self-taught through hands on trial and error. Patrick is no exception.

*You seemed to learn so much from playing on computer games. They taught you a little bit about being resilient and you know if you don't pass this bit to try and get around it. You assess them and wonder how you are going to overcome them. (Interview 1)*

Some educators have recognized that DigiTech (such as video games) can be an important means of supporting student learning in schools and particularly in PE (Finkenberg et al., 2005; Hayes and Silberman, 2007). However, the use of video games by teachers to aid their familiarity and learning through DigiTech is absent in the literature. The idea of learning through playing with DigiTech and working through challenges is a belief that Patrick still holds when applying DigiTech in his teaching.

*20 minutes playing on a device you become an expert in my eyes. After 20 minutes playing on a computer game, for example, you know the buttons, it's the same principle. It's what you do afterwards though, how you develop your ideas, how do you then embed it and I think that makes the difference. (Interview 4)*

Patrick's experiences of DigiTech outside of the educational context have subsequently contributed towards his current practice. The sentiment around the need to reflect on the use of DigiTech when applying the idea of playing with and learning about DigiTech into a teaching environment, was echoed by an assistant curriculum leader.

*I think as a teacher it's, how can I use this? How is this going to benefit my students? Whereas when you are playing around for your own personal enjoyment you have got a totally different mind-set. (An assistant curriculum leader)*

Both Patrick and an assistant curriculum leader highlight the need to consider the pedagogy behind the use of DigiTech. For example, considering the learner and their learning and how their use of DigiTech is going to support this process. Critical reflection of both teacher and student learning outcomes was therefore important to embed in a pedagogical approach focused towards DigiTech. Given the idea of a pedagogical approach to DigiTech being a process (i.e. a series of actions or steps taken to achieve a particular end), trying out different ideas was another important element of sharing as a form of development.

### **5.2.6 Trying out ideas**

Tied in with sharing as developing and playing/learning through the use of DigiTech is the embedded culture (across Patrick, his department and the school) of 'trying out ideas'.

Patrick explained that the school created a culture through the CPD programme that was supportive of his and others developing practice.

*It was a bit more like action research. Going through whatever idea and initiative it was, implementing and putting it into practice. But it's constant. You are always reviewing your practice always trying to think of a way to get better, to improve. (Interview 6)*

A recurring message in documents and interviews with colleagues and a senior leadership team member emphasised that while DigiTech was not always going to work as they had initially intended it to, there was an importance associated with reflecting on both the positive and negative part of the experience and thinking through how the practice could be improved. In the lesson I observed, students used iPads to understand the lesson objectives, create team strategies and record their reflections of the lesson. Patrick had not tried this approach before and it involved him adapting an idea that he had seen on Twitter. As suggested by Casey et al. (2017a), this involved Patrick being brave when exploring a pedagogical approach to DigiTech.

*Being brave and prepared to try. Being brave enough to say actually this doesn't work or being brave enough to say actually it will work if I do this or if I try this. You don't just try something and accept that it doesn't work...there has to be a bit of perseverance. (Interview 3)*

A senior leadership team member highly commended Patrick for being “very open and willing to try new ideas”. She stated that it was part of his personality to do this and that he gave other teachers in his department the confidence to keep trying. This was similar to the findings of Parker et al. (2017), whereby the practitioner using DigiTech saw the trying of ideas as a learning process in and of itself. Furthermore, when faced with challenges the practitioner believed that they can grow and learn. In essence, this continual trying of ideas and reflection on ideas was also part of the consistent strategies deployed across the school to allow the use of DigiTech to develop across teaching and learning.



### *5.2.7 Consistency in strategies*

A key part of developing a culture around the use of DigiTech was having consistent strategies and messages around the use of DigiTech. As illustrated in Figure 6, consistency of strategies can occur in both practice and the types of DigiTech used. For example, in the lesson observation, Patrick and his students used Showbie (see Table 6 for explanation) as a platform to share the lesson content prior to the lesson and as a platform for students to upload their work and receive feedback from the teacher during the lesson. This was a common approach for both him and the students, and one that Patrick believed worked for task management and student learning. As stated by Parker et al. (2017), teachers must act consistently in accordance with their beliefs in order to avoid sending confusing messages to students. Having ‘core apps’ (such as Showbie) meant that both Patrick and the students were familiar with their use, which “ensured that it could be used consistently for different purposes” (Field notes). The ‘app smash’ section (shown in Figure 6) also shows how these core apps can be combined with different apps. This poster was created by Patrick to demonstrate to students and others in department about the different apps, uses and combination of apps that could be used.

5.2.8 Figure 6: An example of core apps used by Patrick and his department

# TOP TEN PE APPS

RECOMMENDED APPS TO USE IN PE TO RECORD, OBSERVE, ANALYSE, CREATE, SHARE & PRESENT

	<b>COACH'S EYE...</b> RECORD, OBSERVE & ANALYSE PERFORMANCE & EXPORT E.G. STUDENT O&A, VERBAL ANNOTATION
	<b>IMOVIE...</b> CREATE VIDEO CLIPS TO CREATE MOVIES & TRAILERS E.G. CREATE VIDEO EVIDENCE
	<b>SHOWBIE...</b> CREATE A PLATFORM TO SHARE STUDENT WORK, ANNOTATE, MARK & FEEDBACK E.G. UPLOAD WORK & FEEDBACK
	<b>EXPLAIN EVERYTHING...</b> CREATE PRESENTATIONS, NARRATE OR USE AS AN INTERACTIVE WHITEBOARD E.G. CREATE A SCREENCAST
	<b>NOTABILITY...</b> ANNOTATE STUDENT WORK OR PROVIDE VERBAL FEEDBACK E.G. PROVIDE FEEDBACK ON BTEC WORK
	<b>COMIC LIFE...</b> CREATE RESOURCES IN AN INNOVATIVE WAY E.G. REVISION GUIDES, TEACHING CARDS & EYE CATCHING RESOURCES
	<b>BOOKCREATOR...</b> CREATE IBOOKS USING A RANGE OF RESOURCES FROM YOUR IPAD E.G. STUDENT WORKBOOKS
	<b>PICCOLLAGE...</b> CREATE A COLLAGE OF IMAGES AND INCLUDE TEXT E.G. POSTERS & TEACHING CARDS
	<b>KEYNOTE...</b> CREATE INTERACTIVE PRESENTATIONS E.G. STUDENTS PRESENT WORK IN THEORY AND PRACTICAL LESSONS...
	<b>YOUTUBE...</b> VIEW AND UPLOAD VIDEOS FROM CAMERA ROLL E.G. DEPARTMENT YOUTUBE CHANNEL

## APP SMASH



The App Smash graphic illustrates combinations of the following apps:

- Coach's Eye + YouTube
- Explain Everything + Explain Everything
- BookCreator + Showbie
- Camera + Comic Life
- Camera + iMovie
- Notability + Google Drive

The benefits of consistent uses of DigiTech to enable students to complete tasks in lessons efficiently and effectively was seen in the lesson observation with Patrick. Patrick used the Showbie app to upload a guidance sheet (created on the ComicLife App) for students prior to their Dodgeball lesson. Students used the app to reference this sheet and edited it during the lesson with their team strategies. Showbie was then used in conjunction with the camera app to allow students to upload their reflections and evaluation of their team strategies. These were uploaded and stored on Showbie to be viewed by Patrick where he could also provide comments and feedback. Despite the variety of steps involving DigiTech in this lesson, due to the use of Showbie being established and embedded into how students could edit, share work and received feedback, both teacher and students knew how to use the app and its benefits in the learning process.

In school documents, statements such as “embedding iPads to support teaching and student progress”, “embedding technology into teaching and learning and pedagogical strategies” and “embed technology into marking and feedback” were evident. School documents summarised this approach as a:

*‘New technologies culture’ of teaching and learning at the heart of all that we do.  
(Document - School development plan)*

Consistency of messages, I felt, were “particularly around marking and feedback” (Field notes) and subsequent use of DigiTech helped Patrick feel he was supporting his own successful use of DigiTech.

*Because of the way the culture of the school and implementing change I think it has been quite simple to use [DigiTech] in our department. (Interview 3)*

This was because “everybody was singing off of the same hymn sheet” (Interview 4). Having DigiTech as an explicit part of school values and approaches means that there was a consistency in messages, expressed by a member of the PE department as a “joined up view” from the “top downwards” (Male PE Teacher 2). Patrick and his department were therefore not working in isolation but were working in alignment with the school. The culture established by both Patrick and the department/school was viewed by many colleagues as

important in supporting DigiTech use. The head teacher identified that Patrick had “grown up in the culture and developed within the culture of the college”. In this sense Patrick’s established practices of being forward thinking and keeping up to date formed a supportive and consistent infrastructure around which he could develop his practice. As such, they formed a key foundation of his pedagogy of technology. The consistency across the individuals, departments in the school was therefore important not only in developing and supporting teachers’ practice but also how the students viewed DigiTech as a tool for teaching and learning.

One of the more interesting aspects of Patrick’s case is the synchronicity of perspectives across Patrick, his department and the school and the fact that DigiTech is embedded across these areas. This may be because, as Krumsvik (2006, p.253) found, schools can develop their own understanding or “digital epistemology” which, when this coincides with that of the practitioner, can appear to provide a positive environment for DigiTech use. Similarly, school wide implementations in which the principal’s vision and motivation is of central importance can provide strong foundations for DigiTech based pedagogical innovations (Forkosh-Baruch et al., 2005).

Tondeur et al. (2008) posited that the DigiTech policies and the views of the school have a significant effect on an individual’s use of DigiTech. Conversely, other literature suggests that most teachers lack organisational support to integrate DigiTech effectively (Fullan, 2013) and under such conditions, teachers can fail to think pedagogically about DigiTech (Casey et al., 2017b). However, Patrick’s case suggests that when the individual and school cultures align they work towards supporting and encourage things they could “do [things] differently” (Interview 5). This, in turn, provides a fruitful relationship to develop pedagogies of technology.

The next theme explores this finding further through the consideration of ‘*establishing routines of practice*’. Similar to having consistency in strategies, this theme explores the practices and approaches that contributed to how and why DigiTech use was developed and sustained. ‘*Establishing routines*’ unpicks some of the practices supporting DigiTech adoption and what has enabled the continued use of DigiTech.

### 5.3 Establishing routines

The theme of ‘*establishing routines*’ of practice with DigiTech came to the fore in exploring how Patrick’s practice with DigiTech has been developed and sustained. Establishing routines of practice was significant in ensuring that the use of DigiTech for learning was the ‘norm’ and that it increased students’ familiarity with DigiTech as a learning tool. This theme has currency in the literature in as much as a teacher’s pedagogical adoption of DigiTech is driven by the values and assumptions embedded in different routines of practice (Pearson and Somekh, 2006; Somekh, 2008). For Patrick and a senior leadership team member, this strategy ensured that students did not see DigiTech as a ‘novelty’.

*As soon as your routines and expectations are embedded...for me and the students it [DigiTech] doesn’t become a gimmick. (Interview 2)*

*We are very clear on expectations of how it will be used in terms of what we expect from our students and our culture for learning with the device. (A senior leadership team member)*

The routine nature of Patrick’s use of DigiTech in his practice meant that the pedagogical strategies utilised became the normal practice culture. They were familiar to Patrick and his students.

*First and foremost, it’s setting high expectations and boundaries of use. It’s the little routines and practice that you put in place that they [the students] follow and it’s the same with the iPads... as that process becomes more familiar to them it [the use of DigiTech] makes it more efficient. (Interview 3)*

Drawing upon the work of Selwyn (2013), establishing consistent routines enabled Patrick and his students to teach and learn in more efficient ways. Having routines of practice corroborates the idea of Goodyear et al. (2017a, p. 25) whereby frequent, specific and repeated practice can allow teachers (and in this case Patrick) to “support learning” “offer individualised support” and “stretch and challenge” students’ learning. Thus, Patrick’s case supports Goodyear et al.’s (2017a, p.25) conclusion that “technology can be used to promote

student-centred learning activities”. However, it would seem that this would only occur and be sustained when it was established as a routine.

### 5.3.1 Taking time and saving time

Establishing routines of practice with DigiTech, can take considerable time to develop.

*Initially I will invest a bit of time to make sure they [the students] understand what I want, what I expect they should be doing and how they should use it. (Interview 2)*

This sentiment suggests that there is an initial time investment required with DigiTech to establish expectations of use. Patrick explained how he had to spend time on DigiTech outside of the lesson before incorporating DigiTech into lesson content.

*I make sure I fully understand them [the DigiTech] before I even consider how I am going to teach with it and how I get that information across. If you are planning to use it, it's going to take a little bit of time to start with. I've learnt that it's worth investing more time at the beginning for the greater impact at the end. (Interview 4)*

When elaborating on the ‘greater impact at the end’ Patrick explained how, for example, by embedding his use and students’ familiarity with Showbie (see Table 6) they could save time when it was used in subsequent lessons. In the lesson I observed, it certainly seemed that students could operate and find learning materials quickly and efficiently. This was also expressed by an assistant curriculum leader as a practice which can “save you time in the long run”. Patrick explained that embedding routines allowed him to save time as students could record their practices individually and collate them on the app for feedback. A practice which Patrick would not be able to conduct independently.

Patrick went on to explain how the initial process of investing time into learning about DigiTech was important in moving towards a pedagogical approach to DigiTech. In essence, being able to prioritise learning and teaching ideas (i.e. using DigiTech for assessment) over the technological knowledge (i.e. inputting passwords or typing). This approach came quite naturally to Patrick but was harder to embed into the approaches of other staff members.

*The idea of how we can use it - not how do you use it - took a little bit of time for that culture to change where staff would voluntarily go out of their way to work on the apps. (Interview 3)*

Taking time to develop practice was also discussed by a senior leadership team member as important to build into the routines of practice.

*We had a long period of research and trials to ensure that the vast majority of ‘what ifs’ were covered, and solutions were ready to be suggested. (A senior leadership team member)*

This process of taking time to learn about the apps and then realising the questions, concerns or pre-empting problems associated with the device, was an important first step in developing a culture of using DigiTech pedagogically. As mentioned previously in discussing the consistency of strategies, there is a recurring theme that the regularity and stability in the use of DigiTech is pertinent to developing effective pedagogical strategies. Two male physical educators commented on how they did not think iPad could be used “just off the cuff” (Male PE Teacher 1 and 2) and was something that had to be planned for and be a part of students’ routine for it to be a success. This finding of establishing consistent routines as supportive of a pedagogical approach to DigiTech goes against some of the literature that suggests that DigiTech can “consistently destabilise the established routines of classroom life” (Robertson et al., 2004, p.179). Furthermore, as commented in the early work by Cuban (1986) teachers face a complicated process of establishing routine that will permit the group to operate. The daily teaching practices, in Cuban’s (1986, p.60) eyes do not “nourish technological innovation”. It would seem, however, that when DigiTech was built into regular and consistent practice it could complement rather than destabilise practice. This, in turn, enables students to see DigiTech as a tool for learning and, for Patrick, this means they are less likely to be seen as a gimmick.

### 5.3.2 Flipped learning

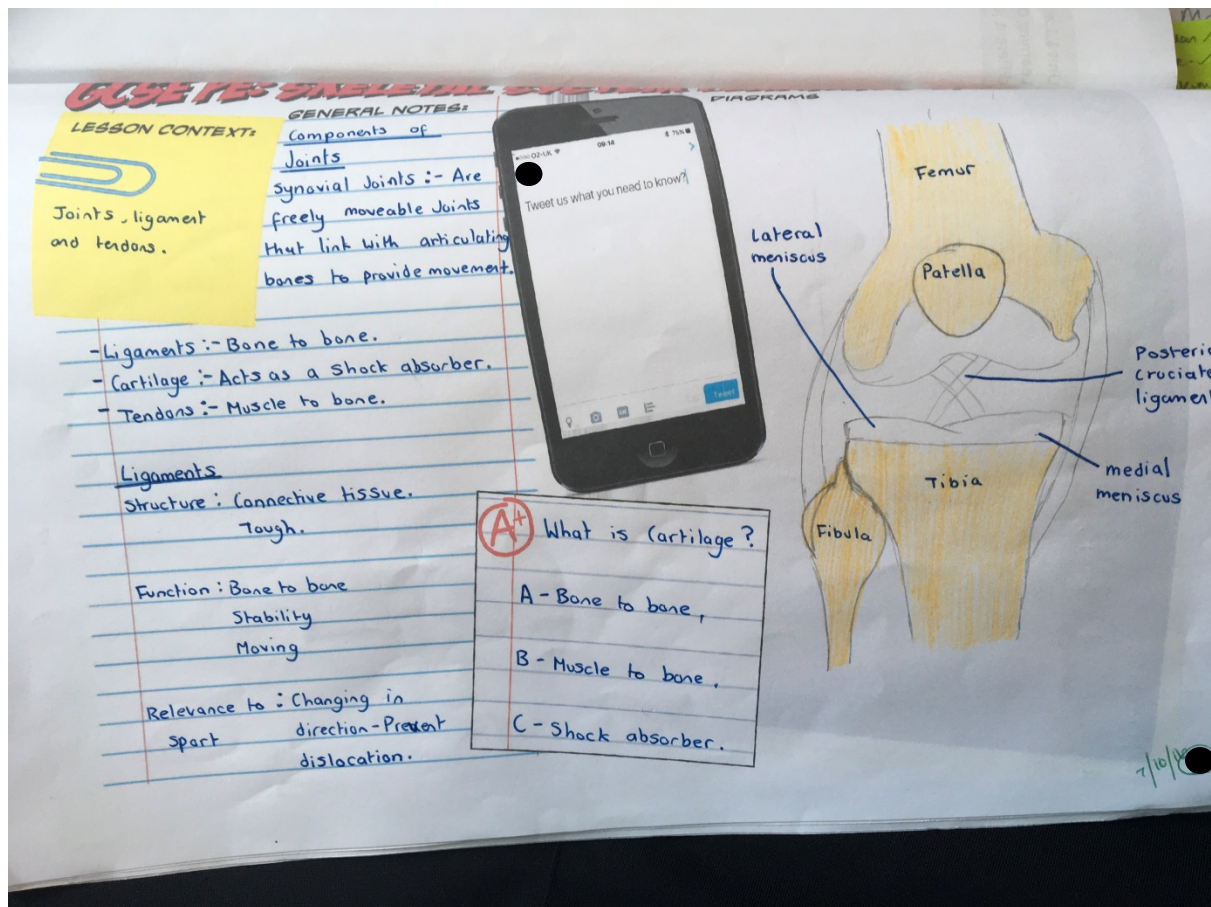
One pedagogical strategy, which was consistent and routine in Patrick's practice, was the use of 'flipped learning'. Flipped learning is a pedagogical approach in which direct instruction moves from the group learning space (i.e. the classroom) to the individual learning space (i.e. at home or online) (Flipped Learning Network, 2014). Hwang et al. (2015) explain how the content traditionally delivered in the classroom, by the teacher, is then accessed and self-learned by students. Whilst it is acknowledged that flipped learning is not a pedagogical approach specific to DigiTech, for Patrick it was a consistent pedagogical strategy used by both Patrick and the school to support the use of DigiTech. This approach was mentioned regularly in school documentation and discussed as working towards developing a culture of "both collaborative and independent learning" (Document - Overview and Impact Statement).

*The flipped learning model has allowed staff, and in some cases students, to create high quality resources/lesson materials which meet the needs of our students and course/assessment opportunities... the teacher is able to support learning and offer individualised support. (Document - Overview and Impact Statement)*

Flipped learning was the focus of specific CPD workshops and was commented on by students in school documents as an approach that "made learning easier" and meant that they could check work and find out what they were doing before the lesson. As expressed by the headteacher, flipped learning is a strategy that allows students to take responsibility for their learning both inside and outside of the school. One of the resources, which allowed this pedagogical strategy to occur, was 'flipped learning mats'. These mats (see Figure 7) were designed by Patrick and given to the students to complete as homework prior to the lesson or to be completed at the start of a lesson. In connection with the previous discussion on 'saving time', this routinized practice allowed Patrick to create important time at the start of the lesson that was dedicated to improvement and reflection. Students would come to the lesson ready to complete the mats or have them ready to be assessed. This routine had been embedded across the school which helped students become familiar with this learning process.



### 5.3.3 Figure 7: A flipped learning mat used by Patrick



The mats provided a guide of what students needed to explore/learn, where to go for help (i.e. Twitter) and a reference point for students. As explained by Patrick after a lesson observation, the lesson would begin with a discussion of students' knowledge and understanding from the homework task. For Patrick this meant that "deeper learning" (Field notes) could occur in the classroom. Key forms of DigiTech used to support flipped learning included creating instructional videos or videos of guided feedback (i.e. answering exam questions). These are examples of DigiTech that Patrick had embedded into his practice and were a consistent strategy that worked to aid students' learning. Flipped learning was also used to increase students' activity time, which will be discussed under the next main theme of 'keeping tasks simple'.

### 5.3.4 Variety in methods

Alongside the decision to establish routines of practice with DigiTech, an important part of these routines was variety in the methods of DigiTech used to ensure there were different

levels of challenge for students. In school documentation, the guidance regarding the use of DigiTech detailed the need for variety.

*The key basic expectation is that devices are used in each area but recognising that this should not be for the full lesson each and every time. A range of ideas/activities which can be incorporated are suggested. Having a range of activities enables students to choose the level of challenge. (Document – development plan)*

Patrick explained how it is not just the use of “different strategies” but also the “different level of challenge within those strategies” (Interview 5). Allowing students to choose the different levels of challenge meant that the students had more ownership over their learning.

*Everybody has a favourite app. A student might have a different app to the person next to them. They could present their work in a different way, whether that's a PicCollage or Comic Life [see Table 6], the end product, the outcome is the same but the tool they've used is different. You [the teacher] just might need to come up with another idea of how the students could present their work or give them opportunities of how they want to present it. (Interview 3)*

The practice of allowing the students to complete work in a variety of ways, and through a variety of platforms, means that everyone is working towards the same outcome or learning objective but using a piece of DigiTech suitable to the user in order to learn. As explored in the section below, this is a relatively simple practice which goes a long way to ensure that learning is at the forefront as students are allowed to choose the type of DigiTech that suits them to complete the task (see also Baert et al., 2017). Patrick further explained how this practice would involve “chunking it [students use of apps] into little stages” to “let them become masters or experts in that app” (Interview 3). In this sense, Patrick ‘scaffolded’ the use of DigiTech to ensure that while students could take control of their own learning they were not inhibited by a lack of technological knowledge. Whilst the pedagogical vision might seem simple to achieve, the realities of the pedagogical use of DigiTech requires consideration of the preferences and skills of the students so that the learning outcome is not lost (Fletcher et al., 2017). In this regard, Patrick had clearly considered the learner and their learning, how to best deliver the content and the context in which this practice occurred.

Thus, whilst it seems important to present consistent messages and establish routines around the use of DigiTech, it is similarly important to provide variety in the methods used in order to give students ownership over their learning and ensure that there is a level of challenge.

The next theme of *'keeping tasks simple'* explores how simple strategies and practices can be deployed to ensure that DigiTech is used towards positive learning outcomes.

### 5.4 Keeping tasks simple

The theme of *'keeping tasks simple'* refers to Patrick's overarching views regarding how/why he uses DigiTech. Examples of 'simple' practice were replete in collected resources, lesson observations and interviews. Patrick suggested that when he first started exploring DigiTech use he found that "trying too much at once creates more challenges" (Interview 4). Put simply, trying to overcomplicate practice with DigiTech hindered students' learning. Consequently, he discovered that when he used it in a more 'mundane' way, DigiTech had more impact. When explaining this greater impact, Patrick said that students could see the purpose of DigiTech when it was used in small and simple ways. Casey et al. (2017a) similarly found that it is important to keep (or make) ideas simple if they are to stick and impact on the practices of others (i.e. students or other teachers). The idea of keeping things simple ensured that pedagogy was at the forefront of Patrick's use of DigiTech.

Fundamentally, Patrick found a few simple methods that worked for him; methods which he gradually developed and expanded each year. These methods included having a core set of apps that both teachers and students were familiar using an iPad camera to capture learning episodes, short and sharp uses of DigiTech to ensure engagement and the use of YouTube videos to aid demonstration and explanation of tasks. Patrick found many simple opportunities where DigiTech could be used to benefit both him and the students' learning.

*Opportunities at the start of the lesson once they have been changed, at the beginning of the lesson when they maybe want to see what the focus of the lesson is about. Opportunities through game play or skill development to have a little look at how they*

*are doing in relation to the task. In core PE<sup>11</sup> it would tend to be a QR code at the start to maybe set the tone, particularly those who are ready first and changed so the first part of the warm up. (Interview 3)*

Two core and simple strategies that Patrick used were using DigiTech was to increase and ‘supplement [students’ physical] activity time’ and ‘identifying factors lending to DigiTech’ use. These are now explored in more depth.

### **5.4.1 Supplementing activity time**

Using DigiTech in ways that could support rather than hinder students’ physical activity time was not something that Patrick always achieved. At the start of his teaching career, Patrick found that it was very much “the physical and the technology” (Interview 1). In other words, physical activity and DigiTech were two separate and dichotomous terms. This is not surprising. Kretschmann (2015) found that due to the common connotation associated with human movement and physical activity, the notion of a pedagogical benefit of DigiTech may not easily come to mind. This is because DigiTech can be viewed as something associated with inactivity.

In reflecting on his early use of DigiTech, Patrick remembered how some of his DigiTech uses were “gimmicky” (Interview 2) because while they were reducing students’ physical activity they did not equate to increased learning. Subsequently, Patrick looked for a way to use DigiTech to supplement or indirectly increase activity time. In Patrick’s words, “maximising the learning time when students were not physically active” (Interview 5). Some of the simple strategies Patrick used to supplement the students’ physical activity time involved using DigiTech in rest periods or whilst students were getting changed.

*Despite how physically active you want to make lessons some of them [the students] cannot go more than two or three minutes without needing to stop. So instead of having rest period where they were sitting down and doing nothing it was during this*

---

<sup>11</sup> The term ‘core PE’ refers to the standard curriculum PE that all students are compulsory for students to undertake as part of the curriculum.

*rest period where we would introduce some ICT...you were ticking the ICT box but actually ticking the learning box as well because although they are inactive as such they are actively learning at the same time. What they didn't realise is that they were resting for a minute but they were learning and engaged for that time. Also, if you've got somebody who's injured who can't take part in the lesson they can be actively involved through coaching, umpiring or creating an analysis task through the use of the iPad...a lot of the work I do now [with DigiTech] is in the changing rooms. I'll take videos and have uploaded them from the previous lesson. Students can then reflect upon the upcoming lesson and the learning objectives. (Interview 2 and 3)*

For Patrick, roles a student would undertake when they were inactive could be as basic as performance analysis, commentary, score-keeping, timers or completing flipped learning mats ready for the next lesson. I observed Patrick asking students to either complete their reflections in the lesson or submit them later on the Showbie app for assessment. He did not, however, solely focus on the different types of DigiTech he could use to supplement students' activity time. Flipped learning was one of the main strategies (through a process of trial and error) that Patrick found allowed him to maximise learning time. This became increasingly important to Patrick due to the reduction in curriculum hours allocated to PE. As seen through a lesson observation, using flipped learning in core<sup>12</sup> PE allowed Patrick to set and share a homework task ready for the lesson. Similar to Østerlie (2016) and Roth (2014), Patrick found that because students then had the knowledge and understanding of the lesson content and goals and physical activity could start quickly. The 50 minutes of lesson time could therefore be used more “efficiently and effectively” (Interview 2).

In examination<sup>13</sup> PE, Patrick could use flipped learning to “spend more time on higher order questioning and assessment” and getting students to “develop their writing skills and applying their knowledge to exam questions” (Interview 5). In documents collected from Patrick, there are examples of flipped learning videos where a screencast was taken of an exam script or students work where Patrick provided his own assessment and commentary

---

<sup>13</sup> The term ‘examination PE’ refers to the optional strand of PE that students can undertake at GCSE, A-Level or BTEC level. This PE is delivered against a set specification and assessed by an examination board.

over the top. Students could then watch the videos created by Patrick and bring in questions and queries ready for the next lesson. In this way, Patrick could ensure that the flipped learning homework “directly linked to the next lesson, so it’s like a journey...they [the students] can see the progress” (Interview 5). In Patrick’s eyes, the homework then becomes purposeful and has a continual link to lesson content. Patrick’s use of DigiTech through flipped learning provided students with an environment where learning was an active process (occurring both inside and outside the school) whereby both teacher and student are involved in knowledge construction. In this sense Patrick was able to develop a pedagogy of technology which contributed in meaningful ways to meeting the needs of his learners and supplement their physical activity time.

### ***5.4.2 Identifying factors lending to DigiTech use***

Identifying instances where DigiTech “lends itself” (Interview 2) to trying simple DigiTech ideas was useful for Patrick and his developing use of DigiTech. This pedagogical decision involves considering the learning contexts such as core or examination PE, type of activity, group dynamics, environment characteristics or learning objectives.

*Certain activities lend themselves more to certain groups. It’s the same with ICT [DigiTech]. ICT lends itself to the same types of lessons, indoor, dance lessons, indoor trampolining lessons. The nature of the lessons means there would be a lot of videoing your performance, watch it back and pick up points. (Interview 2)*

The idea of using DigiTech in certain lessons like trampolining was echoed by an assistant curriculum leader and other PE colleagues.

*[DigiTech] lends itself very well to something like trampolining where students will use video analysis. It’s used more in trampolining because it’s a controlled environment and you have the time to use the iPads without detracting from performance levels. (An assistant curriculum leader)*

Patrick was able to make strategic pedagogical decisions about the learners and the context and use DigiTech in different scenarios to complement students’ learning. In a similar vein,

Patrick explained how DigiTech use can also be ad hoc because it's not always relevant to take devices such as iPads outside. In this case, Patrick's use of DigiTech would occur before, or after the lesson to develop students' skills further. This was a challenge for Patrick because he wanted to make sure that "everyone is actively using ICT but in the right amount of time to develop them" (Field notes). However, I got the impression from Patrick that this balance was sometimes difficult to achieve. Patrick showed an example of these decisions in the lesson observation. Patrick explained that he had differentiated the use of DigiTech depending on the level of the learner. For the more able students, Patrick provided leadership tasks such as creating a strategy map on the iPads for their teammates to follow or analysing a piece of performance. Student learning was therefore stretched and challenge by the need to create a piece of work, evaluate/analyse a performance and Patrick could use this DigiTech strategy as a means to assess students' learning.

For those less able and for core PE, Patrick established an assessment strategy whereby character traits such as responsibility and collaboration were assessed. As such, the assessment strategy was directed towards developing life skills in and through PE and assessing the whole child rather than just performance. DigiTech provided a valuable tool to help students work towards these objectives.

*It [DigiTech] has an impact on the less able students because you don't assess in terms of the performance, you assess in terms of observation and analysis, understanding and being creative. (Interview 3)*

This was explained further by an assistant curriculum leader who described how providing more of an academic element through the use of DigiTech (i.e. reading, writing, oracy) has allowed "everybody to achieve rather than just through performance". Subsequently practices with DigiTech are personalised to each environment and learner. By considering the learning before considering the means in which to achieve it Patrick could ensure that his DigiTech use was tailored to the students learning. Furthermore, DigiTech provided an avenue whereby the learner could benefit from PE assessment in terms of social, affective and cognitive domains rather than just physical assessment.

In addition to the use of DigiTech for assessment, Patrick became aware that DigiTech could be used as a valuable tool for engagement. A PE teacher explained that students liked

assessment that was interactive and in which they could set their own pace. A senior leadership team member explained that this allows students to apply their skills in more ways than just being physically active.

By developing an embedded culture of use across individual teachers, departments and the whole school, establishing routines of practice and keeping tasks simple, Patrick was able to achieve several benefits as mentioned above. When summarising why he uses DigiTech, Patrick explained that DigiTech enhances the learning experience for his students. Patrick felt that since he started using DigiTech pedagogically, students have a better and deeper understanding of skills and sports, connecting to skills that would be of use to them later on in life and increasing the flow of learning conversations. For example, Patrick explained that in students' feedback they had explained how the iPad allowed them to access learning anywhere and that the use of DigiTech for teaching and learning had strengthened the communication between staff and students. These outcomes have promoted Patrick's use of DigiTech and continue to inspire his developing and sustained use of DigiTech.

### 5.5 Chapter Conclusion

This case has illustrated the key aspects and processes that Patrick developed in order to use DigiTech pedagogically in his teaching. These elements contribute towards an understanding of how and why DigiTech is used and what informs a pedagogical approach to using DigiTech. This case raises important points in regard to the approaches or ethos surrounding the use of DigiTech. Individually, Patrick was willing to position himself as an on-going learner and saw his use of DigiTech as a learning process. '*Keeping up to date*' with the latest ideas and pedagogies (with the caveat of being a critical consumer) and '*being forward thinking*' were beneficial factors in supporting both Patrick's and the school's ambitions regarding the use of DigiTech. Similarly, engaging with one's own and students' interests was seen as important for developing and sustaining use. On a departmental and school level, the embedded culture of sharing both the positive and negative aspects of any DigiTech ideas that teachers had tried was important. Similarly, play, as a form of learning, was significant in ensuring that DigiTech could be considered for the context and learner. It was also necessary to be forward thinking towards and pre-emptive of issues that may occur and to learn from trial and error.



The role of the school was decisive in creating an environment that fostered and supported students' skills and knowledge of DigiTech and enabled students and staff to be involved in a mutual learning process. Both Patrick and the department/school acknowledged that practitioner learning was a significant aspect of developing a pedagogical approach to DigiTech: one that involved being brave in '*trying out ideas*'. Consistency in the use of DigiTech and in pedagogical approaches used was also important in ensuring consistent pedagogical messages were received across staff and students.

*'Establishing routines of practice'* ensured students did not see DigiTech as a gimmick or as detrimental to their learning. A routine of practice allows students and staff to become familiar and develop their view of DigiTech as a teaching and learning tool. It is important to note, however, that it can take considerable time to consider all pedagogical contexts and therefore use DigiTech appropriately to achieve learning outcomes. In addition, whilst having consistent strategies (for example flipped learning) and establishing routines of practice means that everybody is working towards the same outcomes, ensuring students had variety in their use of DigiTech was significant in allowing students to have ownership over their learning and experience suitable levels of challenge. Patrick showed how DigiTech can be used in small and simple ways for a variety of purposes. These can include supplementing students' physical activity time, with DigiTech activities and identifying manageable areas where DigiTech could be used. The overarching message in this theme was that innovation did not need to be overcomplicated but focused on considering the context that could be developed to supporting students' learning in PE.

The embedded cultures, routines and consistent practices ensured that Patrick's DigiTech use helped him move towards meaningful ways of assessing, engaging and enhancing the learning experiences for his students. This case has highlighted how the use of DigiTech needs to be viewed as an on-going learning process and one which involves careful consideration of the teaching, learning and contextual factors. Consistent and embedded use of DigiTech is therefore pertinent to developed effective pedagogical approaches that are valued by both teachers and students.

## **Chapter Five: Patrick**

In the next chapter, the case of 'Dillon' is presented and discussed. Dillon's views, experiences and use of DigiTech are discussed in relation to the factors contributing towards his developing and sustained use of DigiTech.

## Chapter Six: Dillon

### 6.1 Introduction

The first theme '*developing an embedded culture*' analyses how Dillon and his department developed a culture that supported and encouraged the use of DigiTech. The culture exhibited individually by Dillon, and within the department, is characterised by '*trying out ideas*' which comprised being open to '*taking risks*' and developing '*confidence with DigiTech*'. Similar to Patrick, Dillon adopted an approach to DigiTech which was centred upon '*being forward thinking*'. Dillon's school had not developed an approach or strategy to the use of DigiTech but had established a culture around '*linking DigiTech to assessment*'. This subtheme is explored alongside the need to ensure teachers have a '*supportive infrastructure*' to support a pedagogical approach to DigiTech. This first section, therefore, explores the views, experiences and factors that influence and promote Dillon's use of DigiTech.

The second theme, '*establishing routines*' is explored through three subthemes. This theme demonstrates the '*consistency of strategies*' such as '*flipped learning*' which are beneficial to Dillon's practice with DigiTech. Establishing routines is also discussed by Dillon as a practice that involves ensuring '*variety in method*'. This theme, and its associated subthemes, explores the practices and factors that Dillon believes has allowed him and his department to develop and sustain their pedagogical use of DigiTech.

The final theme '*keeping tasks simple*' explores how and why Dillon uses DigiTech to '*enhance the learning experience*' for his students in a way that provides '*relevancy to the user*'. This theme also explores the use of DigiTech as a '*tool for engagement*' where Dillon explores the simple strategies he used with DigiTech to engage his students. For Dillon, keeping tasks simple ensures that he can provide relevant learning experiences for his students. This section, therefore, explores Dillon's views around how and why he uses DigiTech in his practice.

Prior to discussing each theme and its associated subthemes, Table 7 details the types of DigiTech (i.e. apps or devices) used by Dillon, what functions were used and how the DigiTech was used. Whilst not all of these individual pieces of DigiTech are discussed in the

following chapter they represent the diversity and range of DigiTech used and provides a context for Dillon's DigiTech use.

6.1.2 Table 7: *DigiTech/apps, functions and how they were used by Dillon*

Case Teacher	Type of DigiTech (App/Device)	Functions/Description	How it was/has been used
Dillon	iPad (device)	An Apple tablet device used to download apps, store information, take pictures/videos and access the Internet.	<ul style="list-style-type: none"> <li>Used by Dillon to record students, store and create work, access the internet.</li> <li>Used by groups of students (1-3) to complete work, take videos and access applications.</li> </ul>
	iPod 'Touch' (device)	An Apple device used to download apps, take photos/videos, play music and access the Internet	<ul style="list-style-type: none"> <li>Used by Dillon to record students, store and create work, access the internet.</li> <li>Used by groups of students (1-3) to complete work, take videos and access applications.</li> </ul>
	Apple TV (device)	An apple device used in conjunction with a TV which allows the user to stream picture/videos or apps directly to a TV screen.	<ul style="list-style-type: none"> <li>Used by Dillon in changing rooms to show videos/performances.</li> <li>Used by Dillon in lessons to show drills, videos or students performances.</li> </ul>
	Twitter (online and app)	A micro-blogging social media platform which allows users to interact with each other through messages, links and other media, called 'tweets'.	<ul style="list-style-type: none"> <li>Used by Dillon as a tool to gain ideas and resources. Used to connect with like-minded practitioners, post questions and practices.</li> <li>A source of Dillon's professional learning network.</li> <li>Used to assess learning in lessons, provide revision prompts and feedback to students.</li> <li>Creation of department page to post student activities.</li> </ul>
	Google forms (online)	Online platform used to create and deliver online assessment.	<ul style="list-style-type: none"> <li>Used by Dillon to create mini quizzes and assessment of learning.</li> </ul>
	YouTube (app)	A video-sharing website that allows users to upload, view, rate and share videos.	<ul style="list-style-type: none"> <li>Used by Dillon to upload useful videos and self-created videos.</li> </ul>
	TV's (device)	TV screen used to display audio/written and visual content.	<ul style="list-style-type: none"> <li>Used by Dillon in changing rooms and in sports hall to display audio/visual resources.</li> </ul>
	LinkedIn	Used to share and disseminate	<ul style="list-style-type: none"> <li>Used by Dillon to share</li> </ul>

	(online/app)	learning resources such as presentations and ideas.	presentations and disseminate ideas.
	ShowMe (app)	Interactive whiteboard app used to create shareable presentations.	<ul style="list-style-type: none"> <li>Used by Dillon to create presentations and share with students. Students can comment and engage with material.</li> </ul>
	Google Drive/Docs (online)	Create and edit web-based documents, spreadsheets and presentations.	<ul style="list-style-type: none"> <li>Used by Dillon to store students' revision materials, store assessment/resources and create documents for students to complete.</li> </ul>
	Padlet (online)	Online message board where users can post and have discussions on a virtual message wall.	<ul style="list-style-type: none"> <li>Used by Dillon to post questions and comments.</li> <li>Used by students to answer questions and show understanding.</li> </ul>
	Prezi (online)	Create online interactive presentations	<ul style="list-style-type: none"> <li>Used by Dillon to create online presentations to share with students/colleagues.</li> </ul>
	Study Blue (online)	An online library of resources such as flashcards and class notes on your phone. Allows the user to make and share materials, track progress, set reminders and create quizzes.	<ul style="list-style-type: none"> <li>Made accessible for students to access online content and use for revision.</li> </ul>
	My PE Exam (online)	An online site for learning. Pre-populated with revision videos, quizzes, assignments and assessment.	<ul style="list-style-type: none"> <li>Used by Dillon/department to track progress and performance of students work.</li> <li>Used to learn revise concepts, communicate with other students/teacher and identify gaps in learning</li> <li>Primary source of 'flipped learning'.</li> </ul>
	Edmodo (app)	A virtual classroom for the user to interact with others specifically on work.	<ul style="list-style-type: none"> <li>Used by Dillon to create presentations.</li> </ul>
	Google Hangouts (online)	An online platform that allows the user to message contacts, video or voice calls or have a conversation with a person or group of people.	<ul style="list-style-type: none"> <li>Used by Dillon to engage students in class discussion and group assessment/revision.</li> </ul>
	Coach's Eye (app)	Performance analysis application that can allow playback of captured footage in real time, slow motion and frame-by-frame. Video clips can be annotated and placed side-by-side alongside other videos.	<ul style="list-style-type: none"> <li>Used by students to observe and analyse student performances.</li> </ul>
	Explain everything	Interactive whiteboard app that creates slides of information that	<ul style="list-style-type: none"> <li>Used by Dillon to create videos for students to access.</li> </ul>

	(app)	are narrated over.	
	Camera (app)	App used to take photos and videos.	<ul style="list-style-type: none"> <li>Used by Dillon and students to take static images and videos of students' performances.</li> </ul>

### 6.2 Developing an embedded culture

Prior to starting his teaching career, Dillon worked in the health and fitness industry and was increasingly being introduced to DigiTech for the purposes of doing his job (i.e. communicating with clients and advertising services). Dillon's main interest in DigiTech came through its use for performance analysis when playing rugby. However, it was not until the introduction of smart devices (specifically the Apple iPhone), in conjunction with starting his teaching career, that Dillon expressed a real interest and passion for using DigiTech in his teaching. For Dillon DigiTech "became more accessible as a tool" (Interview 1) for teaching and seemed relevant for both his personal and professional contexts.

*What really piqued my interest certainly in my current profession is when the iPhones came out and when all the idea of apps and things that can really monitor and benefit students' learning. (Interview 1)*

Dillon has been a practitioner at the same school since he started teaching. At the start of his career, Dillon joined a department in which DigiTech was becoming an increasing part of their approach to teaching. With investment in new devices and experimenting with different uses in PE, Dillon was introduced to an environment where DigiTech was being positioned as a teaching and learning tool. Dillon has subsequently adopted and maintained a practice culture which is similar to his departments and one which has been adapted and developed over the past decade.

Dillon described DigiTech as "engrained in my approach, 100%" (Interview 2). He explained this "embedded" (Interview 3) use of DigiTech through an example of DigiTech use for assessment.

*[DigiTech] is used on a continuous basis. So, it's not just every four weeks, it's every week or every lesson... so they get that engrained in their [the students'] learning really. (Interview 3)*

Dillon and his department's culture around the embedded use of DigiTech operates in relative isolation to the rest of the school. The department's use of DigiTech, however, was viewed by those external to the department as embedded and beneficial for students (i.e. aiding movement analysis) and the department's delivery of lesson content.

*They [the PE department] have got all the kind of analysis and movement stuff. I think technology for those is embedded I guess you'd call it across there...they are probably leading the way [in the school]. (Headteacher)*

The school has tailored its use of DigiTech to each department's needs and has not adopted or embedded a whole school approach. The school had (as explored in the subtheme '*linking DigiTech to assessment*' below) invested in the use of DigiTech for whole school assessment purposes. Thus, DigiTech was valued and at the forefront in the school for this purpose. Yet, as described by the IT Manager, the school recognised the embedded nature of DigiTech and that the value of DigiTech stretched broader than just assessment.

*I'd describe it [DigiTech] is actually the centre piece from my perspective because it, technology, has sort of its hooks in every single part. (IT Manager)*

As a result, whilst Dillon and his department are somewhat unique in their DigiTech approaches, they are still supported by the school. Their approaches are appreciated because they align with the school values around "preparing students for lifelong learning" and "constantly looking for new ways to improve learning" (Document – school values). As such, Dillon and his department have been able to develop their own embedded culture around the use of DigiTech which, although not replicated across the school, has enabled PE to be seen as innovative and has been able to demonstrate the value of DigiTech in achieving its teaching and learning goals. This theme therefore supports the findings of McKnight et al. (2016) and Levin and Schrum (2013) who found that developing a sustainable culture of innovation, whereby schools had a clearly articulated vision of their use of DigiTech, was a key factor that promoted the pedagogical use of DigiTech.

### 6.2.1 Trying out ideas

Dillon explained how the department was focused on trying out new pedagogical ideas, which included DigiTech. As such, Dillon perceived that there was an underpinning vision of how the department wanted to guide and scaffold the use of DigiTech.

*Nothing was taboo. There was a big culture of “if it doesn’t work, it doesn’t matter” ...You go and try it and give it your best go and if something goes wrong, so what? We’ll make adjustments. So, the ethos was if you want to try something, we’ll give it a go and use it. (Interview 2)*

The ethos instilled in the department when Dillon started was to trial the use of DigiTech. Similar to the findings of Levin and Schrum (2013), Dillon’s department recognised that supporting teachers to learn to integrate DigiTech involves an acknowledgement of the “trial and error process” (Interview 2). All schools involved in Levin and Schrum’s study (2013) which successfully leveraged the use of DigiTech for school improvement, “supported a culture that said it was okay to make mistakes when using technology but you had to at least try” (Levin and Schrum, 2013, p.39). Dillon, however, did not find the trial and error process (and subsequent evaluation) as something that came naturally to him.

*I had to learn in the delivery not to be afraid to talk about things in detail. I think certainly when I first started trying I almost tried to fix the problem straight away. Whereas now I look at what I need to do and how you do that is by researching whether or not technology would actually make an impact to what you want to do. (Interview 2 and 3)*

Dillon maintained that he needed to try and work backwards in looking at what outcome he wanted the students to achieve and whether DigiTech could aid him (and them) in achieving this goal. For example, in planning his schemes of work, Dillon had embedded the use of DigiTech into “evaluating and improving” (Document - scheme of work) and would use DigiTech with students for self and peer assessment. As such, DigiTech was used as a tool to develop skills such as communication, speaking and listening and co-operation in activities and planned into schemes of work such as Cricket and Basketball. A similar pedagogical process was highlighted by Bozkurt (2011) who argued that teachers should determine what kind of role DigiTech is going to play in their instruction before it is used. Such an approach has also been argued to reduce the tendency to integrate DigiTech into teaching and learning



in a mechanistic way (Okojie et al., 2006). This consideration by Dillon prior to trying to implement DigiTech, thus provided him with the opportunity to reflect on the department's curriculum, its delivery and how DigiTech can contribute to learning outcomes.

Taking these learned practices forward into his current role (as head of department), Dillon has attempted to instil and embed the culture of trying the use of DigiTech into his department.

*Some teachers are scared of getting it wrong, whereas I try and encourage and say that it's okay to get things wrong. (Interview 6)*

For Dillon, the idea was that “failure is part of success” (Interview 6). Indeed, viewing failure as important part of trying and learning about DigiTech became a part of the culture of the department. Dillon regarded failures as meaningful and used these experiences to evaluate his uses of DigiTech. He would consider how DigiTech had been applied to the learning objectives and reflect upon how he could redesign future lessons accordingly. This culture of trying out ideas was noticed by other colleagues as a factor that promotes Dillon's pedagogical use of DigiTech.

*Dillon has really pushed it [DigiTech] and he's often telling us about an app that he's used or, “have you tried this one?” or, have you tried that one?” (Female PE teacher)*

*He will try something and if it doesn't work first time he'll work out a way of making it work. (IT Manager)*

Over time, Dillon found that developing his embedded use of DigiTech did not always occur straight away. Developing his embedded use of DigiTech involved a process of trying out ideas and students experiencing DigiTech regularly in their learning.

*There's always a cycle with introducing technology. It will start off almost negatively and then, as it becomes engrained and entrenched in the teaching and learning it becomes more the norm. (Interview – post lesson)*

For Dillon, this sentiment explains how trying out ideas with DigiTech can start off in a negative way but by embedding a culture of use DigiTech becomes the norm and engrained into a teaching and learning approach. In other words, trialling DigiTech and evaluating

errors/failures allowed Dillon to reflect on what outcomes he wanted to achieve before seeing how DigiTech could be used as an aid to reach this purpose. Part of the process involved in trying out ideas is ‘*taking risks*’ with DigiTech.

### 6.2.2 Taking risks

Dillon explained that when he first started trying DigiTech in his department taking risks was part of the DigiTech learning process.

*Because essentially nothing was wrong and it was trial and error at that time, nothing was really safe and it was just going with it. (Interview 1)*

When reflecting on how he felt at this stage of trial and error with DigiTech, Dillon explained how DigiTech was difficult to implement because he felt it presented a risk to his teaching performance.

*I’ve learnt that there is almost a sense of fear, maybe in the first 3-4 years, that I’ve got to get things right, it has got to be good. I was impatient, so if something didn’t work immediately in my early years of practice I reverted to a practice that was a bit safer or in my comfort zone...the easy option was not to take a risk. (Interview 2)*

Dillon explained further that it was not until he was able to accept the potential risks as part of his developing practice that he could begin to try and learn how new ideas could fit into his practice.

*It wasn’t until I was willing to take more risk that I think technology became more prevalent in my usage or professional practice. We still actively encourage, take a risk, when you can... It’s that sense of giving it a go and getting involved in terms of trying to improve practice. (Interview 2)*

From speaking to Dillon and his colleagues, however, it is clear that taking risks is something that Dillon has embraced into his practice and is important to his developing use of DigiTech.

*He’s a risk taker with technology. He’s one of those few teachers that are a risk-taker when it comes to technology. He will take the risk. It doesn’t always work but he does have a go. (IT Manager)*

The IT Manager believed having spoken to Dillon and the department, that taking risks was an important stage in developing a pedagogical approach to DigiTech.

*Technology is not fault free...it's always got an element of risk involved with it. In my opinion, we have to take risks to see whether it works. (IT Manager)*

Dillon epitomized a practitioner who was willing and able to take risks and saw the trial process as a form of learning. By embedding the approach of trying ideas and taking risks in his practice Dillon was able improve his practice with DigiTech. Dillon explained how this approach to DigiTech may not come naturally to practitioners. Indeed, at first, it may simply be too risky. In order to feel able to take risks when trying out DigiTech ideas, the developing confidence of both teachers and students was seen as important in the development of a culture of sustained and meaningful DigiTech use.

### **6.2.3 Confidence with DigiTech**

Dillon felt that it takes time to develop confidence in DigiTech and, therefore, the ability to embed a culture of trying out different ideas. In his personal pedagogy, Dillon described how he would often try out different ideas at home. For example, Dillon would try out his planned apps and strategies at home both with and without the Internet. Dillon explained how this developed his confidence in the use of DigiTech and its application in his classroom. This approach meant that Dillon felt able to deal with scenarios that might inhibit his practice (such as a lack of Wi-Fi) as he had anticipated them and had a practice to use if these scenarios occurred.

*With every app I use...I want to be pretty au fait with how to use it before I sort of... I won't just download an app and then give it a go. I want to be [confident] so if there are any questions from students I'll know how to solve that. (Interview 2)*

This extract represents the importance of developing self-confidence in the process of trying and developing a pedagogical approach to DigiTech. Similar to Bozkurt (2011), it is important to be aware of, and compensate for, the limitations of DigiTech as well as knowing the opportunities it presents. Developing his own confidence as part of his developing use of DigiTech also tied in with Dillon's approach to taking both staff and students out of their comfort zones and trying new practices.

*I like to push and take students out of their comfort zone. Some teachers will not be happy taking them [the students] out of their comfort zone and making them think for themselves because they are not in control of that situation. The student is more in control. Therefore, technology has taken the control out of their hands. Whereas I see it the other way, it's empowering them to think more, learn more. (Interview 5)*

Subsequently, developing confidence in DigiTech and embedded practice involves taking students out of their comfort zone and allowing students to take ownership of their learning. As implied by Dillon, this can shift control away from teachers and places a greater emphasis on students' independent learning. In field notes, Dillon was observed guiding and facilitating students through questioning, helping students find their own answers and helping them become confident in constructing their own understanding. As a result, students were developing greater independence in their own learning aligned with the skills Dillon believed students would need when they left school.

*The role of the teacher is to help guide them [the students] towards the right information...the technology, instead of me standing in front of everyone saying "do this" they [students] were able to gently progress through and felt comfortable in terms of being active and involved in their own learning of the skill. (Interview 6)*

Dillon, therefore, indicates a preference to creating practices whereby DigiTech is an exploratory learning experience designed to stimulate student-centred thinking. Developing confidence is subsequently a learning process for both the teacher and the students. In this sense, both parties are involved in exploring and developing knowledge of DigiTech use. It would seem that an initial step in developing students' confidence in DigiTech is the teacher's confidence to be aware of, and react to, potential problems students may face.

At this juncture, this theme has represented how DigiTech has been positioned as a tool to be explored and embedded into practice by trying out ideas, taking risks and developing confidence. Adopting a perspective of being forward thinking also supported and underpinned Dillon's and his department's culture of DigiTech use.

### 6.2.4 Being forward thinking

Dillon believed that being forward thinking was a crucial idea of developing a culture of DigiTech use. Dillon spoke about how he felt that he was somewhat different to other teachers in his school in terms of thinking ahead with his DigiTech use.

*I tend to look at the long-term benefits more, i.e. if we do this or if we get over this barrier, these are the benefits we will get...thinking if we get over this barrier if we see this as a hurdle not a wall we will actually get benefits further down the line. (Interview 4)*

By looking at the longer-term benefits that might occur once DigiTech has become embedded into teaching and learning, Dillon tended not to view obstacles in his developing use as unsurpassable. Furthermore, he felt he could find solutions to potential problems and actively involved solution finding in his trial and error learning process. Part of Dillon's approach to anticipating barriers and looking towards potential benefits was liaising with his IT Manager to understand how the school could support his developing use.

*Working with people like Dillon that know what they want to achieve and then being able to help them achieve it is a joy for me because I haven't got to think about how they're used in the classroom, because they've already thought about that, they already know what they want to do, they want someone to work out how to do it. (IT Manager)*

Dillon would, therefore, plan how to apply DigiTech into his lesson objectives and then seek support as to how best to achieve this. Dillon was pro-active and thought ahead to anticipate problems and support rather than just reacting to them after they had occurred. The importance of being forward thinking is an approach used by many schools to leverage DigiTech towards learning goals (Levin and Schrum, 2013). This is because it helps schools and teachers to see the systemic nature of trying to use DigiTech to meet their teaching and learning visions. Dillon's case would seem to suggest a similar approach is useful for individual departments such as PE.

### 6.2.5 Linking DigiTech to assessment

Dillon, the headteacher and a senior leadership team member, all suggested that the school did not have an embedded culture towards the use of DigiTech for teaching and learning. However, the school had invested and developed a strategy towards the use of DigiTech; specifically, for assessment. Across most of the school departments, a digital software package was used for online marking and tracking students' progress.

*I think we are using DigiTech to have a better view about the ability and progress of children than ever before. I think that's a huge step forward...our programme is used to support our interface with learning. (Headteacher)*

The school played a role in encouraging the use of DigiTech for assessment. The software helped the school to gain summative assessment information about students and was seen as an "assessment tool that would be accessible and beneficial for all" (Headteacher). In regard to the PE department, Dillon felt they were "struggling to find a place in how to record assessment" (Interview 1). The school's software was used to provide summative assessment, but Dillon noted that it was difficult to complete formative assessment using this programme (Field notes). Formative assessment was, therefore, conducted in PE using DigiTech to aid assessment and feedback. Dillon explained how the visual benefits of iPads, and being able to use iPads to record practice, ensured that students could self-identify what they needed to do to improve. This was evidenced as I observed students using a video-delay recording of their skill acquisition for feedback in a handball lesson. The use of such video recordings meant that Dillon could support other students in the execution of the skill and provide verbal feedback to support skill development (Field notes).

In examination PE, Dillon sometimes found it difficult to give specific feedback in an efficient manner that allowed students to see areas to improve their theoretical work. Dillon subsequently used the app 'Explain Everything' (see Table 7) to create video feedback on each student's piece of work. Dillon explained how he could give more detailed feedback in a way that was referenced to a specific piece of text and the students could look into their work in their own time. Dillon would then set up online sessions whereby students could pinpoint questions in relation to the video. As a result, Dillon could embed a feedback loop which could be established inside and outside of the classroom.

In this case, despite the school investing in DigiTech for assessment/feedback, the PE department found ‘better’ ways to use DigiTech to meet the individual needs of the subject. Dillon, therefore, ensured that he did not just use the school’s software but tailored his and his department’s approach to meet the requirements and needs of his subject. For that reason, considering the application of DigiTech in relation to the parameters of each subject and context is an important stepping stone in using DigiTech pedagogically.

### 6.2.6 Supportive infrastructure

Providing a focused yet flexible structure of ideas to use DigiTech for specific areas was a practice culture which helped support the use of DigiTech for assessment. Dillon conveyed how developing an embedded culture (both personally and in the department) towards the use of DigiTech in PE involved having a supportive infrastructure (such as Wi-Fi access, IT support and support to try new teaching and learning approaches). Dillon certainly felt supported by his school in terms of trying DigiTech.

*I am fully supported. If I want to do something there is nothing saying I can’t do anything. I can do whatever I want in terms of delivery and certainly the use of technology. (Interview 4)*

Both Dillon and the IT manager spoke about how they had been collaborating to ensure that the PE department’s use of DigiTech was supported and how the school could aid them in achieving their visions for DigiTech use.

*They’ve each got their own department improvement plan so we’d be sitting down and going through that and seeing where technology could help support them... this is something that we are still developing, nothing is sort of a fixed solution here. We are seen by management as enablers so we are sent to help and try and make technology work. (IT Manager)*

The IT manager expanded on the school's pedagogical approach to investing and supporting DigiTech in terms of considering what outcome teachers wanted to achieve and then selecting the best DigiTech to aid this practice.

*It's not just so much chucking equipment at it but it's targeted as to where we put it and what type of equipment... it kind of comes back to what are we trying to achieve? (IT Manager)*

The IT manager gave an example of how he worked with PE. Dillon said that he wanted to find a way to project visual material in the sports hall and suggested some software that he had seen. The IT manager explained that projectors readily get broken, are expensive to fix and software is very expensive. The IT Manager instead recommended TV screens and Apple TV which could be used with the department iPads. This involved each party "thinking a bit differently and abstractly" (IT Manager) rather than investing in expensive software as the first port of call. This example shows how embedding a culture whereby exploring DigiTech use is collaborative and planned in line with learning outcomes helps support DigiTech use in the classroom.

Conversely, there were some instances where DigiTech did not work as effectively. Dillon felt that there were certain approaches (i.e. flipped learning) that did not work when PE was working in isolation from the rest of the school.

*We are trying to do things to develop ideas and trying to develop procedures but sometimes we are let down by the fact that we haven't got a whole school technology focus... that's where [in reference to flipped learning] I think the whole school approach is required because otherwise PE stands alone and I'm being realistic rather than pessimistic and defeatist, our position in the school and education at the moment means you are instantly seen as holding less value. The phrase "it's only PE". (Interview 5)*

This example represents the essential role of community support in encouraging pedagogical approaches to DigiTech. Dillon's autonomy and his collaboration with IT support were sufficient to initiate the use of a pedagogical framework for learning with DigiTech. Dillon



felt supported in trying out new ideas and sought collaboration with his IT Manager to consider how he could find the best way to make his pedagogical ideas a reality. However, in relation to the case of flipped learning (which will be discussed further in below sections), strategies can sometimes struggle to operate effectively in isolation. In other words, without a whole school approach or a strategy becoming embedded into regular teaching and learning practices, some strategies struggle to feel supported and valued by students. This, in turn, can mean that the profile and perception of DigiTech use in PE can sometimes feel diminished and hold less value because the approaches are not embedded or replicated across the whole school.

In the next section the theme ‘*establishing routines*’ is discussed. This theme is explored through three subthemes; ‘*consistency of strategies*’, ‘*flipped learning*’ and ‘*variety in method*’. Through a discussion of this theme and subthemes, the practices and factors that Dillon believes has allowed him and his department to develop and sustain their pedagogical use of DigiTech are discussed.

### 6.3 Establishing routines

Dillon found that a significant factor in his belief of how DigiTech has worked for him and his practice has been establishing and sustaining routines of practice. Dillon created both routines of DigiTech use and expectations around the use of DigiTech. He found that building up routines of DigiTech use ensured that DigiTech was seen as part of the normal learning culture in PE. He felt that, when these routines were embedded into the culture of students’ learning in PE, students became more familiar with DigiTech uses and more comfortable in how to use DigiTech to aid their learning.

*Routine gets students used to it [DigiTech] and I tend to be a little bit more selective with some of the stuff that I choose so that students are familiar with it and they know how to use it. A lot of your implementation of technology is based on giving up your time to get them into a routine get them used to using it. (Interview 3)*

Being flexible with time and being able to overcome glitches or technical difficulties was, therefore, a critical part of the planning process for Dillon. Dillon explained how routines of practice would involve ensuring that students had access to DigiTech, could log in to apps,

showing students the basic features within each app/device and establishing expectations of use, i.e. what to do with the devices when the teacher is talking. Another routine was using DigiTech for assessment (e.g. a short online Kahoot quiz – see Table 7) as an end of lesson plenary. A similar practice was also observed in an observed lesson, where the teacher posed questions using Kahoot based upon assessing students' understanding of the lesson content (Field notes). As Dillon explained, he “religiously” (Field notes) uses DigiTech for assessment at the end of a lesson.

For Dillon, spending time to establish routines of use was vital to ensure DigiTech can be used towards effective and quality teaching and learning.

*I pretty much spend a couple of weeks at the beginning of each year talking to students and saying right we are going to be using iPads, iPods etc. and teaching the basics of how we are going to use it or these are some of the lessons.... I like there to be a pretty simple, basic framework that myself and students are comfortable with and know it is a requirement for the lesson. So, for example, they know that if they come to a lesson they are going to use some form of technology or be able to interpret some information on technology and be able to use it comfortably. (Interview 3)*

Dillon found that investing time establishing routines of practice aided him and the students because the quality of learning improved and they [the students] were getting regular opportunities to practice their use of DigiTech. This, however, is something that takes considerable time investment, such as researching DigiTech outside of school. Dillon found that it was not until he had got into the routine of investing his own time outside of school to explore DigiTech that he began to benefit from DigiTech in school. This investment was an aspect of establishing routines that Dillon felt that other staff overlooked.

*I think they [other teachers] don't invest their time... I think that's why they haven't developed that pedagogy of you know using technology more within their PE lessons. (Interview 3)*

Part of establishing routines of practice for Dillon is, therefore, investing his personal time regularly into exploring ideas and uses of DigiTech. The time spent exploring DigiTech allowed Dillon to be more confident in its use and ensure that practice routines can become established. Paired with establishing routines and time investment is having consistency in

the strategies and use of DigiTech.

### 6.3.1 Consistency of strategies

Having consistent uses of DigiTech was significant for Dillon and his students. Consistency of use was important because it not only increased their familiarity and comfort in their use of DigiTech for teaching and learning but, also, ensured that students felt engaged and autonomous in their learning.

*The process is continual really. I think it needs to be consistent. The students become more and more adept at using it [DigiTech] because they are becoming more and more familiar. (Interview 2)*

*I think there are elements that need a whole school approach, i.e. so things like flipped learning, and some concepts like that, require a whole school approach that is consistent. (Interview 5)*

Dillon suggested that this continual process allows students to feel confident in their use of DigiTech and meant that students became “familiar so they can deal with different uses and scenarios” (Interview 3). Despite not using DigiTech as regularly as Dillon, many other colleagues in the PE department recognised the need to be consistent in the approaches.

*Using technology in a positive way, continuously, so that students realised it's part of the PE lesson and becomes second nature. (Male PE Teacher)*

*It's a daily process. I use my iPad in every lesson. Whether it just be for the register, simple kit marks or using YouTube videos, it's a daily usage. (Female PE teacher)*

A consistent message, which also came across in the case of Patrick, is that if there is not a continuation of use and strategies, DigiTech can be increasingly seen as something that should not be valued or can be seen to deviate away from aiding students' understanding.

*If you just dip your toe into it [DigiTech], it's like it almost appears a faddy thing... that's why there is consistency and they are not just making an iMovie themselves or whatever it might be and forgetting about it. There has got to be continuation and flow to it. (Interview 3)*

Subsequently, having consistent strategies and use of DigiTech, especially one which is embedded into the learning culture of PE, allowed both students and teachers to become more familiar and confident with the use of DigiTech for teaching and learning. Consistency also increased students' autonomy with DigiTech and increases the likelihood that it is valued as a tool for learning. Consistency in establishing routines of practice is therefore important when embedding and moving towards a pedagogical approach to DigiTech use. One of the strategies that Dillon had been working towards becoming a consistent practice is flipped learning.

### 6.3.2 Flipped learning

As mentioned in the previous subtheme, Dillon found that his use of flipped learning could sometimes falter because it was not a consistent strategy for teaching and learning across the school.

*One of the common reasons for the failing of flipped learning, in my lesson, is that [student comment] "I don't have to do this in any other lesson". Well if that was standard across the board... [pause]. So, it's not necessarily even the concept of flipped learning, it's a concept of learning itself. There seems to be different expectations around the school and not one followed strategy. (Interview 6)*

As a result of this inconsistency, Dillon perceived that some students did not value the flipped learning approach. This shows how some pedagogical strategies used in conjunction with DigiTech work better when there is consistency across departments or when it is supported as strategies for learning. Dillon did find, however, that when used consistently in examination PE, flipped learning helped him give more individualised feedback and increased the focus on addressing students' learning needs. McKnight et al. (2016) also found similar results whereby flipped learning enabled teachers to spend more time engaged with one-on-one support and correlated to positive learning outcomes, such as generating deeper understanding inside and outside the classroom.

Dillon's rationale for initially seeking out a pedagogical strategy to use with DigiTech was to identify aspects or gaps in his teaching that he wanted to improve. Dillon found that the "use of flipped learning really lends itself to technology" (Interview 3). This is because it allows

students to access lesson content outside of the classroom. His initial rationale for choosing flipped learning was that he wanted “to get into more detail in lessons with individual students and make them more responsible for their content” (Interview 5). Flipped learning was chosen as a strategy that would aid Dillon in reaching these goals. More specifically, Dillon used ‘myPE exam’ (see Table 7) to deliver his flipped learning strategy because this allowed him to use a consistent lesson format for theory PE. Within my time in school, I observed the students use of myPE exam in lesson time which allowed them to work through the content and assessment questions at their own pace depending upon the areas they needed to work on. The teacher was also available to support and enhance their comprehension in these situations (Field notes).

*In a theory lesson it would be right we are going to learn about the skeletal system. Your homework is to watch this video [i.e. on myPEexam] ...you go and watch it; you’ve got to do this little test at the end... [the students] then come back into the lesson where I give them [the students] a little test and they [the students] have got to check their knowledge and understanding. Then I’ll have six stations of varying levels [of difficulty] and then they can move around and progress as and when they feel it’s appropriate for them. What this allows me to do it circulate the room a bit more, get a little bit more hands on and helping more with individual needs. (Interview 3)*

With this strategy, Dillon could create a flexible learning environment whereby independent study was supported and students could choose when and where they learnt. Dillon could spend more time giving individualised feedback and could assess the students’ learning. He would use a piece of DigiTech such as Google Form quizzes (see Table 7) to assess the students’ flipped learning homework. Dillon’s focus was shifted to a learner-centred approach whereby in-class time was dedicated to exploring topics in greater depth. The learner was responsible for developing their own learning and comprehension with the support of the teachers’ resources. Flipped learning, therefore, provided Dillon with the means to allow students to learn and understand an idea or topic area before they entered the classroom.

*I’m really trying to hold onto the idea that flipped learning, whether it is a video, a newspaper article, reading a tweet or listening to something on a podcast will ultimately benefit them in the long run because they are having to come up with their*

*own ideas.... They won't necessarily have all the right answers and it's not a substitute for me teaching them. (Interview 5)*

Dillon, however, noted that it was not only important for teachers to think critically about the purpose and content of what students were given to learn. Teachers also had to consistently support the students in gaining ownership of their independent learning.

*Teachers really like to have control. They like to know that they're teaching and, therefore, the information the students are getting is right. I actually have the opinion of... well [pause] get as much information as you can, I'm sort of like the middle, the central glue that holds it [the learning] together. (Interview 5)*

In core PE, Dillon used flipped learning in a different way. He looked for a strategy to engage his students and increasingly tried to promote the benefits of PE to his students in different ways. Dillon identified that in a core PE setting he wanted “to create more interest, contact and more exposure of PE into students’ lives” (Interview 3). Conversely, he also sought to ensure that the students were becoming more independent learners. Dillon used the flipped learning strategy in a way that allowed for students to learn independently and reflect on key aspects of the lesson content or objectives. He would display this content on a TV screen in the changing rooms prior to the lesson for students to reflect upon. This use of DigiTech allowed Dillon to utilise all of the lesson time and allow the students to gain some basic understanding of the lesson objectives and content.

When used consistently and over a period of time, Dillon (like Patrick) believed that the flipped learning strategy (in core PE) was beneficial in increasing student engagement and students’ experience of PE. In examination PE, Dillon suggested that over several years those students who had consistently used the flipped learning strategy had on average increased their grades by at least one. As a result, Dillon saw flipped learning as a vital and consistent strategy in aiding both teaching and learning across a variety of learning scenarios in PE. Moreover, flipped learning was a pedagogical strategy that allowed Dillon to use DigiTech in ways that were suitable for him and his students’ learning.

Alongside establishing routines that involve incorporating consistent strategies, Dillon explained how having variety in the methods of use (i.e. techniques) was important in ensuring that students had access to a variety of different approaches to learning.

### 6.3.3 Variety in method

An important caveat to being consistent in the use of pedagogical strategies (such as flipped learning) was also using variety in the different uses of DigiTech. Dillon was mindful that DigiTech was a tool for his teaching and that it should only be used when appropriate to the context, the learner and the teaching he had planned. He was cautious to ensure that, like many teaching methods, there is variety in its use.

*They [teaching approaches] are the sort of things that I think you have to be quite careful not to do over and over again. Otherwise they become monotonous and that's the same with the overuse of technology. It's important to get the balance right. (Interview 6)*

This was a sentiment supported from a member of the senior leadership team who viewed DigiTech as “a tool, but I think it’s one of a range of tools to be used”. Embracing the variety of options that DigiTech can consequently afford allows flexibility for students and teachers. Dillon felt this was “because there are no set guidelines on how much technology should be used or what should be used for there is not one final end target to achieve” (Interview 5).

In the literature, it is acknowledged that greater curriculum guidance on how and why to use DigiTech in PE is required (Hennessy et al., 2005). The lack of guidance can be seen as a factor that inhibits pedagogical change (Hennessy et al., 2005). Dillon viewed this as a positive experience in as much as he could be flexible and autonomous in his use. This highlights the importance of taking into account a teacher’s own theories about teaching and learning and their experience of using DigiTech for personal reasons within a social and professional context, when seeking to integrate DigiTech (Hennessy et al., 2005; Loveless, 2003). Dillon had the ability to apply DigiTech in ways that were suitable for his context, curriculum and needs of his students. The lack of guidelines or standardised procedures in school with DigiTech regard to DigiTech can, therefore, be seen as a positive. This flexibility allowed Dillon to do “lots of different things” (Interview 5) tailored to the department’s curriculum. Practice with DigiTech can, therefore, be developed and sustained in a variety of ways that can be tailored to the individual needs of the user.

The next theme ‘*keeping tasks simple*’ explores how Dillon viewed the use of DigiTech and why he uses DigiTech. This theme and its subthemes identify how simple strategies could be used in ways that Dillon and his students benefit.

### 6.4 Keeping tasks simple

Dillon and his colleagues found that embedding simple strategies and practice into their routines, i.e. using approaches that were easy for students to follow, were the most beneficial to their practice. As discussed through the subthemes below, the strategy of keeping practices simple allowed for greater outcomes with DigiTech. These outcomes contributed towards students' learning experiences rather than complicating approaches which then detracted from learning. "What I learnt to do, and would pass on, is concentrating on a little bit of detail, concentrate on just a little small element to make a minor improvement" (Interview 3).

For Dillon, simple practices included: showing students a video clip of their skills and identifying with them what is good and what needs improvement (observed in practice); replaying a video of performance back to students for self-reflection and on-going formative assessment (observed in practice); putting a time clock in the changing rooms with questions/tasks to consider for the lesson; creating small movies of work or areas where students could look to improve and using tasks such as taking a 'selfie'<sup>14</sup> at each orienteering post, to aid engagement.

Displaying a video on a projector, iPad or computer screen was mentioned several times as one of the simplest but most effective strategies to aid students' skill development in PE.

*It could just be a simple video on replay. It could just be getting them videoing themselves so they can see themselves playing. It could be just a simple description like a voice recorded, getting them to do it. It could be just watching what their warm-up is going to be. (Interview 1)*

*Just being able to visually see what they are doing right or wrong is really powerful. Using examples of perfect modelling on YouTube that's a big part of improving the practice of students as much as staff. So, a simple strategy is just being able to show right and wrong. (Interview 3)*

---

<sup>14</sup> A 'selfie' is a photograph that one has taken of oneself. Typically taken on a smartphone camera and shared via social media.



Dillon found that simple strategies, such as these, would provide a wider range of learning experiences, relevant and current content and greater depth of student engagement not otherwise available. This theme is explored further through the subthemes below.

### **6.4.1 Enhancing learning experience**

Dillon talked at length about how he found that small and simple strategies allowed him to give students an enhanced and broader learning experience in PE. Dillon acknowledged that DigiTech did not allow him to achieve anything radically different, but that it was a tool that allowed him to develop the students' broader experience of PE.

*The reasons for technology and how technology has influenced my teaching and outcomes would be that it has provided a mechanism that is able to inspire, develop, educate and progress students' experiences. (Interview 6)*

Dillon explained that he believed students' experience of PE should be more than just the physical side. For that reason, DigiTech was a tool that allowed him to provide learning opportunities in cognitive domains.

*[Describing DigiTech use] trying to be inspiring or creative and [students] realise that they may not be the best performer but, they might be able to direct a video, they might be able to coordinate what should be said, they're using things like their literacy skills, speaking and presenting skills. (Field notes)*

Dillon structured the students' assessment by cognitive and social outcomes. In realising that their learning could be valued, Dillon found some students became more engaged. Goodyear et al. (2014a) also identified a similar finding when using cameras as a tool for engagement. They found that 'non-sporty students' were engaged in DigiTech based roles such as 'camera person' or 'coach'. When engaged in this DigiTech based role (and whereby physical competence was not a definitive learning outcome of their role), students developed their learning in social and cognitive domains. DigiTech for Dillon was, therefore, viewed as a vehicle for him to address and provide different levels of understanding for his students.

*It [DigiTech] has the ability to develop the experience of both the teacher and the learner so that they are getting a different outcome that they may not have necessarily*

*expected... some people might actually surprise you because you think they are not going to be very good at commentary but actually they've done a really good job in terms of improving their oracy and their understanding of a topic, so it's really multifaceted in what it provides you with. (Interview 6)*

DigiTech use in PE can, as a result, be used as a tool to teach students that PE is not just about physical performance and can be used to develop other life and cross curricular skills. This idea was supported by the IT manager, who explained how DigiTech can be part of a student's learning journey.

*I actually think ICT is part of the journey rather than the actual strategic element of it. It is about enabling and I think it's a journey...showing the student that the technology they are using can be used so much more than just Facebook or Twitter. (IT Manager)*

This view that DigiTech is a journey rather than an outcome (i.e. learning about the critical or educational use of DigiTech) mirrors the perspective of Okojie et al. (2006) whereby a pedagogical approach to DigiTech views DigiTech as part of students' wider educational journey and not just the destination. Seeing how DigiTech can contribute towards enhancing the learning experience for students, and therefore, seeing it as a valuable teaching tool is not something that Dillon had always maintained. Cook (2009) described teacher change as being a 'messy process' where teachers go backwards and forwards between old and new practices/beliefs before they change their pedagogy and beliefs. This reflects the journey experienced by Dillon.

Dillon had previously seen DigiTech and PE as "far more separate" (Interview 2).

*I did think technology was almost one stream or one avenue that belonged in education but not necessarily in PE. They were like two parallel lanes; they were side by side but didn't necessarily belong together. Whereas now I think those lanes are far closer together. As much as possible, I try and get them to merge so they are going in the same direction. Whereas I did feel like technology was maybe doing one thing and taking away from the physical. That was my view. It was taking away from the PE... whereas now I see it actually benefiting the broader PE requirements of a student. (Interview 2)*

Part of this change in opinion occurred through seeing that “the whole [student] was massively important” (Interview 2) and, as mentioned above seeing that students would achieve different outcomes through their use of DigiTech. Dillon said he believed that PE was now a far more “holistic idea” (Interview 2) and therefore DigiTech was now more relevant because students could learn through DigiTech. This helped Dillon to make PE relevant to students’ lives. Subsequently, DigiTech has provided a means for both Dillon to learn about how to enhance the learning experience of his students and, in turn, deliver DigiTech in a way that allows students to understand a variety of different learning experiences. Part of enhancing the learning experiences of students involves providing learning opportunities that are relevant to the user.

### **6.4.2 Relevancy to the user**

Dillon felt that DigiTech could be used simply to enable all students to experience PE in a way that was relevant to them and to consider the wider educational context of the learner.

*It’s [DigiTech] the cornerstone, it’s the building block of how I want to get my students learning and therefore developing and progressing them to help them in their future lives...it might be something that you dip your toe in and out of but it’s always something that can help inform your delivery and your ability to inspire and enthuse students as well as being able to make it [PE] relevant in the long term. (Interview 5)*

When exploring this perspective, Dillon viewed DigiTech in a far more general sense. DigiTech was a vehicle to aid his students in gaining different skills from DigiTech that could be applied both inside and outside of school. In this respect, similar to the practice used in Parker et al. (2017) DigiTech can help students develop personal and social responsibility skills by “giving the students tools to deal with situations and experiencing success and failures when things go wrong” (Interview 4).

*They [the student] become a little bit better at problem solving. So, for example, the use of technology, if they are not familiar with making a movie or doing recording or whatever, then they figure it out. They might go, “oh this is doing whatever” and you have to help them, but they generally figure out or find a solution to do what you are asking them to do. (Interview 6)*

In this way, Dillon could use DigiTech as a method of teaching students' problem-solving skills and use questioning techniques to ensure that students were taking responsibility for their learning. This practice of allowing students to self-discover and adapt the task to suit their own preferences for learning or designing, was observed in a basketball lesson where students created coaching videos of a skill. Within this lesson, they were asked to select a skill (such as dribbling or shooting) and create a video breaking down the parts of the skill for the learner.

To ensure that each practice was simple and tailored to make it relevant to each learner, Dillon would (in planning) ask himself simple critical questions to guide his decisions on appropriate DigiTech use.

*I think there is a purpose for technology and it's about being confident about applying [DigiTech] at the right time...which bit of technology? Which platform? Which usage? How do you link that in with the right group? The right situation? So, I think what you've got to do is think, right, what do I want to get out of the group for this lesson? It's almost a process...there is a checklist of saying, this group are able, this group are not so able, special learning needs and then pitching the right level of technology that you have at your disposal to that group. (Interview 1)*

For Dillon, this would ensure that his use of DigiTech is relevant and tailored to the needs of his learners rather than using a piece of DigiTech and then considering what it could be used for. Through this self-reflection and questioning process, Dillon could ensure that his planned, and subsequent delivery of DigiTech, had a pedagogical underpinning that was relevant to the user (teacher and student) and context. One of the simplest strategies used to considering the relevancy of DigiTech to the user was to use DigiTech as a tool for engagement.

### **6.4.3 Tool for engagement**

Dillon sought to use DigiTech as a tool to engage students in PE that was not just focused on students' physical performance improvement. As mentioned previously, using videos had many benefits for Dillon's practice; benefits that included visually stimulating and provide interaction for students with special needs. Other simple strategies included (i) using social

media to publicise students' achievement and (ii) getting students to create mini coaching videos for local primary schools.

The practice of using videos to aid learning was a regular part of Dillon's practice and occurred in one of the lesson observations. Dillon used videos to show an example of handball skills. These videos were used as a reference point for students to answer his probing questions. Video feedback was also used so students could see their skill performance (in this case a handball shot) immediately after it had occurred. This was observed in a lesson where students were engaged by the immediacy of the use of DigiTech, as it was a simple way for them to see themselves performing. In addition, and with guided feedback from Dillon, students could identify some areas for improvement. A similar practice was used by other PE teachers in the department.

*I have a group that's got a lot of learning support students in and for those [students] it [iPads] is invaluable. Using the iPads and showing the video – for those, they're really, really engaged by it, but it also helps them to understand the skill breakdown.*  
(Male PE teacher)

Another simple strategy used by Dillon was to post information regarding school clubs, activities and students' achievements on TV screens around the school. I observed these TV programmes at several points around the school, such as the science building and in the dining hall. In addition, Dillon would post useful ideas and celebrate student successes on Twitter. This content could then be synchronised with the content on the TV screens. This use of DigiTech allowed Dillon to provide "greater exposure of PE into students' school lives" (Interview 3) which, also meant that students had a greater knowledge of PE activities that they could be involved in. This practice similarly enabled Dillon to strengthen the "profile of PE" (Interview 3) in the school.

*I'm a really big fan of using Twitter for the school usage. I wanted to celebrate successes and things like that, so I use Twitter to promote successes for teams or personal achievements and from speaking to students, Twitter, Facebook and Instagram seemed to be a really good platform or basis to do that. (Interview 1)*

The final strategy of enabling students to create coaching videos was one that that was also seen in a lesson observation. Dillon gave small groups of students either an iPod or iPad and

tasked to then create a coaching video of a skill that they had previously learnt. They were given exemplar videos on YouTube as a source of inspiration. These videos were to be edited and reviewed before sending to local primary schools. Dillon found that students who had previously not been engaged PE “really voiced an interest” (Interview 2) whereas, previously, they had found lessons unengaging. Dillon further explained that the videos “gave them [the students] more enthusiasm for the lesson afterwards” (Interview 2) and subsequently, this was a practice that he has repeated with different groups. Thus, as supported by Goodyear et al. (2014a), DigiTech can be used in simple ways to “engage those less enthusiastic learners” (Interview 5) and create a strand of learning for that is focused more on knowledge and delivery rather than just physical or performance abilities.

This practice with DigiTech also enabled Dillon to extend the purpose and audience for students’ work. As noted by Dillon, and observed in practice, this particular example meant that students felt a form of “responsibility” (Interview 6) towards the work they produced using DigiTech. McKnight et al. (2016) support a similar finding whereby DigiTech can be used to improve students’ learning outcomes. This is because when conducting practices such as creating a coaching video, students cared about the outcome (i.e. what they produced) as it was going to be viewed by others. This practice subsequently extends the purpose and audience of students’ work that may act as a tool for engaging students in PE.

### 6.5 Chapter conclusion

This chapter has explored Dillon, his department and his school’s views regarding the uses, factors and experiences of DigiTech that have contributed towards developing a broader pedagogical approach to DigiTech. Dillon and his department had deployed many strategies that worked towards creating an embedded culture of developing their use of DigiTech. This involved trying out ideas, taking risks, being forward thinking and developing confidence. Despite adopting a different culture to that of the school, the school saw the value in embracing DigiTech for assessment and supported Dillon and his department’s use of DigiTech.

Trying out ideas involved considering the trial and error process inherent in any approach to DigiTech use. Dillon and his department considered failures as something that could be evaluated and reflected upon. They saw trying DigiTech as a learning process where they

could explore their use of DigiTech to enhance their learning outcomes and how to better plan to use DigiTech as a tool to help them achieve their goals. Taking risks involved seeing the use of DigiTech as a form of learning and taking risks to see whether DigiTech might contribute towards student's PE outcomes. Taking time to develop the confidence of both teacher and student in using DigiTech involved trailing DigiTech in different scenarios and seeking to compensate for potential limitations or barriers. This sometimes involved taking both students and teachers out of their comfort zone and facilitating students' independent learning. Being forward thinking was seen as a trait that allowed Dillon to consider the longer-term benefits, being proactive in anticipating problems and identifying possible solutions.

The school valued the use of DigiTech for assessment and had embedded a culture around the use of DigiTech for summative assessment/feedback. PE had devised their own methods of formative assessment that allowed them to use DigiTech in ways to provide effective and personalised assessment. Combined with a supportive school infrastructure, Dillon and his department were able to try out new ideas and consider whether DigiTech could enable them to meet their intentions for learning. Dillon recognised that some strategies (such as flipped learning) required a broader and whole school approach for them to be considered as meaningful by his students. This highlighted the importance of school support and leadership in ensuring that a pedagogical strategy is valued and used effectively.

Establishing routines and expectations around the use of DigiTech was viewed as important but this is an approach that takes time to develop. In initiating such an approach, students were increasingly comfortable and familiar with the use of DigiTech for learning and consistency in strategies allowed them to see DigiTech as an important and valued part of learning in PE. Ensuring there is variety in use, and therefore, diversity in the use of DigiTech, can allow teachers to reach a multitude of different learning outcomes.

Keeping tasks and uses of DigiTech simple ensured the greatest outcomes and benefits for Dillon and his students. This allowed the use of DigiTech to be focused on, rather than detracting from, learning. 'Enhancing the learning experience' of students explored how Dillon used DigiTech as a tool to provide different and broader learning opportunities for students. Similarly, DigiTech was taught and assessed in relation to different learning domains (i.e. cognitive and social). DigiTech could, therefore, be used by Dillon as a

pedagogical strategy to support students learning in ways that was not solely focused on physical performance. It was also used to contribute to students' holistic development and skills required for lifelong learning. Using DigiTech in ways that were relevant to the user and the lifelong learning of students was always something that Dillon questioned about his practice. Viewing DigiTech as a vehicle to help him achieve these goals allowed Dillon to consider the value and meaning of DigiTech. In addition, DigiTech can also be used as a tool for engagement and increasing the profile of PE in students' lives.

The main lessons learned in this case were that the developing use of DigiTech in PE is a learning process and one in which both teacher and students establish strategies to support their use. Dillon's case provided examples of the developing use of DigiTech and exploring where DigiTech can support teaching and learning to provide tangible and beneficial teaching and learning outcomes. Trial and error was an important part of Dillon's approach to developing and constructing his approach to DigiTech. This enabled Dillon to identify practices to instil into the regular routines and practices of his department.

The next chapter explores Alice's views, experiences and uses of DigiTech.



## Chapter Seven: Alice

### 7.1 Introduction

This chapter unpacks the views and experiences of Alice, and others in her school, regarding DigiTech use. The findings are presented in an effort to understand the factors and experiences that influence how and why Alice had developed the use of DigiTech in her teaching.

The first theme '*keeping tasks simple*', explores how Alice created short and simple uses of DigiTech as a tool to support teaching and learning. These simple uses of DigiTech allowed Alice to provide learning experiences that were relevant to her and the students. DigiTech allowed Alice to improve her avenues of communication with her students. Alice used DigiTech sporadically and worked towards '*identifying factors lending to DigiTech use*' to allow her to use DigiTech appropriately and efficiently. Alice used DigiTech through simple methods as a '*tool for engagement*' and to '*enhance the learning experience*' of her students. Alice used DigiTech in this way as she believed it gave students variety in their learning opportunities and greater options for students to access learning resources. This section explores Alice's views regarding how and why she chooses to use DigiTech in her practice.

The second theme '*establishing routines*', explores how, by working to establish routines of practice, Alice was developing expectations and relationships with students that supported the use of DigiTech. Establishing routines is discussed as a process which involves '*taking time*' to develop and, may be difficult to sustain. Taking time to develop the use of DigiTech is discussed as a factor that can affect confidence when seeking to develop regular practice. '*Variety in choice of DigiTech*' shows how the diversity in DigiTech use allowed Alice to create different learning opportunities for students and permitted students to experience greater autonomy in their DigiTech use.

The third theme '*developing an embedded culture*', highlights the role of school support in promoting and supporting Alice's use of DigiTech. '*Trying out ideas*' explains how undertaking trial and error with DigiTech allowed Alice to develop new approaches and gain

knowledge of how to use DigiTech in her teaching. *‘Learning through DigiTech use’* presents Alice’s view on and uses of DigiTech as an on-going learning process.

Prior to discussing each theme and its associated subthemes, Table 8 details the types of DigiTech (i.e. apps, devices, software, online application) used by Alice, what functions were used and, how they were used (i.e. by teacher or student and for what purpose). Whilst not all of these individual pieces of DigiTech are discussed in the following chapter, they represent the diversity and range of DigiTech used and provide a context for Alice’s DigiTech use.

7.1.2 Table 8: *DigiTech/apps, functions and how they were used by Alice*

Case Teacher	Type of DigiTech (e.g. App/Device/Software)	Functions/Description	How it was/has been used
Alice	iPad (device)	Apple tablet device used to download applications (‘apps’), store information and take pictures.	<ul style="list-style-type: none"> <li>Given to students to record and analyse each other’s performances.</li> </ul>
	Camera (app) Video camera (device)	App used to take photos and videos. A device used to take photos and videos.	<ul style="list-style-type: none"> <li>Used by Alice to take pictures of students work or record/video students’ performances.</li> <li>Used by students to record and view performances</li> </ul>
	Kahoot (online)	A game-based, learning platform used to create multiple choice quizzes.	<ul style="list-style-type: none"> <li>Used by Alice to create quizzes to assess students learning (both individual and group assessment).</li> </ul>
	Heart rate monitors (device)	Wearable devices used by students to monitor and record heart rate. Data can be accessed on an associated application or on the device itself.	<ul style="list-style-type: none"> <li>Used by students to record and analyse their heart rates during physical activity.</li> </ul>
	Fitness ‘7-minute workout’ (app)	Fitness app providing visual demonstrations of exercises, timers and planned interval sessions.	<ul style="list-style-type: none"> <li>Used by students to self-direct their health and fitness sessions.</li> </ul>
	YouTube (app)	A video-sharing website that allows users to upload, view, rate and share videos.	<ul style="list-style-type: none"> <li>Used by Alice to find relevant videos for demonstrations or class discussions.</li> </ul>
	PowerPoint (software)	Presentation creating software.	<ul style="list-style-type: none"> <li>Used by Alice to create presentations for theory and practical lessons.</li> </ul>
	Interactive whiteboard (device)	An electronic whiteboard used to display information and provide interaction with images, videos and text.	<ul style="list-style-type: none"> <li>Used by Alice to present material and resources.</li> <li>Used by students to engage with tasks and demonstrate</li> </ul>

			understanding.
--	--	--	----------------

## 7.2 Keeping tasks simple

Alice and her colleagues described how DigiTech was used in simple ways to aid their teaching and students' learning. Alice viewed DigiTech as beneficial to her teaching and students' learning when it was used in ways that were straightforward for her and her students.

*I suppose the benefit of technology for me or the ease... would be about how quick and easy it [DigiTech] is to use...for me to set up. But, also, about how quick and easy it is for them [the students] to use in the lesson as well. (Interview 6)*

Alice explained how her use of DigiTech was not based on the frequency of its use but her perception of its simplicity.

*I am not talking about a lot of IT, so it was very simple IT and still is. You just got on and used it; I suppose it just very quickly became the norm. (Interview 2)*

In reflecting upon her use of the Kahoot (see Table 8), Alice explained that her decisions to use this piece of DigiTech were based on the ease of its use for her and her students.

*I suppose it is that instant impact that it has. So, it is quick and easy for me to set up. It is very quick and enjoyable. It is only just for a plenary...so you are looking at the last 10 minutes of a lesson...you are not relying on it to be able to get all the information across...it's a summary so that's why it makes it useful. Short, sharp, quick and, easy to use. (Interview 6)*

Her pedagogical decision to use DigiTech was, therefore, whether the functions could make her teaching more efficient. DigiTech was used by Alice to maximise her ability to summarise the key points of the lesson and assess students learning via the quizzes. Another simple practice identified by Alice as becoming more regular in her practice was using the iPads for video analysis.

*The focus would be a case of you [the students] are going to use technology to analyse your performance. You are going to pick the skills you are working on and try to it look at it [the iPad] and see how best you can do it. (Interview 5)*

Alice perceived this practice as a simple but effective use of DigiTech, which gave her the ability to monitor students' use alongside giving them the freedom to use the devices in aiding the assessment of their performance. This practice was observed and recorded in a trampolining lesson. Alice provided students with iPads and asked them to "be creative in how they made self-assessments of their skill development" (Field notes). By simply offering students different means through which to complete the task (in this case the development of a somersault technique), each student could draw on DigiTech if, and indeed when, it helped with their learning (Field notes).

*The iPad, and its camera app, were used by some higher ability students when seeking to improve their skill development of a somersault. The iPad was selected by a student and given to another group member (off of the trampoline) to video the performance of the somersault skill. This video recorded the distance the student was travelling across the mat of the trampoline and the overuse of their arms to initiate the rotation. Through this use of the iPad, and the visual demonstration of the skill acquisition, the student was able to use this video feedback to self-correct and improve their skill when it was performed again. The student had tried the skill multiple times and had made little improvement without the visual stimulus. The video on the iPad was also used as evidence to show the teacher that they had completed the skill and could progress onto the next skill development. (Field notes – Visit 2)*

As this use of DigiTech was not utilised by Alice in all lessons, and was not used by each student, it is important to explore the decisions and ways Alice considered DigiTech use and its relevancy to the user (i.e. teacher and student).

### **7.2.1 Relevancy to user and improving communication**

An aspect of Alice's view of DigiTech (and why she subsequently used DigiTech) was considering its relevancy to her and her students. Alice explained how DigiTech was relevant to her teaching when it was being used as a tool to achieve a specific purpose. Subsequently,

despite using DigiTech sporadically and aspiring to use it more on her teaching, Alice was reflective in how she viewed DigiTech and its relevancy.

*For me, technology is a means to an end. So, I use it because it's useful to me and if I need to use it I will find out how to use it but, I would never be one that's constantly trying to upgrade my phone. (Interview 1)*

Boody (2001, p. 7) believed that many of the arguments about the benefits of DigiTech in education take the form of 'means-end thinking' – i.e. thinking that starts from a given end and then strives to find the means of accomplishing that end (Selwyn, 2010). As pointed out by Sinelnikov (2012, p.40) it “helps to think of the technology as a means to an end, and not as the end result”. This is because DigiTech can then be viewed pedagogically as a tool to aid teachers and learners to achieve educational outcomes. Rather than being used and viewed as for DigiTech's sake. Despite stating this means-end viewpoint, Alice's use and discussion of DigiTech indicates that she viewed DigiTech as a means to achieve a variety of different benefits for her and her students. One of the most prominent and relevant factors as to why DigiTech was used by Alice was to support communication, as well as an important part of teaching and learning in the school.

*My main reason for using technology is communication, so, how I want to communicate with my students and the set-up is probably very similar to how I would want to use it in my life. (Interview 1)*

*As a teacher, initially, [DigiTech is] a means to an end in terms of communicating with other teachers. (Interview 5)*

Alice felt that DigiTech was “an easier way of getting information across” (Interview 1). Alice also used DigiTech (such as YouTube videos and interactive whiteboard presentations) to deliver information in a way that was both simple and relevant to the students.

*You can use it [DigiTech] for communication in terms of videos and things to show objectives and content of a lesson. So, if, for example, students weren't able to make the lesson or you wanted [pause] again going back to the idea of putting more information out there, you could do some form of podcast which allows you to communicate with your students outside of school hours... you can do it in advance*

*and just set it up so they can access it. I think communication is key really to their future as well as ours really. (Interview 5)*

Alice, subsequently, considered the learning in context and acknowledged that this occurs both in and outside the classroom. Given that there are many forms of communication available, Fletcher et al. (2017) argue that we must move away from conceptualising literacy and communication as taught or ‘transmitted’, to a far more interactive process. DigiTech can become a part of regular practices to support this interactivity (Fletcher et al., 2017). Alice, it could be argued, aspired to create learning opportunities which “make it [learning] more interesting, more relevant” (Interview 2) and beyond traditional forms of learning and communication (Fletcher et al., 2017).

In addition to aiding communication, Alice collaborated with her students to use DigiTech in her teaching in ways that were relevant to the students’ interests. This involved incorporating the use of fitness apps (7-minute workout app – see Table 8) that students were already using as a tool to aid their physical activity outside of school.

*A couple of girls brought in the 7-minute fitness apps...I was like “ok we will download it from the iPad in the department to have a look at it”. It's about introducing opportunities for them to stay active in their own time. A lot of people have Fitbits<sup>15</sup>, fit watches and things. I think, as a department, moving forward, teachers are going to have to start to tap into some of these things because that is how they are going to be active when they are older so, how can we maximise their use of a fit watch? How can we maximise the use of apps to stay active and healthy? (Interview 3)*

*The trends, at the moment, are to access exercise videos at home so the insanity<sup>16</sup> stuff, workouts out there...so much is done on social media so the little workouts that you see on there, people are more inclined as well to download apps onto their phone... I think that is kind of the way it goes. Students need to be aware that those*

---

<sup>15</sup> Fitbits are wearable devices that measure data such as number of steps walked, heart rate, quality of sleep.

<sup>16</sup> ‘Insanity’ is a brand of exercise class (accessed ‘live’ in gym sessions, on DVD’s or as an app). It is a 30-minute, whole body, cardiovascular exercise which is based upon maximum intensity interval training.

*apps are available or that those short, seven minute clips, they can use and access them. So, part of my job, I think, is to motivate them to exercise when they leave school and giving them the tools to do it. Showing them [the students] that it exists... that it's one of the tools that they could use to stay fit and active. (Interview 5)*

Alice and a member of the school's senior leadership team suggested that an important "tool" students needed to learn (when operating and using these apps), was their critical consumption of what messages and information the apps presented. Alice explained how it was important to educate her students about these apps and for the students to "understand the pros, cons and how to use it appropriately" (Interview 6). A senior leadership team member explained more broadly about the critical consumption of DigiTech and the holistic development of students learning with DigiTech.

*I think students need an understanding of that [DigiTech] so that they don't just go for the first YouTube clip...where are those resources coming from? Who are they referencing? Who's built them? I think building that understanding in students is really critical so that they can be successful beyond school. (A senior leadership team member)*

Goodyear et al. (2017b) found that healthy lifestyle DigiTech, (such as health-related mobile applications and wearable devices) are increasingly being used within education settings. However, the consumption of these DigiTech devices or apps can cause reductions in physical activity motivation, guilt and monitoring pressure on students (Kerner and Goodyear, 2017). Subsequently, it was important for Alice to use DigiTech as a means to communicate the critical consumption of these apps to students to ensure that they contribute positively to students' active lifestyles inside and outside school.

### **7.2.2 Identifying factors lending to DigiTech use**

Alice explained how many of her decisions regarding how and when to use DigiTech in her teaching were dictated by her views of PE, the students she was teaching and the context of her lesson.

*It [the decision to use DigiTech] goes back to curriculum and what activity we are delivering. I think it also depends on the type of learner. (Interview 3)*

*Sporadic [use of DigiTech] in terms of the activity so I think...certain activities lend themselves more readily towards the use of ICT. (Interview 6)*

Alice explained that she believed certain activities (i.e. trampolining, dance and gymnastics) and the type of outcomes and content of the lesson (those undertaking examination PE) influenced her “sporadic” (Interview 6) use of DigiTech. Alice and some her colleagues identified that they believed students had positive learning experiences when they used DigiTech in performance-based activities (in particular, trampolining). I felt that in the trampolining lesson the students’ use of the iPad supported their skill assessment and was a positive experience for those that opted to use the device. For Alice, there was a “clear link” (Interview 4) for using DigiTech in trampolining: one that she maintains has a simple but effective benefit for her practice. As mentioned previously, this was observed as beneficial for students aiding their understanding when developing their skills. It was noted, by other colleagues, that trampolining is a particular curriculum activity in which the use of DigiTech has been positive for teaching and learning. This positivity with DigiTech was identified in terms of engaging inactive students and peer assessment.

*I saw [Alice] taking one [an iPad] in earlier actually to do trampolining where the activity lends itself well because you’ve got people off of the trampoline. If the student can watch themselves and say “ah, I do that” and then, as a result of that work, try to develop that [skill]...then video him or her being better then, for me, that’s purposeful. It [iPads] has been really positive in terms of trampolining lessons. (Head of Department)*

*A lot of the kids love it [iPads] for trampolining...We only have three trampolines and we give them roles when they are stood off of the trampoline. So, video analyst is a good role. (Female PE Teacher 1)*

*The teaching of trampolining.... the school has iPads and I got Coach’s Eye, the app where students can just record it, compare it to an example of what it should look like and then self-assess against it, or peer assess. Just to give them a direct, visual assessment of where they are at and what they can improve. (Female PE Teacher 2)*

The curriculum activity, therefore, had an influence over the use of DigiTech. This is because Alice and her colleagues believed that certain activities such as trampolining enabled



DigiTech to be used. Their rationale behind this belief is that in performance/aesthetics-based activities, DigiTech aided analysis of skills, skill development, and could be used by those not active on the trampoline to aid assessment.

In addition to the influence of the activity on the use of DigiTech, the type of outcomes and content of the lesson influenced her use of DigiTech. Alice identified that she would use DigiTech a lot more in examination PE lessons where she was “trying to make lessons more interactive” (Interview 3). Alice believed that when she was teaching theory PE she had a “greater opportunity” (Interview 2) to use DigiTech. This is because she was delivering theoretical content and information and used DigiTech in an attempt to make the learning interesting and engaging. For example, Alice’s simple uses of DigiTech included the use of Kahoot for her assessment plenaries and PowerPoint/YouTube videos to deliver information. Alice’s teaching role was largely based around core and practical PE. Thus, Alice felt that because she had a greater amount of practical lessons she “used it [DigiTech] a lot less” (Interview 1). In explaining this differing use of DigiTech in relation to the type of PE she was delivering, Alice found that DigiTech use in her core/practical PE could be detrimental to students’ physical activity.

*I don’t think it [DigiTech] can be a big part of your lesson when you’ve got so much to get through because students have got to physically learn the information.*  
(Interview 2)

In this sense, Alice’s pedagogical decision to use DigiTech was influenced by her views of PE (i.e. for students to be physically active) and the possibility of DigiTech inhibiting these levels of activity. Furthermore, the type of activity (and subsequently the curriculum/context) and the learner characteristics all played a part in Alice’s decisions about how and why to use DigiTech. As shown by other practitioners (see Goodyear et al., 2017a), being concerned about time spent on DigiTech and the reduction of physical activity can affect one’s decision to use DigiTech. Thus, Alice used DigiTech in much smaller and simpler ways in core PE (i.e. giving devices to those with no-kit to record and analyse performance) and tried to consider the students’ stage of development and the relevancy of DigiTech to their learning.

Another aspect of Alice’s views on how and why DigiTech was used is a tool for student engagement. This next subtheme, ‘*tool for engagement*’ explores the use and aspirational use of DigiTech to aid student engagement with learning.

### 7.2.3 Tool for engagement

Alice explained that one of the main reasons why she used DigiTech in her teaching was as a tool to engage her students. Alice would keep her tasks simple and short to ensure her use of DigiTech was engaging and of benefit to learning.

*Technology, within PE and an educational setting... it's a tool. It's an aid to help deliver, to engage students and make it [learning] more interactive and help with their level of understanding. (Interview 5)*

Alice's practices included using "clips off of the television, YouTube videos that they [the students] can have a discussion about" (Interview 2). Alice identified these uses of DigiTech as "nothing ground-breaking" (Interview 2) and, therefore, relatively simple. However, she found practices such as these "more engaging" (Interview 3) for students. This was because the use of DigiTech "breaks up the chalk and talk and the monotony of just delivering" (Interview 3) and Alice perceived students to become more involved in the lesson. Alice believed that using DigiTech allowed her to "engage them [students] in a different way" (Interview 3) and create greater interactivity between students and the learning content. Thus, Alice believed that DigiTech was helping to keep her students engaged by enabling her to vary her delivery of lessons. As a result, Alice would use DigiTech for this reason alone, particularly if it was a topic some students had found difficult or boring.

*I use a little bit [of DigiTech] in examination PE, theory lessons, in terms of obviously PowerPoint, but YouTube clips when you are looking at skill characteristics or we've done a lot on violence in sport and the media...it definitely helps because it not only breaks the lesson up but stimulates discussion, it [DigiTech] increases students' knowledge and awareness of the topic as well. It [DigiTech] makes the lesson more interesting. (Interview 4)*

The interactive whiteboard was also a piece of DigiTech Alice had found useful as a tool for engaging students.

*In terms of using technology, you [the teacher] can have them [the students] out of their seat; you can have them moving around... it [the interactive whiteboard] stops them from just copying and not thinking. They have to interact so they are putting their pens down, they are looking at something, they are observing it, they are engaging in a different way.*

*So it [DigiTech] makes them learn, hopefully on the spot, as well as taking information away with them. (Interview 6)*

DigiTech use (such as Kahoot in examination PE lessons), also allowed Alice to engage the whole class, obtain an overview of what students had learnt and, find gaps in students' knowledge.

*Kahoot enables the entire group to give an answer rather than me just asking one student. So, you've got mass participation...increasing time on task...you are still on topic thinking about what we've done but it is more fun and more engaging (Interview 5).*

Alice was, therefore, seeking to use DigiTech as a tool to increase student engagement in examination PE. Using DigiTech as a tool for engagement was also an area that the school was looking to develop. The school were in the process of investing in more/better audio/visual equipment (such as interactive whiteboards) to support classroom instruction in PE.

*We [the school] are trying to drive student engagement through DigiTech across all subjects, including PE. Where DigiTech has been introduced in classrooms, the engagement from students is much higher. The problem about PE is, anecdotally, what the PE teachers tell me is that's where they are struggling because the classroom-based, theory, is the stuff that the kids don't really like doing. (IT Manager)*

DigiTech was, therefore, used by Alice as a tool in different ways to modify her delivery style, increase student interactivity and engage students in the learning process. In addition, DigiTech was used to address the issue of engagement and to manage and organise group assessment. The factors of teaching, curriculum and student context were all considered as pertinent factors when deciding how and why to use DigiTech as a tool for engagement.

The next sub-theme below explores how Alice believes that her uses of DigiTech could enhance the learning experience for her students. The use of DigiTech was therefore seen as being capable of extending Alice's capabilities to promote a range of learning outcomes in ways that enhances their learning experience in PE.

### 7.2.4 Enhancing learning experience

As noted, Alice found that when she kept tasks with DigiTech simple she could enhance the learning experience for her students. For Alice, enhancing their experience meant that the students could “experience information in a different way” (Interview 2). For example, Alice had previously had access to heart rate monitors. She used this piece of DigiTech when teaching students about their heart rate zones. Students could use the devices whilst undertaking activities at differing levels of intensity (such as walking, jogging and sprinting). As a result, students were being physically active to “get their heart rate into those training zones” (Interview 2) using the monitors as an aid. Alice found that the use of these devices worked to “reinforce the [students’] learning” (Interview 2) of aerobic and anaerobic thresholds. As such, Alice felt she had enhanced the learning of this concept with the aid of DigiTech.

Another example of using DigiTech to enhance the learning experience was providing students with an alternative way to access learning outside of school to create more autonomous learning.

*In terms of [examination PE] lessons...you [the teacher] set the criteria, the task, but then there are also the resources on the school web link, go away, read that too, draw your conclusions from it to produce your work. So, it is about encouraging students as well to do some independent research and some independent reading around the topic. (Interview 6)*

When used in this way, DigiTech became a tool to “stimulate the learning or stimulating them [the students] to be proactive about their learning” (Interview 2). Furthermore, the online resources provided students with a means to guide their learning and enhance the information they have obtained in the lesson time. This was raised by a senior leadership team member as being an important way to use DigiTech to enhance teaching and students’ learning.

*The key thing is about not just seeing it [DigiTech] as something that teachers are doing because they want to use ICT, but something that’s going to add value to the lesson. So, building research tasks in the lesson that are going to promote independent learning but, also, knowing that the resources that you are going to use*

*are going to help students understand key concepts. (A senior leadership team member)*

Alice, therefore, was able to add value to her teaching and students' learning in small and simple ways. Examples such as providing online resources for independent learning and using devices such as heart rate monitors to aid understanding of concepts were used to enhance the learning experience of the students. DigiTech can thus be used as a tool support students' learning and can simply be beneficial in its use to make content more relevant, engaging and interesting.

The next section explores the theme '*establishing routines*' and explores how, by working to establish routines of practice, Alice was developing expectations and relationships with students that supported the use of DigiTech.

### 7.3 Establishing routines

Alice explained how it was important to establish and build routines of practice with DigiTech. Alice found this beneficial to her practice and it was one of the factors that promoted her DigiTech use. Establishing routines was seen as important to Alice because it helped her to develop beneficial learning relationships with students. When DigiTech was established as a routine, Alice explained how:

*They [the students] knew what the expectations were and how they could access the higher grades and were starting to do it, but until you've taught them that or started to drill that into them, it becomes routine, then it has very little impact. (Interview 5)*

Routines would include establishing expectations from the start (for example, completing a reading prior to the lesson or homework for assessment), how to operate the DigiTech, the purposes of each activity or ending the lesson with an online assessment. Routines of practice with DigiTech ensured that students were familiar with how and why the DigiTech was being used to enhance learning and this helped them to see the importance of it as a tool.

*You [the teacher] have to get students up to a certain ability to be able to use it [DigiTech], not just on the ICT but also practically...it is about building up the*

*routine and those relationships with the students so that they understand and appreciate the reason for doing it [using DigiTech]. (Interview 5)*

Ensuring that students could understand and appreciate their reasons for using DigiTech was important for Alice. This, in her mind, helped to ensure that students could use DigiTech effectively as a tool to aid them in their learning.

*You've got to find and establish the right routine of how to use it. They [the students] need to know why. The students need to understand why you [the teacher] are doing it and how to make it effective in their learning. (Interview 6)*

An example of this developing routine with DigiTech was home learning and revision. The rationale behind this approach was so students could gain knowledge and understanding before they entered the classroom and spent the lesson time developing and extending their knowledge. DigiTech was used as an optional tool for students to conduct independent research and learning. Alice aspired to extend her practice by having an online space where students could have access to resources, could submit work online and ask questions to the teacher. As noted by the IT Manager “home learning for PE is not something that’s engrained in their students”. Alice was aware that these routines “take me a year or so to get a group to start accessing it regularly” (Interview 6). However, Alice was also aware that once these teaching and learning routines involving DigiTech were established students would benefit from their independent learning.

*They [the students] will be learning and it becomes...that's the exciting part...that's the motivating part for me to see them learning and working for themselves but as a consequence of what I'm doing, but, I do think it takes time to build those relationships. (Interview 4)*

As such, DigiTech could be used as a tool to support learning (i.e. independent and home learning) for students when it was an established part of their routine. Establishing routine of practice with DigiTech was important to ensure that DigiTech was integrated into different learning opportunities and so that students could begin to understand the purpose of their DigiTech use. It was noted that the process of establishing routines and relationships with students takes time to develop and is explored further in the subtheme below.

### 7.3.1 Taking time

Alice explained that it had taken considerable time to “build up the relationship, the right relationship” (Interview 6) with her students to develop the use of DigiTech to aid learning. However, Alice said that she sometimes felt that she did not have the time to sustain her use of DigiTech. The curriculum was one factor that Alice felt, on occasion, impacted her ability to sustain her use of DigiTech.

*The syllabus that you are delivering from is much bigger so you’ve got to get through the content a bit quicker, I don’t have the time to use it [DigiTech] in a lesson to consolidate that learning. (Interview 2)*

At times, DigiTech was viewed by Alice as something that she did not have time to sustain in her routines of practice.

*I think it's the shortness of our lessons... so by the time you've introduced the task, set up the equipment up there is no time. That's the key is the time of not being able to set it [DigiTech] up before. So, by the time you've set the equipment up and got it effectively in use you've then got 10 minutes to explore it [DigiTech]. (Interview 3)*

Alice felt that she did not have enough time to explore the use of DigiTech to consolidate learning in core PE and, therefore, tended not to use DigiTech in this context. The feeling that she did not have enough time was inflated by Alice’s confidence (or lack of it) in her teaching with DigiTech to ensure that students were on task.

*I want to do more but it [the use of DigiTech] is going to impact on your lesson time and it's that insecurity of not being able to do it [use DigiTech] in the time frame you want to do it in as well. I just haven't got the confidence because it would take up quality lesson time. (Interview 4)*

Alice found this frustrating and despite establishing routines of practice (i.e. video analysis in trampolining) the integration of DigiTech into teaching and learning was not without its problems. Being able to manage the delivery (i.e. when and how to use DigiTech) was, at times, difficult to implement in ways which were time effective.

*I think if you plan to do something [with DigiTech] and you go into the lesson and then it doesn't work it's quite frustrating and you end up losing valuable teaching time. (Interview 1)*

Alice, therefore, was torn between developing and sustaining her use of DigiTech and seeing it as a tool that was being developed into her routines. Alice aspired to use DigiTech as a teaching method which aided her students' physical activity (i.e. using fitness apps and heart rate monitors) but, she felt it was taking time for her to be utilise it effectively to contribute towards learning in the physical domain. Interestingly, whilst the reduction and shortness of lesson time has meant that Patrick and Dillon have looked to DigiTech to support and increase students' activity time, Alice found that DigiTech reduced the amount of time her students were physically active. This conflicted with Alice's aspiring use of DigiTech and her beliefs around students needing to be physically active - particularly in core PE.

*It [DigiTech] saves you time, when you are doing a lesson, planning, presenting, putting things together, it can save time. But I think if it's new or it's a lot of technology involved it takes up time, particularly when you've got no time in between lessons and they are only 50 minutes long. I think that eats a lot into the time on take, practically for students. (Interview 5)*

When established into the routine of teaching and learning, DigiTech can save time and can be used to support learning outcomes (i.e. see Patrick and Dillon). It is important to bear in mind, however, that routines of DigiTech use take considerable time to develop. Furthermore, developing the confidence to be able to use DigiTech in ways that are time effective, can be difficult to sustain especially when other factors such as the curriculum and ensuring that students are physically active put restraints on time to use DigiTech.

Alice made pedagogical decisions to not use DigiTech in ways that would be a detriment to students' learning (i.e. taking too much time). Thus, Alice used her autonomy to make pedagogical decisions based on what use or non-use of DigiTech is in the best educational interest of students. This would seem an important point to highlight as a developing learning process and stepping stone of moving towards a pedagogical approach to DigiTech. Furthermore, taking time to consider DigiTech and its pedagogical appropriateness plays a part in establishing a routine of practice to support teaching and learning with DigiTech.



The next section explores that whilst Alice acknowledged that establishing routines supported the use of DigiTech, it was also important to ensure there was variety in the use of DigiTech. This enhanced student autonomy and was underpinned by adopting different methods when approaching tasks and choice of DigiTech.

### ***7.3.2 Variety in choice of DigiTech***

Alice explained that she would ensure that there was variety in her use of DigiTech. She described this use of DigiTech as “sporadic through a choice of teaching style” (Interview 2). Therefore, her use of DigiTech was dictated by the different teaching approaches she was using. Alice tended to use DigiTech either to aid her direct instruction or use DigiTech as a tool for students to use when they were conducting independent and group research or assessment tasks. Alice explained that initially her use was focused around teaching and having variety in her teaching approaches.

*For me it was more about teaching: wanting them to experience information in a different way. (Interview 2)*

However, over time, Alice described how she differentiated her use of DigiTech due to the outcomes and content of the lesson (i.e. GCSE over Core PE).

*I've learnt how the use of technology is useful to approach different types of learners. I've developed a different [pause] it's not massively different but somewhat different, teaching approach because of the type of learner you are working with. The way you use it [DigiTech] to interact with them [the students] and engage with them and put information across in different methods and different ways in order for them to understand and get it. (Interview 3)*

An example of how Alice used different methods with different learners would be using video cameras with examination PE groups to film coaching presentations for self-assessment. Alice would tend not to use this sort of DigiTech use with core PE groups as her focus was less on identifying the finer details of a skill and more on getting students physically active.

Alice found that she could guide student learning with the DigiTech, whilst also giving the students choice over when and how they used it.

*I give them pro-formas [a guidance sheet] to use but I allow them to adapt, mould, re-do... I give them the proforma to make sure that they are hitting the right boxes in terms of the content...I wouldn't restrict them on how they want to do it [the task] so one of the courseworks was a presentation. So, I said PowerPoint but, they could have done it [the presentation] in any way, shape or form. (Interview 4)*

Subsequently, students could base their own choices of DigiTech based on their skills and knowledge. Variety in the choice of DigiTech used was also seen by a senior leadership as important to build into the routines of practice and the learning cultures surrounding DigiTech use.

*It's not about saying, "you must use this [piece of DigiTech], this is the best way to use technology". It's about, "here's one way you can use it [DigiTech], however, there are several other ways" and it's using the most constructive method for you. (A senior leadership team member)*

By ensuring that there is variety in the choice of DigiTech that students could use to complete a task (with some guidance), students were given autonomy to use a piece of DigiTech that suited their learning needs. Furthermore, by using variety in the teaching methods with DigiTech for different learners, Alice could differentiate the uses of DigiTech to suit her context.

Establishing routines, and sustaining DigiTech use within them, seems to be influenced by a variety of factors such as time, confidence and views of PE. In addition, there are dimensions that are less visible, yet are important to the ways in which teachers embrace the "competencies, capacities, judgements and discretions that are drawn on while teaching" (Orlando, 2013, p.233). As such pedagogical decisions to use or not to use DigiTech would seem to take time to develop and should consider the place of DigiTech into different routines of practice.

The next theme '*developing an embedded culture*' explores how Alice and the school were aspiring to establish DigiTech into the culture of teaching and learning. The theme, therefore,

presents the factors promoting the pedagogical use of DigiTech and the influence of the school in supporting DigiTech use.

### 7.4 Developing an embedded culture

Alice's school had been working towards developing their use of DigiTech and had been exploring the implementation of an iPad scheme (providing individual devices to staff and students). A senior leadership team member had responsibility for piloting the scheme by working with staff and students to explore the potential of these devices for teaching and learning. She explained that despite deciding not to adopt a school wide approach, the school still wanted to embed DigiTech into the culture of the school.

*It's about embedding [DigiTech], whether it be to bring your own devices, iPads that we provide... it's embedding it in the learning. It's looking at that from a whole school, but even a trust<sup>17</sup> perspective. (A senior leadership team member)*

This whole school perspective towards developing and embedding DigiTech into the practices of the school was further supported by the IT manager.

*The trust is growing and it's important from an IT point of view that we have a vision about how we are going to deliver IT, DigiTech. (IT Manager)*

As mentioned previously, the school was seeking to embed the increased use of audio and visual DigiTech (i.e. interactive whiteboards) into all teaching spaces. This was to be delivered with the aim of increasing interactivity and student engagement. Furthermore, the school was looking to develop their use of the flipped learning and exploring application of the model through DigiTech.

*We have a prep learning, so we have a flip classroom model where students do the basic learning outside of the school and they come in...so that we can have those deeper discussions in the classroom... technology can really help you engage students because you're building on their baseline knowledge. (A senior leadership team member)*

---

<sup>17</sup> A trust refers to a single trust responsible for a number of academy schools whereby the schools work together under a shared academy structure.

For Alice, this developing culture towards the use of DigiTech was required to promote and support her individual use of DigiTech.

*I think, sometimes, it needs to be the whole school or a whole school push or a departmental push. So, we are all going to have a go at x, y or z [referring to pieces of DigiTech] and you all pull together and share your resources and you put things together so it's not just one person doing it all. (Interview 3)*

Similar to the work of Watson et al. (2012), Alice's reflections highlight the apparent need to have a shared vision among different stakeholders (i.e. teachers, IT support, senior leadership) in order to create sustainable and successful approaches to integrate DigiTech. Equally, Alice believed that this embedded approach and culture needed to be consistent for students as well as staff. One of the reasons why Alice believed her practice was not yet fully developed into her practice was the learning culture for students in regard to DigiTech and independent learning.

*They [the students] just see you [the teacher] almost as a TV, I am the TV, I just talk at them and they just want me to give them the information. (Interview 3)*

*It [DigiTech's use for learning] just isn't the culture yet, it isn't the way it's done so there isn't that expectation. Students come to lessons just expecting you to print it out for them, their culture is "you give it to me, I'll go away and learn it". (Interview 5)*

In other words, Alice thought that some students were not ready to learn from a DigiTech-orientated approach to aid independent learning as it had not become a regular part of their culture for learning. From Alice's viewpoint, a change in the approaches of the curriculum would support her and her students' use of DigiTech.

*If the exam boards were saying "we are going to have a push on developing technology in PE" or the use of it and they put something in the specification that encouraged you or allowed you to explore ICT in a different way. (Interview 3)*

As such, Alice felt that a greater focus on DigiTech was required and developed across the school, rather than teachers working on an individual basis.

*If you want the use of ICT to improve, I think, there does need to be a push on it, bigger than just one person in the department. It needs to be supported by strong, technological connections and equipment. (Interview 6)*

This sentiment further highlights the role of school support and the school context in supporting teachers' efforts to integrate DigiTech (Tondeur et al., 2016a). In addition, developing an embedded approach and culture towards DigiTech involves a number of factors such as student expectations, sharing knowledge and curriculum support.

The next subthemes, '*trying out ideas*' and '*learning through DigiTech*' explores some of the experiences and features of developing an embedded culture of DigiTech use. In particular, they focus on the developing pedagogical process that Alice had adopted in order to develop and support her use of DigiTech.

### **7.4.1 Trying out ideas**

Alice explained that an important part of developing a culture towards the use of DigiTech was trying out new ideas and exploring their potential for her teaching. Alice trialled different pieces of DigiTech (i.e. heart rate monitors, iPads and fitness apps) in different contexts (i.e. previous school, current school, core and examination PE) to explore the functions of the devices to support her delivery of content. As mentioned previously, Alice had tried heart rate monitors to aid students' understanding of different concepts in examination PE.

*Heart rate monitors, I've always tried to use those quite early on for the science side of things and teaching anatomy and physiology of the heart. (Interview 2)*

Alice had heard about the use of these devices for aiding students understanding of training zones from another colleague and had tried them with small groups. Feeling supported in being able to try new ideas was important for moving towards a developed culture of DigiTech use.

*There should be an element of flexibility to create new ideas to try, and, engage your department in using different ideas. (Interview 6)*

Alice's department had invested in some iPads to trial. Initially, the head of department explained how these were to be used for taking registers in the changing rooms. However,

Alice had tried to apply the iPads in ways which were more directed to students' learning rather than just productivity or efficiency in taking the registers. A particular approach was to consider students' ideas of how DigiTech could be used to support them and their learning. The use of the '7-minute fitness apps' (which was accessed on the iPad) was one of these instances of trying new out ideas. Alice explained how she would not have thought to try the apps unless the students had suggested it. Thus, there was a collaboration process between Alice and her students on trying new ideas to aid their learning.

*I think I knew they [the students] were interested and I could access them [the fitness apps] but sometimes it is knowing whether the students would be interested... In seeing that those students were interested I think, maybe, "ok we'll have a go at this and roll it out so it's kind of a mutual thing. I suppose it is quite nice when students do show you things like that and you can think actually this could really work. (Interview 6)*

Alice aspired to try and increase her use of DigiTech with small groups of students in trampolining as it had previously been efficient in supporting their skill development. Furthermore, Alice aspired to try and develop a school PE Twitter account to promote the profile of PE, to increase student engagement and celebrate department/student achievement. Whilst Alice was yet to put these ideas into practice, she was willing and open to trying new ideas to support her delivery of PE.

Interestingly, Alice explained that being asked to reflect on current and previous practices that had been a success (and also seeking to identify the reasons for the success) spurred her to think about how she could try out new ideas and her DigiTech uses in the future.

*To be honest, I just haven't thought about it [the use of iPads in trampolining] again. Now you are making me think, I might do it and it is a really good thing...to talk to you and reflect I'm thinking yeah, I could actually do that now, we've got the iPads it would be quite useful and beneficial so it's now obviously opening up doors again and remembering that you can do it. (Interview 4)*

Gray et al. (2017) found that when teachers reflect on positive or successful practices, this, in turn, can encourage them to build on their own success stories and contribute to their on-going reflection and inquiry into trying ideas. A sentiment that Alice seemed to also exhibit.

In conclusion, ‘*trying out ideas*’ with DigiTech shows it is important to explore the potential of DigiTech for teaching and learning. Feeling supported to try new ideas was significant when developing a culture towards DigiTech use. Engaging with ideas that may be of interest or (beneficial from a student perspective) supported Alice in trying out new ideas with DigiTech. Furthermore, reflecting on successful practices and the reasons why these were successful can support new idea development and generation. In relation to trying out ideas with DigiTech, learning through and reflecting on DigiTech was an important part of developing an embedded culture of DigiTech use. This is explored in the following subtheme.

### **7.4.2 Learning through DigiTech use**

Alice saw her developing use of DigiTech as an on-going learning process for her and her students. As such, DigiTech was positioned as something to learn through and as a tool in which to gain new knowledge.

*I didn’t get those skills [in relation to DigiTech use], so I’m learning with them, to some extent I’m learning with the students. (Interview 4)*

A part of this learning process involved Alice reflecting on her use of DigiTech and questioning the potential learning process for students.

*Is it [the use of DigiTech] time efficient? Am I hitting every student? Are they [the students] all learning something from it? Or are 30% of the class just on their own thing and not doing anything? (Interview 6)*

Due to Alice’s developing use of DigiTech, she did not always have the answers to her own questions. However, by questioning her use and the outcomes it achieved (or did not achieve) reflects Alice’s pedagogical decision making. Reflecting on DigiTech was becoming part of Alice’s developing routine and played a part in informing her learning and future uses of DigiTech.

*If there isn’t enough [devices] you’ve always got students stood around waiting which is a problem. Time on task is minimal so some students either aren’t active in a*

*practical lesson or aren't engaged for five minutes of the lesson. It's weighing up the pros and cons in that respect as well. (Interview 2)*

As a result of such reflections, and the limited access of DigiTech at the school, Alice would tend to introduce DigiTech in a small aspect of the lesson and as an optional task for students. Therefore, the task and learning outcome was not planned around needing to use DigiTech but as a different or alternative way to approach the task. Alice described the use of the interactive white board as a positive learning experience. A particular instance was where there were different stations to use DigiTech to gain information on different topic areas.

*It [use of DigiTech] meant that I could engage them [the students] in a different way. So, a 10-minute slot of a different delivery style...having a carousel of events going off so they are doing a Q and A [question and answer] session here and they'd have something on the board over there. (Interview 3)*

*I think it's nice to have tasks where you can step back and let them [the students] get on. It takes the pressure of you and then they [the students] can work more independently...taking more responsibility for their learning. (Interview 3)*

Alice explained, however, that she did not have sustained access to some of the DigiTech devices that she had found previously found effective and beneficial. Without this sustained access, Alice's learning processes through her use of DigiTech were put on hold. Given that the use of DigiTech was important for these reflective learning processes to occur, the lack of sustained access to DigiTech can force a break in the development of the pedagogical use of DigiTech. This differing access can be heavily influenced by the school and its management of resources. Therefore, this subtheme has again highlighted the role of the school in supporting the development of DigiTech use. Furthermore, it points out the importance of having regular access to DigiTech that is embedded and sustained into learning practices in order to serve as a means of continuing professional development.

### 7.5 Chapter Conclusion

In this chapter, the case of Alice and her views, experiences and developing use of DigiTech in terms of how and why it is used has been presented. The first theme, '*keeping tasks simple*' explored how Alice used DigiTech in short and simple ways to support teaching and learning. Alice made pedagogical decisions to use (or not use) DigiTech based on its ease of DigiTech



adoption for her and her students. For Alice, keeping her utilisation of DigiTech simple ensured that the delivery of information was maximised and learning was not inhibited.

Alice viewed DigiTech as relevant to her and her students when it was being used to achieve a specific purpose (i.e. assessment, presenting information or analysing skills). One of the most prominent uses of DigiTech for Alice was to support communication and a means to display content. She also used DigiTech such as fitness apps as an important tool to communicate with students about the appropriate and critical consumption of their content. DigiTech was, therefore, a tool to support students' physical activity (in school and their future lives) but also to educate students.

When making decisions about how and why to use DigiTech, Alice considered her teaching, the students and the context of her lesson. These factors influenced her sporadic use of DigiTech. Trampolining was seen as a particularly positive environment to utilise the use of DigiTech as it aided students' ability to observe their performance, engage those performers who were not active on the trampoline and provide a different opportunity for students to develop their skills. Alice explained how she also felt more inclined to use DigiTech with her examination PE groups. In this context, she felt able to use DigiTech to aid the delivery of theoretical content in a way that was engaging and interesting for the students.

The theme '*establishing routines*' explored how Alice found DigiTech beneficial to her practice and contributed to her successful use when DigiTech was built into her practice routines. Working towards establishing routines of practice with DigiTech was important for Alice to establish a positive learning relationship with her students. Establishing routines was a process which took time to develop. Time was also described as a factor that influenced Alice's decision to sustain the routine of DigiTech use. To develop her current use Alice felt believed she needed to feel more confident in her ability to keep students physically active in the lesson.

'*Developing an embedded culture*' described the developing culture of Alice's practice towards DigiTech and the developing culture of the school towards embedding DigiTech. This culture was still developing, and Alice believed that a whole school approach (e.g. DigiTech use being the norm for students and teachers) and leading consistent approaches were required to promote and support her individual use of DigiTech. Alice felt that this support (alongside greater direction in the curriculum) was needed for DigiTech to be used

## Chapter Seven: Alice

effectively in teaching and learning. This theme highlights the role of school support in sustaining teachers' efforts to incorporate DigiTech into teaching and learning and how the context can affect a teacher's perceived ability to use DigiTech pedagogically.

The next chapter explores the case study of 'Harriet' and her views, use and experiences of DigiTech in her teaching of PE. In this chapter, the themes and subthemes depict Harriet's use and aspiring use of DigiTech in order to appreciate her construction of a pedagogical approach to DigiTech.

## Chapter Eight: Harriet

### 8.1 Introduction

This chapter presents the views and experiences of Harriet, and others in her school, regarding DigiTech use. The findings are presented in an effort to understand Harriet's perceptions of her DigiTech use and the factors and experiences that influence how and why Harriet has developed her use of DigiTech in her teaching. Three consistent themes which were constructed from the data analysis are presented in the following order.

The first theme, *'keeping tasks simple'* explores the ways Harriet uses DigiTech in small and simple ways to aid with her delivery and communication of information, to aid students with their understanding of skill development and to record students' learning for assessment. *'Enhancing the learning experience'* explores why Harriet believed DigiTech was important to use in her practice as it allowed her to improve areas of students' learning such as skill development, communication and demonstrations. *'Tool for engagement'* presents how and why Harriet used DigiTech as a tool to engage her students through practices such as video demonstrations and video analysis tasks for students not actively taking part. The use of DigiTech engaged some students by making tasks more appealing and interesting. *'Relevancy to user'* explains how Harriet made pedagogical decisions to use (or not use) DigiTech based on her consideration of the purpose of the DigiTech use and the relevancy to her teaching, the students' learning and the context.

The second theme *'establishing routines'* unpicks Harriet's perceptions of the need to develop routines and regular uses of DigiTech (alongside the importance of professional reflection) to improve students' expectations of DigiTech for learning. *'Consistency of strategies'* presents some of the regular strategies used with DigiTech and the perceptions of how to develop the pedagogical uses of DigiTech. *'Supporting communication'* describes some of Harriet's uses of DigiTech to support her visual and verbal communication with students. *'Taking time'* identifies the significant time Harriet spent on her personal reflection of DigiTech uses as a means to identify pedagogical gaps in her teaching.

The third theme, *'developing an embedded culture'* discusses Harriet's views regarding the individual need to have an underpinning and whole school approach to DigiTech. *'Trying out*

*ideas*’ presents some of the factors Harriet believed helped her to develop her use of DigiTech; namely, by constructing her use of DigiTech as a trial and error process and a source of learning. ‘*Learning through DigiTech*’ unpacks how Harriet reflected upon her uses of DigiTech and established a means in which to acquire greater knowledge of identifying the appropriate and beneficial uses of DigiTech in PE. ‘*Accessibility of DigiTech*’ presents a discussion of access to DigiTech as a factor influencing her use and her belief in school support to develop and sustain her pedagogical uses.

Prior to discussing each theme, Table 9 represents types of DigiTech (i.e. apps or devices) used by Harriet, what functions were used and how the DigiTech was used. Not all of these individual pieces of DigiTech are discussed in the following chapter; they represent the diversity and range of DigiTech uses.

8.1.2 Table 9: *DigiTech/apps, functions and how they were used by Harriet*

Case Teacher	Type of DigiTech (App/Device)	Functions/Description	How it was/has been used
Harriet	Tablet (device)	A portable tablet device used to download apps, store information, take pictures/videos and access the Internet.	<ul style="list-style-type: none"> <li>Used by Harriet to record and capture students’ work.</li> <li>Used by students to observe and analyse performances.</li> </ul>
	Twitter (app)	A micro-blogging social media platform which allows users to interact with each other through messages, links and other media, called ‘tweets’.	<ul style="list-style-type: none"> <li>Used by Harriet as a tool to gain ideas and resources. Used to connect with like-minded practitioners, post questions and practices.</li> </ul>
	PowerPoint (software)	Presentation creating software.	<ul style="list-style-type: none"> <li>Used by Harriet to create presentations for theory and practical lessons.</li> </ul>
	Camera (app)	App used to take photos and videos.	<ul style="list-style-type: none"> <li>Used by Harriet and students to take static images and videos of students’ performances.</li> </ul>
	YouTube (app)	A video-sharing website that allows users to upload, view, rate and share videos.	<ul style="list-style-type: none"> <li>Used by Harriet to find exemplar videos relevant to lessons.</li> </ul>
	QR codes and QR reader (app)	(QR) Quick response codes are device readable codes that allow users to quickly access information that is stored online but accessed by scanning the code.	<ul style="list-style-type: none"> <li>Harriet created QR codes to help students quickly access homework, resources or key websites.</li> </ul>

		The QR code app reader allows the codes to be scanned and the associated link opened.	<ul style="list-style-type: none"> <li>App used to scan and therefore access content on students' personal devices.</li> </ul>
	Class Charts (software)	An online school and classroom management software package which allows teachers to create seating plans, monitor/record student behaviour and analyse behaviour and attainment. It also allows staff, students and parents to communicate through the software.	<ul style="list-style-type: none"> <li>Harriet used this software to monitor and log student behaviour and communicate with the students' parents.</li> </ul>

### 8.2 Keeping tasks simple

Harriet described how she used DigiTech in what she considered to be simple ways (i.e. easily understood or completed) to aid her teaching and her students' understanding of different concepts in PE. Harriet viewed her use of DigiTech in her personal life and her teaching as beneficial to her as it “makes everything a lot easier” (Interview 1). In a teaching context, DigiTech such as the school software ‘Class Charts’ (see Table 9), enabled Harriet to communicate more efficiently with students and parents.

*Whereas before, a phone call was your only real line [of communication] or potentially sending a text message home. That [Class Charts] has made communication easier and, therefore, technology is more useful for it [communication]. (Interview 5)*

Golding (2000) suggests that DigiTech rarely enables us to do things previously impracticable or inconceivable. However, DigiTech “allows us to do ‘things’ a little better; i.e. speedily, efficiently and with less effort” (Casey et al., 2017a, p.255). This would seem to mirror Harriet’s reflections. Some examples of simple tasks that Harriet reportedly used included downloading YouTube videos to show to students and using the camera/video function on her tablet to record student performances.

*I used to download YouTube videos onto my tablet, which I could then use on the field or, where I don't have the internet. (Interview 2)*

*It would mainly be things like a camera or getting someone to video or voice record themselves. (Interview 3)*

For Harriet, these simple tasks meant that she could use DigiTech as a tool to aid her teaching. Harriet had limited access to the Internet when teaching outside on the school playing fields. Subsequently, she would download YouTube videos on her tablet to aid her in her demonstrations of skills. Simple tasks included giving a tablet to students and allowing students to record their performances. In addition, students could perform a commentary over video of their performance. This was regularly used by Harriet to engage students (explored further in the subtheme ‘*tool for engagement*’ below). Other tasks included “using it [tablet or laptop] to play music” or “playing a video” (Interview 3). For Harriet, this was “something that’s easy” (Interview 3) to use and deliver as a part of the lesson.

*Even if it [the purpose of DigiTech use] is I want to get everyone moving and you decide to use technology to put on some music so that everyone feels comfortable moving around. It [the use of DigiTech] has been useful, not necessarily for the learning but for the outcome of the lesson. (Interview 3)*

In explaining her developing use of DigiTech Harriet described how she would always “start with something simple” (Interview 3). She would introduce DigiTech in a way that was staggered or ‘scaffolded’ to ensure that students were not overloaded with DigiTech and to ensure that it could form a small part of her lesson.

*I use it [DigiTech] as an add-on to the lesson as first, so that if you then don’t use it or if it doesn’t work, it doesn’t affect the rest of the lesson. Then I start using it as the main, key feature of the lesson. (Interview 3)*

As such, DigiTech was a planned part of the lesson that could be drawn on as and when it was appropriate (i.e. depending on students’ speed of learning). Harriet remained flexible with her use of DigiTech to ensure that it was dictated by the learning and she remained prepared with other teaching strategies if the DigiTech failed. Over time, Harriet became more adept at identifying where and when DigiTech would be effective in supporting students’ learning. This could be as simple as judging when and where in the lesson that students would benefit from seeing a visual demonstration of a skill or drill. For example, in the extract below, Harriet identifies her judgement and decision-making process in considering when to use DigiTech, i.e. at the beginning, during or at the end of the lesson.

*In athletics, it's actually easier to use technology when it's warm because the kids are quite happy to sit there and take the time to sit and look at whatever it is you are showing them. If it was football, in the middle of winter, it's cold outside, I want to minimise the amount of time that I'm standing looking at a video unless I take them all inside or do it at the start or the end. (Interview 5)*

Harriet's use of DigiTech ensured that learning remained the focus. Recognising and then balancing the potential benefits (i.e. as a reference point for demonstrations) and constraints (i.e. can cause students to be inactive and disengage) requires the teacher to have a knowledge of the subject domain and competence in the judging the appropriate use of DigiTech (Loveless, 2011). Harriet, therefore, had begun to take some simple but initial steps in developing and constructing a pedagogical approach to DigiTech.

A simple task that Harriet had found effective in her use of DigiTech, was students' use of a tablet and its camera/video function. Harriet found that the tablet device could be used to support younger students (in this case Year 7) in capturing and assessing what they had learnt.

*One of the excellent things that we did with my tablet was we recorded the kids talking about resilience. We had proof of reflection and [students developed] more confidence. It was the best thing ever...they [the students] were fantastic. It [the video] had the kids going, "I've learnt about resilience because it shows this". It was the kids that were videoing, it wasn't me prompting them, and it was them interviewing each other. (Interview 3)*

In a documented extract of her practice diary, Harriet reflected on how students provided a reflective commentary on what they had learnt on the topic of resilience in PE. Students provided verbal answers and gave peer feedback on the video. These videos were stored as examples of formative and peer assessment. Harriet commented on how students were particularly engaged with the use of the tablet in order to record these reflections and how it allowed students to demonstrate their learning orally. By providing students with the more active role of peer assessing each other, Harriet felt that students were able to articulate and become more independent in their assessment.

In summary, Harriet used DigiTech in small and simple ways to contribute towards students' learning. Some of the most beneficial tasks identified by Harriet were simple ones which allowed students to participate in the lesson and play a part in their assessment for learning.

### 8.2.1 Enhancing learning experience

Harriet explained that one of the reasons why she used DigiTech in her delivery of PE was that she believed it enhanced “learning and then for engagement...to enhance their [my students] learning in some way” (Interview 2). In exploring the ways that DigiTech has enhanced these areas, Harriet reflected upon a number of different practices (i.e. using DigiTech to aid demonstrations and communicating learning points). For example, Harriet described how she would use YouTube videos to help demonstrate skills that she was not proficient in performing herself.

*I've used technology to help me teach things which I'm not necessarily a pro at...I can quite easily demonstrate the perfect football pass but if you were ask me to demonstrate a higher ability skill my model is not going to be as perfect as something that I can use technology to show. (Interview 2)*

In this sense, Harriet believed that DigiTech could enhance students' learning of a skill by showing them a visual demonstration that she could not perform herself. Videos could be used by Harriet as a means to deliver direct instruction and give students a better quality example of a skill. Furthermore, DigiTech supported Harriet's communication of her teaching cues. Harriet explained that using videos to demonstrate skills was a “simpler form of communication that wasted less time and got students moving quickly” (Document - ICT audit). Harriet could, therefore, use DigiTech simply to deliver key information to students to assist their learning or to provide a different means of accessing the learning content.

*I think it [DigiTech] is just another way of doing it [teaching]. People don't just look at a video and go “oh, I've learnt something” but, it's another way of accessing it [information]. I think that's what I mean by it initiates learning. It's one of a multiple number of things which can help people learning so, therefore, [it's] a source of learning. (Interview 5)*



The use of videos to demonstrate skills or tasks provided students with visual examples of the activity they were going to perform.

*I used it [videos] to show them [students] a drill that they then went and did; so, I showed them and they did it and that was appropriate because they were mature enough to sort of not go “oh my god she’s got an iPad” ... it [the tablet] gave them all the teaching points they needed, so it was useful. (Interview 5)*

Harriet’s use of videos to aid her teaching and enhance students’ learning experience was also applied to capturing students’ performances and initiating their thinking.

*If you’ve got a video such as playing a game, it gives you something else once you’ve played the game or done the skill. It [the video] gives you [the student] something to think about afterwards. (Interview 5)*

In other words, the tablet device enabled Harriet to “capture learning experiences” (Interview 2) and students’ performances and, then, it could be used as a reference point to explore students’ understanding and learning after a skill or game. Harriet explained this as “recording it [a performance], showing success and helping them learn” (Interview 2). In essence, this use of the tablet and its video function aided performance analysis and helped students capture their performances and identify learning points to improve on.

In a reflective document provided by Harriet, she commented on the ‘usefulness’ of different pieces of DigiTech and whether it enhanced students’ learning. Harriet explained a particular instance where the camera and its video function had been an advantageous means to enhance students’ ability to develop their skills in dance.

*[The use of the camera and video] was a useful extension for higher ability pupils in year 8 Dance to help lower ability dancers to improve by videoing and giving concurrent feedback. Students improved on timing as they could see how to improve...some students were very interested in watching themselves from a performance aspect to improve. [The video] got them [the students] interested in aspects of the dance performance/success criteria we came up with ourselves. (Document – ICT audit)*

Harriet believed that this use of DigiTech enhanced the learning experience as students were able to demonstrate a greater depth of knowledge of their dance skills using the video as an aid. Similar to the findings of Casey and Jones (2011), this use of the camera/video was focused upon improving the identification and verbalisation of errors made by peers, more in-depth identification of evaluating a performance and increasing the quality of peer feedback during the lesson. These findings were similarly presented in Parker et al. (2017) whereby the practitioner showed how the use of videos could engage students in their learning. Arguably, whilst this use of DigiTech did not help Harriet do anything 'new', it did allow her to enrich her students' learning experience. Students were interested in seeing themselves on the video and were intrigued to see how the video could improve their skill development. This use of DigiTech as a tool for engagement is explored further here.

### 8.2.2 Tool for engagement

Harriet explained that her use of DigiTech in her teaching needed to have a purpose. In other words, Harriet and her students needed to be aware of the reason behind their use of DigiTech.

*I think...it's not particularly tangible, like one particular thing. I've got a very strong opinion or feeling that it [the use of DigiTech] has to be... I know I use the word a lot, meaningful. So, you don't just use it because it's an iPad, it's got to have a purpose to it. (Interview 4)*

One clear pedagogical purpose that Harriet had for DigiTech was to use it as a tool to engage students in their learning. Harriet viewed DigiTech as a tool that could aid her inquiries into how she could enhance learning.

*It [In the planning stages] was me going, how can I get them [the students] to engage a little bit more? Oh, I'll use this. So, it was me trying to fit it [DigiTech] in the lesson to solve a problem I guess. (Interview 2)*

*I sat down to plan my lesson and I go... I've got my learning objective of doing this and I go, ah that [DigiTech] would really help them and engage them in trying to achieve it. (Interview 2)*

Harriet's pedagogical decisions were focused on deciding on the learning objective first and then, secondly, considering whether DigiTech could help her students achieve this outcome. An example of such practice was the use of videos as a demonstration tool. Harriet believed this was effective in engaging students as it provided the demonstration through a visual form of delivery. Drawing on the example of video use in the previous section, Harriet, in this regard, had considered elements of students' "aesthetic experience" and altered how the lesson content was presented in a way that is interesting, stimulating and vivid for the learners (Loveless, 2011, p.303). As Loveless (2011) explains, these considerations root understandings of pedagogy and DigiTech in terms of questioning why we are doing something. This means making critical connections with content, learning environment and value of the student learning experience (Mayes and de Freitas, 2007).

Another simple task used by Harriet to engage students in learning was the provision of opportunities for the students to become more involved in the lesson. Through prescribed roles involving DigiTech, such as video performance/analyst, Harriet sought to "engage any learners who weren't a part of the [physical] lesson" (Interview 2). For Harriet, this would not take the format of a performance-based task but through roles that involved answering questions on the content of the lesson, filming performances, providing commentary or keeping score. In a document commenting on her use of DigiTech, Harriet reflected on how she felt DigiTech had supported student engagement.

*[Camera/video] Useful to provide interaction in the physical learning without the learner doing it themselves – better than a worksheet as they are still involved in the task. (Documents – ICT audit)*

As a result, of students being given these roles involving DigiTech they became part of the lesson and its learning. Harriet would plan these roles into the lesson and found that because the tasks had to be delivered through the tablet device there was a reference point for students to complete their work independently.

*It's [the use of DigiTech] quite an easy way of me bringing them [the students] into the lesson with preparations I've done beforehand rather than while I'm in the lesson and trying to do everything...if I've given them a sheet or tablet, it's a focal point for them and then I can later go "why haven't you looked at this?" without me having to keep prompting them. (Interview 4)*

Harriet also found that DigiTech had a large impact on lower ability students and their achievement of learning objectives. Harriet reflected on a particular use of DigiTech, which she felt enabled students who consequently had a greater level of engagement with their learning. The lesson involved students being able to learn, perform and teach a haka<sup>18</sup> dance through collaboration and peer learning.

*I did a lesson on the haka and I grouped [the dance] into four sections. Students got into their own groups they wanted to be in and then I numbered them all and sent them off. They each had to learn one of those four sections and then went back to their original groups. They then had to teach one of those four sections to everyone was responsible for [learning and delivering] a bit of the dance. (Interview 5)*

*They were a lower ability. Predominantly because they were quite poorly behaved and it worked because it focused them a little bit so they went “oooh we are videoing now, we need to concentrate because we are going to look at this” ... I think that was why it [the use of the videoing] had quite a big impact on them. Not necessarily getting them any higher in terms of physical progress and things but it kept them focused on the lesson so they were able to meet the basic learning objective which otherwise they might not have even thought about. (Interview 5)*

The tablet was used to record the dance performance and capture each students' learning of their section. As a result, Harriet found that students were more engaged in peer teaching their section of the dance to other students. Furthermore, lower ability students were more focused on the lesson and meeting the learning objectives. DigiTech was, therefore, a tool that allowed Harriet to engage and focus students on their learning of the dance. In this sense, DigiTech was viewed as an aid to support conceptual understanding and extend thinking rather than just being used as an alternative resource.

Due to Harriet's positive experience of using DigiTech in peer teaching, she aspired to undertake a collaborative research project with students to explore their perspectives on designing learning activities around developing and sustaining their engagement in PE. DigiTech was, thus, anticipated to play an increasingly important role in both her teaching of

---

<sup>18</sup> A haka is a type of ancient Māori war dance traditionally used on the battlefield and native to New Zealand.

PE and as a tool to aid students' learning. Subsequently, Harriet was seeking to design and provide learning experiences with the help of DigiTech which were relevant and appropriate to the learner. This is explored in the next theme '*relevancy to user*'.

### 8.2.3 *Relevancy to user*

Harriet's view of DigiTech was that it was relevant to her when it could be used as a tool to help her achieve a specific purpose. Similar to the views of Alice, Harriet described DigiTech "as a means to an end rather than an end" in itself (Interview 4). Harriet explained that DigiTech "was more about what the technology can do for you than what the technology is" (Interview 1). In other words, DigiTech was not valued or important on its own but, was useful in achieving an educational or personal aim.

In expanding upon this viewpoint, Harriet said that she would not make a decision to buy or use DigiTech and then find out afterwards what purpose it could be used towards. She would always have a purpose first and then inquire as to whether DigiTech could aid her in achieving this purpose. For Harriet, her use of DigiTech was not necessarily complicated or a large part of her lesson but it had to have an intended purpose. One purpose that Harriet perceived as useful and relevant to students was to use DigiTech as a means to teach students about their critical consumption of DigiTech. Harriet aspired to incorporate this into her practice.

*Link [the use of DigiTech in PE] to things that are important to people's lives. Activity trackers...so many people have activity trackers like Fitbits... out of all your subjects it's probably PE or PSHE<sup>19</sup> that you would maybe want to teach people about rather than them find out about it themselves. (Interview 4)*

Harriet thought that despite viewing DigiTech as a means to an end, it should be a topic that students learnt about rather than only being for tracking students' physical activity or assessment.

---

<sup>19</sup> PSHE is an acronym to refer to the personal, social, health and economic education and has been a part of (however not always compulsory) the National Curriculum in UK schools since 2000. Areas covered by this subject include, sex education, personal health, citizenship and careers.

*In the world we live in now, maybe it [DigiTech] should be a bit more of the end product, the outcome, rather than just the process. (Interview 4)*

*So maybe technology in PE...[pause] maybe there should be learning objectives and assessment objectives where it's how to use my Fitbit to track my exercise...they [the students] should be learning about how they can use it within physical activity rather than how can we [teachers] use it to track physical activity...If you are teaching them about it [DigiTech] in the lesson, because of the way society is and very technologically minded they [the students] may be more likely to go and try it outside of the lesson. (Interview 5)*

As such, DigiTech could be the object of students' learning as well as being used as a tool to aid their learning process. Harriet considered DigiTech pedagogically significant as a topic for students to critically reflect on and, as a result, beneficial for their future lives and broader understanding of DigiTech. In other words, Harriet is thinking more about the pedagogical use of DigiTech rather than thinking about DigiTech itself.

Harriet tailored her use of DigiTech depending on the learner. She focused on what she believed was relevant to them and adjusted the content accordingly. She explained that she would use DigiTech when it “matched their [the students] learning needs” (Harriet Interview 2). For example, Harriet differentiated her use of DigiTech depending on the level of her students' learning (i.e. more in-depth analysis for higher ability students and basic performance analysis to engage lower ability students).

Harriet was aware of alternative pieces of DigiTech that she could use and that might be of relevance to her students. However, Harriet felt that instead of benefiting from the use of different types of software, using some software would be more of a hindrance than a help for learners and their learning.

*I know there is coaching software like Dartfish<sup>20</sup> where you can watch a game and track things. We don't use that because it would just get too complicated and it would*

---

<sup>20</sup> Dartfish is a software package that allows the user to directly take or upload videos or pictures onto the software. Features of the software allow you to analyse the video performance such as slow-motion, drawing tools, text, audio comments etc. These videos and their edited content can then be saved and shared.

*detract away from what we are actually doing in PE if we were to use that in the lesson. (Interview 5)*

In further explaining her decision to use DigiTech based on its relevancy to learning, Harriet explained how a students' practical ability formed part of her decision to use (or not use) DigiTech.

*I could go and plan a lesson looking at the breakdown of sprint speed, or sprint start technique using a slow-motion camera, but if I've got a bunch of kids who just want to race each other and don't really care about the technique, and that's not what I want to teach [performance analysis of sprint technique], you know I might not be able to teach them in that way. You've got to know the kids; I think a little bit more. There are some classes I'd never use my tablet with because (a) there's too many of them and they just talking; and (b) they don't learn that way; they learn by doing and getting involved. (Interview 3)*

This extract hints at how the pedagogical use of DigiTech involves considering the context and if or where it is appropriate to use DigiTech based on the learning outcome. Harriet's head of department explained that this might not always be in learning through physical learning domains.

*I think it [the use of DigiTech] gives them [the students] the idea that it's not all about performing in PE; it's about the different things – there are loads of different jobs in sport, so it can open their eyes to those types of things. (Head of Department)*

The use of DigiTech needs to be considered in relation to what is relevant to the teacher and what they are teaching, the learner and their learning and the context of the activity. In this sense, considering DigiTech in relation to the three aspects of pedagogy - teachers and teaching, learners and learning and knowledge in context (Armour, 2011). However, this theme has also highlighted that the use of DigiTech needs to be multifaceted. In other words, it is developed and tailored in ways that are relevant and appropriate to users. To assume a one-size-fits-all approach to DigiTech which is suitable for or used in all circumstances, would therefore seem to place the DigiTech before pedagogy.

The next theme ‘*establishing routines*’ seeks to understand how Harriet underwent a process of developing and constructing her pedagogical approach to DigiTech by establishing routines of practice.

### 8.3 Establishing routines

Harriet believed that in order for DigiTech to be effective in her teaching, it needed to be an established part of her routines of practice. Harriet acknowledged that it took time to develop these routines. Routines included building up lesson plans and producing tasks with DigiTech that were effective for her teaching.

*After a while of consistently using it [DigiTech] I'd have those lesson plans there... With Athletics for my GCSE students last year, I had quite a few videos that I could transfer over, so it was quite easy to use those. But when I was trying to use it for Volleyball that took a while to set up with my Year 10 group. I wanted to have the video of them playing; yeah it took me a while to figure out. (Interview 2)*

Furthermore, it took time for Harriet to make pedagogical decisions as to when and where it was appropriate to use DigiTech. Over her first year of teaching, Harriet began to develop knowledge of planning DigiTech into different lessons and making decisions in regard to which contexts/activities suited its use. Harriet reflected on a gymnastics lesson where she had a circuit of tasks involving DigiTech that students progressed through.

*I had different types of [DigiTech]... I'd go and do that again as an introduction or ending lesson, because I've got the plan now and I could quite easily go and set that up and do it because I know it worked with that particular class and I know it would work with another group. (Interview 3)*

This reflection on planning and knowing what has worked with DigiTech enabled Harriet to process the factors that contributed to her success with DigiTech (i.e. a variety of different stations, different pieces of DigiTech to complete the task). For Harriet, one of these success factors was making sure the use of DigiTech became a part of a student's learning routine. This allowed students to become aware of what to expect with regard to their DigiTech use (i.e. how it is used, where it is used and why it is used).



*If you want a sustained, positive impact of it [DigiTech] it can't always just be a one-off... If it's a one off for another reason, like today let's record ourselves doing dance, and there the outcome is we've got a dance recorded. If you want to keep using it and make it for a reason, it's got to be over a period of time. (Interview 4)*

Harriet was clear that in order to develop and sustain her use of DigiTech it had to be able to achieve a positive outcome (i.e. students' learning over time). Although this was easy in theory, Harriet suggested that in practice it was more difficult to achieve as regularly as she would have liked. Nonetheless, Harriet saw the regular and routine use of DigiTech as an important topic of reflection.

*If it [DigiTech use] doesn't really become part of your regular habits it's always sort of an "oh, I use this" and then use the next one...but because you don't then consistently use it doesn't become part of your everyday sort of teaching habits. But it does then become a part of, sort of, I've tried it and I know how to do it, so if I then hit another problem which this one would solve...I'd then be able to use it (Interview 5)*

The routine nature of her practice with DigiTech ensured that Harriet could develop her knowledge of the DigiTech and begin to identify which parts of her teaching or her students' learning DigiTech could help her bridge. As described by Okojie et al. (2006), when teachers explore the process of DigiTech integration and search for ways that it can be effectively accomplished, they develop the rationale to examine the appropriateness of the technologies and whether they are compatible with their learning outcomes. However, this is a "process rather than a single, isolated or discrete activity" (Okojie et al., 2006, p.68). Harriet was still involved in this process which, at the current juncture, involved making her use of DigiTech more consistent and establishing which gaps DigiTech could help her to fill (i.e. engagement).

Harriet also recognised that the routine use of DigiTech needed to be established with both staff and students. Harriet explained how this would be similar to having "department resources" which tended to make teaching and learning processes easier because "when both of you [i.e. the department] are doing something, the kids accept it a little bit more" (Harriet Interview 3). In other words, establishing routines of DigiTech practice across the department enabled students to understand their use of DigiTech.

*Everyone is on board... not necessarily the same thing because different classes merit different approaches but, if everyone was expected to use the iPad or some form of data capture then...it would just mean that in lessons kids would expect the teacher to have the iPad and they could get it out at any moment when it was appropriate in the lesson. (Interview 5)*

Establishing routines of use (whilst acknowledging that the use must be tailored to different contexts/uses when appropriate) was seen as a factor that promoted the use of DigiTech in the classroom. For Harriet, it was also seen as a technique that lengthens and, therefore, sustains the impact of her use of DigiTech towards students' learning.

*I think if you [the teacher] were to regularly use it [DigiTech] and incorporate it into your practice, then yes they [the students] would, definitely get it. Because you'd then do displays with it and sort of...it [the regular use] lengthens the impact of it [DigiTech]. (Interview 4)*

To summarise, Harriet viewed her (and others) use of DigiTech as something that needed to be used consistent if she was to establish DigiTech into the routines of her practice (with the acknowledgement that this still needs to be tailored to each class/context). The importance of establishing and sustaining routines of practice with DigiTech was equated to students beginning to learn how to use DigiTech in their learning and valuing it as a teaching and learning strategy. Using DigiTech as a 'one off' was seen to inhibit Harriet's ability to incorporate DigiTech into her pedagogy. This theme has highlighted the need to have consistent access to and strategies of use for DigiTech.

### **8.3.1 Consistency of strategies**

Consistency in teaching strategies across the department was important for Harriet. It meant she felt supported in her practice with DigiTech. Harriet and her head of department had "very similar ideas in terms of what PE should be" (Interview 1). This perspective was based around engaging students in PE and developing lifelong physical activity. Harriet believed that the "kids liked consistency in terms of the content and the way you teach the content" (Interview 5). This belief in the consistency of strategies had an influence on Harriet's view and use of DigiTech for her teaching.

## Chapter Eight: Harriet

This is illustrated by Harriet who found that her use of DigiTech as a tool for engagement was beneficial when it was being used more frequently and consistently with her students. Harriet believed that this made her use of DigiTech more impactful on students' learning in relation to it being tailored to students' interests and what they found as engaging to their learning. Harriet explained that whilst her use of DigiTech was developing in its stability, the school's approach to the use of DigiTech needed to have greater consistency.

*It wouldn't need to be consistent [the use of DigiTech] all the time but as a department, or as a school the whole approach is this is why we use it. (Interview 5)*

As mentioned above, Harriet felt that pieces of DigiTech such as 'Class charts' worked because there was a consistent message from the school in stating how and why it was to be used (i.e. to monitor students' behaviour and allow greater communication with staff, students and parents).

The head of the PE department supported Harriet's belief that consistency was important to the developing practices of the department and their approaches to DigiTech. He talked about establishing consistency and having defined roles for the use of DigiTech which also created consistent approaches that the students would then expect in PE.

*If there were defined roles within a lesson and then they could share it [DigiTech] out, then very much linked into the sport education model...it becomes then part of their kind of normal PE lessons. All right kids, so your performance today, I'm giving visual feedback and we're doing analysis of the performance now. Those types of roles; if that became the kind of language for the kids then that would be fantastic, I would love that in the PE lessons. (Head of department)*

Defining roles for DigiTech use was, therefore, a strategy that the department were working towards. Harriet felt that having greater consistency in her use of DigiTech would enable her to feel more confident in what she was delivering.

*I'd still like to be improving and try new things but, it would also be nice to be at a level where I can go, right, we did this scheme of work last year, I know exactly what I'm doing. (Interview 4)*

Having greater consistency in her approaches to DigiTech would therefore, in Harriet's eyes, enable her to have greater knowledge of the ways DigiTech was planned into a scheme of work and knowing what works/how to use it.

Harriet, and her head of department, felt that consistency in teaching strategies using DigiTech were important if the use of DigiTech was to be impactful and engaging for both the teacher and the student. Consistency in the underpinning approach to DigiTech (i.e. why it is being used and to what purpose) was an important step in developing a pedagogical approach to DigiTech and establishing Harriet's confidence in its use. Another practice that Harriet was developing into her practice routine was using DigiTech to support her communication with students.

### 8.3.2 Supporting communication

From Harriet's perspective, the regular use of certain pieces of DigiTech (i.e. YouTube) allowed her to differentiate her modes of communication so that students could access and learn information through both visual and verbal means. An example of this support communication involved Harriet creating a circuit of DigiTech uses which included QR codes/reader (see Table 9) as a form of communication for students to learn and perform different gymnastics skills. Harriet used the QR code to communicate information to the students and the students used the QR readers to scan the code and obtain information on the gymnastics skills/routines.

*I used the QR codes and they [the students] had to look different things up and then practice it. We had bits to music, so it was a bit like a circuit, so each station had a different use of technology. (Interview 2)*

Roth (2014) demonstrated how QR codes can be used in a variety of ways to convey information on the syllabus or information to access outside the classroom. In this regard, QR codes can help to increase the efficiency of students' access to information (Gleddie et al., 2017), support differentiation of tasks (Enright et al., 2017) or, make resources more interesting for students (Armour et al., 2017a). For Harriet, the QR codes were used to support communication as they were used disseminate information to guide students' skill development. Students could, therefore, work in groups and use DigiTech as a teaching

device to obtain videos to watch and guides to read regarding the skills, rather than seeking information directly from the teacher. Enright et al. (2017) also discuss how QR codes can function as a support to the learning process by carrying out some of the communicative tasks of the teacher. QR codes can communicate both visual and audio material or pictures/guides depending on the circuit station and level of the learning and, thus can serve as a means of differentiating the learning material. This use of DigiTech, therefore, allowed the students to (re)watch/read the videos/tasks at their own pace and the teacher can then offer more individualised support to other students.

Another way Harriet aspired to use DigiTech to support her communication with students, was in her delivery of the lesson content. As found in the case of Patrick and Dillon, DigiTech was used to maximise the students' learning time by providing information such as learning objectives or questions for students and to help students understanding of the lesson once they are changed. Whilst Harriet had not yet used this approach, she was planning to play a video in the changing rooms to start students thinking about the lesson content.

*It's a YouTube clip and I was going to have it on in the changing room, because some of the girls get changed quicker than others, and they tend to be the ones who like PE, so I was like, ah, if I just have that on and get them thinking about it [the lesson objectives] – because we're doing attacking the goal, I can just get them starting to think about where they want to be on the pitch and things by looking at this video. Like I say, I didn't manage to actually do it, but it was me going, "how can I get them to engage a little bit more? I will use this [piece of DigiTech]". So yeah, trying to... [pause] it's me trying to fit it into the lesson to solve a problem. (Interview 2)*

In addition to this consideration, Harriet's viewpoint was similar to Quennerstedt (2013) who explained how YouTube can be seen as a socio-pedagogical site to share or obtain information. In this regard, Harriet viewed YouTube as a tool to communicate information about the development of their physical skills.

Harriet particularly favoured using videos in athletics as a vehicle to demonstrate and help communicate to students' understanding about the physical activity they were going to complete.

*Particularly in athletics, and things like that, or if I'm trying to show them a new type of game or drill, so I used it [a video] once in volleyball, just to get them thinking about their position rather than like it [the ball] flying around in the air. So, you'd show that first and then use that [the video] as the way into, oh, so what are we going to do. (Interview 2)*

Harriet acknowledged, however, that whilst this video could be used as a means to communicate instructions to her students in a different way (i.e. visually and verbally) it needed to be supported by teacher questioning in order to be supportive of students' learning about physical activity.

*I think it was beneficial, because the videos I used, especially in Athletics, it gets the kids thinking about it [their skills] ... so if there were kids gathered round, I'm making sure that everyone could see and using directed questions to like check their understanding of things. (Interview 2)*

Harriet, therefore, used DigiTech as a reference point for students when answering her questions. This, in turn, was used to clarify students' understanding and learning which could then be used as information to support students to develop their skills.

Similar to the experiences and views of Alice, Harriet also found that developing and sustaining her use of DigiTech took considerable time and ongoing refinement to begin to work towards incorporating DigiTech into her practice routine. Harriet's views and experiences regarding this topic are explored in the next subtheme 'taking time'.

### 8.3.3 Taking time

Taking the time to consider the use of DigiTech to support her practice was a reflective practice that had become a customary part of Harriet's routine.

*I do really enjoy all the teaching and learning and the research. So, on a weekend I'll quite happily go and sit and plan a football lesson and try and do extra stuff. (Interview 1)*

Despite being willing and able to conduct the process of taking time to consider DigiTech for teaching and learning, Harriet acknowledged that it has taken considerable time to develop this method of reflection.

*I think to use technology took me [pause] it takes me quite, a little bit longer to sit down and go, how am I going to use this? Or what is the management of it going to be like? Where is it [the piece of DigiTech] going to be when I'm not using it? Who's in charge of it? What groups [are given DigiTech to use]? (Interview 2)*

This meant that the teaching or delivery (i.e. how am I going to use this?), the students' use and management for learning (i.e. who's in charge of it?) and the knowledge in context (i.e. what content is this going to support?) were considered in planning prior to use. For Harriet this, therefore, was not a quick fix but something that had taken time to consider how to plan for DigiTech use to be appropriate. Harriet explained that once this routine (of taking time to consider the pedagogical use of DigiTech) had occurred she had better general knowledge of where DigiTech had been useful.

*After a while, if I was consistently using it, I'd have all those lesson plans there. So, after a while that extra time of producing, I'd have it [the lesson plan], but getting to that point takes a while. (Interview 2)*

*It took me a while to figure out how to download YouTube videos onto it [the tablet], but I figured that out, so I could use it [the video on the table]...I could show videos on the field and, even though I didn't have Wi-Fi on the field, it wouldn't matter. (Interview 3)*

As a result, routinely taking the time to consider the pedagogical use of DigiTech afforded Harriet with the ability to problem solve which, in turn, benefited her developing practice.

The next theme '*developing an embedded culture*' seeks to understand how Harriet believed that constructing a consistent and embedded approach to guide her DigiTech used served as a support to her practice. Furthermore, this theme unpicks the role of the school and its continuing support in maintaining a pedagogical approach to DigiTech.

### 8.4 Developing an embedded culture

Similar to Dillon and Alice, Harriet identified that, whilst she had worked to establish routines of practice with her own use of DigiTech, this was not underpinned by a culture or ethos of DigiTech use in the school. Harriet believed that DigiTech worked as a tool to support teaching and learning when it was embedded into the culture of how the teaching and learning operates at the school - and when there was a consistent message about what DigiTech is used for. Harriet described this as “more embedded, rather than just sporadic” (Interview 4).

As noted, ‘Class Charts’ was a particular piece of software that Harriet found effective as an aid to her teaching as it was embedded into the behaviour management strategy of the school.

*Everything we do is logged on our Class Charts, so, behaviour management...we’ve been using that and it has been really positive in terms of behaviour management and rewarding progress...the software they have bought at our school is quite a positive step. (Interview 1)*

*Class Charts, as an example from a whole school perspective, has been good because everyone has come on board and used it at the same level. That’s why it has worked...so that sort of approach is needed like everyone needs to get on board. (Interview 5)*

The idea of ‘everyone needing to get on board’ was an important factor that Harriet believed had supported her use of ‘Class Charts’ for behaviour management and would support her developing use of her tablet.

*I think it [a whole school approach to DigiTech] would just make it [the tablet] easier to use. So, if I was to get my iPad out all the kids are like “oh why have you got your iPad out?” Whereas if the entire school goes, we’ve got the iPad today, you know it’s [the tablet] going to be for a finished product, you’d get it out and the kids would go “oh it’s going to be an assessment” or something like that rather than them questioning it. Potentially having the barriers of people talking on camera, if it is used all over the school, they [the students] might be like “meh” but they know it’s a school wide approach, that’s just the way it is. (Interview 5)*



Harriet felt that having an embedded “whole school approach” to DigiTech would support her individual use of DigiTech. Harriet explained that “without the support of the school it means you have to do a lot of it off your own bat” (Interview 4). In other words, Harriet was working in relative isolation and felt that a lot of the groundwork i.e. establishing routines of practice and developing lesson plans to support her DigiTech, was based solely on her own efforts. Harriet explained that the most effective approach to developing the use of DigiTech would be a foundation to work from and guide in which to orientate her use of DigiTech.

*It wouldn't be one set way of using it [DigiTech] but it would be the overall, underpinning values of how it's used or why it's used...people know how to access it in loads of different ways and then select the best ones in the ethos of 'this is how we use IT [DigiTech]'. I guess it would be a flexible approach that's comprehensive and consistent.... there wouldn't be one specific way to do it. (Interview 5)*

Harriet suggested that how she uses DigiTech is, thus, influenced more broadly by aspects such as access. It would also seem to involve an embedded culture of DigiTech use developed from a school perspective and then individuals or departments using DigiTech under this approach. Furthermore, this culture would seemingly be viewed by Harriet as an approach that has “a focused yet flexible leadership structure” (McKnight et al., 2016, p.203) that does not dictate what to use but allows for individuals to apply their use of DigiTech pedagogically based on their own contexts, teaching approaches and the learners.

*It would be a whole school approach or a departmental approach I guess, so the school's policies saying, “acceptable use” or “not acceptable use” to back you up in case of any issues. Then you need everyone using it with consistent rules and things to make it... [pause] to properly embed it in your practice. I think that's what I mean; it would make it more like as a whole school approach it would make it [the use of DigiTech] more consistent. It wouldn't be an ad-hoc, last minute, rush job, using it. It would be more of this is how we use it to learn and, that way; everyone knows it and makes the way it is used a lot more efficient. (Interview 5)*

Harriet believed that having an embedded culture around DigiTech use (i.e. thought given to how and why it's used) would support her individual use, aid her in embedding DigiTech into her practice, and make her use more efficient. It would seem, as stated by Somekh (2008, p.454), that a “local definition” of pedagogical practice regarding DigiTech is required if

Harriet is to enhance her pedagogical approach to DigiTech use. Put differently, an approach specific to the school context which provides parameters for one's use. Harriet felt that this had been a factor that had contributed towards other successful uses of DigiTech in the school (i.e. the embedded use of PowerPoints and laptop computers) and, therefore, could be transferable to other DigiTech uses and contexts.

*If everyone in the department had an iPad and it was expected that everyone, not necessarily used it but... [pause] it's like the whole school having a laptop. Everyone in the school has a laptop and, therefore, the laptops are used for everything. That's why PowerPoints are so embedded in PE. That medium would be either a small camera that you might be expected to video certain aspects of your lessons or a tablet that everyone has and then everyone can use. I reckon if everyone had one, everyone would use them consistently and people would start using it in the same way. Then it could be used to compare between classes and things like that. (Interview 5)*

Harriet believed that having the embedded culture or ethos behind the use of DigiTech would provide her with clearer expectations and greater consistency in her approaches. Furthermore, Harriet's impression that this would allow for greater value in cross curricula practice reflects the sentiment by Sheridan (2016, p.5) where she states that "closer ties are required between educational subjects and the enactment of practice...to expand beliefs and improve teaching and learning practices". This, in turn, would support Harriet in feeling able to embed DigiTech into her regular practice and allow for greater consistency. Another element of developing an embedded culture and approach towards DigiTech is attempting different uses of DigiTech. This is explored in the subtheme below.

### **8.4.1 Trying out ideas**

Harriet described herself as "quite driven in that I want to improve" (Interview 1) in terms of her use of DigiTech. Thus, Harriet still felt she had areas to improve upon and could be "viewed as still developing her practice and seeking to try ideas to find out what works for her" (Field notes – Visit 2). Harriet was resourceful in her approaches to trying out different ideas and pieces of DigiTech. She had "borrowed equipment from other departments (such as

Kindles<sup>21</sup> and Cameras) and had brought in her own device (BYOD) to use in the classroom” (Field Notes – Visit 1).

Harriet was reflective of her time in teacher training whereby she was introduced to trying pieces of DigiTech to aid her in her delivery. She saw this training environment as a beneficial experience that influenced her current use of DigiTech.

*It [the use of DigiTech in teacher training] made me realise that you can use it [DigiTech] in PE first of all I guess. Made me actually think about using it in PE and then it's giving me ideas of how to use it in PE and then giving me information of where to go to get more ideas of how to use in PE. (Interview 1)*

This introduction to DigiTech in a training and formal learning environment gave Harriet the perception that she “had the ability to make mistakes and it didn’t matter” (Interview 4). The message she felt she took from her teacher training was ideas that DigiTech “could work in your lesson and it might not” (Interview 2). As a result, Harriet developed the perception that DigiTech was something that could be trialled and considered for her practice.

Harriet took the idea of trying out different DigiTech into her current practice. Harriet felt motivated to “go out and try it [DigiTech]” (Interview 3). From her experiences in teacher training, it was customary for Harriet to feel “quite happy to try something and it go wrong” (Interview 4). Her perception of being comfortable in attempting to use DigiTech and taking to account the possibility of her use going wrong was not something that Harriet averted.

*If it [the use of DigiTech] doesn't work it doesn't matter, but you should always be trying it, so don't shy away from using technology. (Interview 2)*

Harriet grew to feel comfortable that she could plan to use DigiTech in a way that she believed would work. Yet, if her practice did not go to plan, Harriet did not dismiss her attempts of “trial and error” (Interview 3) but viewed them as a process of learning. Ruggiero and Mong (2015) also purported that teachers in their study used DigiTech in an iterative cycle to develop their practice through trial and error. When used in this way, they argued that DigiTech provides a tool to create one’s own learning scenarios that are rich in

---

<sup>21</sup> A Kindle is an electronic reader (e-reader) created by Amazon which allows the user to store and read electronic books.

perspectives for interpreting new knowledge (Ruggiero and Mong, 2015). Harriet's perspective seemed align with this viewpoint.

*Even the best planned lesson involving technology...you could get into the lesson and it could just not work and that doesn't mean [pause] I wouldn't ever go "I'm not doing that again" because there may become a time when I go oh ok I'll try it again but I think it's 100% trial and error. (Interview 5)*

Viewing DigiTech as a method of trial and error reflects Harriet's interpretation that her use of DigiTech involved trying a number of different methods and learning from the mistakes that she made. Accepting the process of trial and error, therefore, seems to be part of the pedagogical process whereby DigiTech is used primarily experimentally at first but, is developed and refined over-time. Other studies have highlighted the process of trial and error as pertinent to a teachers' pedagogical development in using DigiTech (Ertmer et al., 2012; Ruggiero and Mong, 2015). Hennessy et al. (2005, p.30) explain that it may be that teachers have to take a step back in terms of their "pedagogical evolution" with DigiTech. This is because when they position themselves as novice practitioners (in the sense that they have not yet developed grounded ways of integrating DigiTech into subject practice) they view their trial of ideas as a learning process. The trial and error process of trying DigiTech and new ideas did not always feel like a linear process to Harriet.

*It's like putting a jigsaw puzzle together, I guess. I don't tend to...[pause] sometimes you go and pick things off the Internet and you use lesson plans and things like that but, other times it's like, ah, if I did this, they [the students] would be able to do this. (Interview 5)*

Similar to the other case study teachers, Harriet did not see her use of DigiTech as a static or 'one-off' piece of learning but as on-going progression. Harriet explained that from a teaching perspective, having a greater embedded culture or emphasis of the school's approach to DigiTech would support her ongoing learning and practice.

Despite feeling that she wanted on-going support to embed her practices with DigiTech, Harriet still sought other avenues to support her developing DigiTech ideas. Twitter was an online space where Harriet went to gain ideas that other teachers had tried and ones that she could try in her own practice. It was also a space for her to "gain ideas and knowledge that

others had shared – this seemed particularly important to Harriet given her small department” (Field notes -Visit 1).

*When you see an idea, you run with it so a bit so I'd see an idea on Twitter and go and use it and give it a shot...I'll go on Twitter and I'll see one tweet and I'll be like oh let's try that and I'll plan it [into her own lessons]. (Interview 5)*

Harriet used ideas that she had seen on Twitter and then reflected on her experiences. For Harriet, this was “quite exciting to go ‘I saw this on Twitter’ and I am now going to put this into practice” (Interview 1). Reflection seemed to be a key process in trying out her ideas.

*I was constantly looking at and researching things [on Twitter] and then the reflection definitely did help because as I was reflecting I'd throw up another idea about what I wanted to do. (Interview 2)*

*It [Twitter] gives you a bit more information and makes you critique your own practice and reflect. (Interview 4)*

Twitter was, therefore, a source of information or ideas, a source of inspiration to generate new ideas and a platform that initiated professional reflection. In this regard, Twitter opened new avenues that helped Harriet develop her ideas beyond that of her teacher training and was seen as a supportive space to utilise in her current position (i.e. in a small department). By embedding the approach towards trying DigiTech as an educative process, Harriet was able to learn through her use of DigiTech. This is explained further in the subtheme below.

### **8.4.2 Learning through DigiTech**

Harriet found that developing an embedded approach towards her use of DigiTech involved both her and students' learning through DigiTech. For example, Harriet found that by regularly trying out different uses of DigiTech she could learn what worked and what she (as a teacher) found beneficial to her practice. Whilst Twitter was one piece of DigiTech that Harriet used, she hadn't always valued it.

*The main reason why I couldn't see the value [of Twitter] back then [in teacher training] was because all I wanted to do learn is how do I teach I was a bit like “I don't need to know about Twitter right now”. But, now, I want to start refining it and*

*tweaking it [my teaching]. ...Twitter is now where I can go and get that. (Interview 5)*

Despite not seeing the initial relevance of Twitter to her teaching in her training period, as Harriet's practice had developed, she learnt that Twitter was a space she could gain valuable information to aid her in her teaching. Furthermore, it would seem that Harriet needed to take some initial steps to be driven to 'refine and tweak' her teaching in order to begin to see the relevance of Twitter as a space to open up her professional network and share/develop her ideas.

Harriet's use of DigiTech had certainly had its rewards. She quickly began to gain ideas that were successful in practice or learnt about what worked for her and her students. As mentioned previously, Harriet explained that one of the biggest successes she had with her use of DigiTech was when she captured (using a camera) students' reflections on what they had learnt in the lesson in terms of learning resilience. Students were told to "interview each other about what they had learnt" (Interview 3).

*It [students interviewing each other using the camera] was the biggest success I think we had last year...the kids were still talking about it and even now you can go, "well why are you giving up? You're not being resilient?" So that was good, because it made us think about using other things rather than focusing on skills. (Interview 2)*

Harriet had learnt to use different strategies and techniques with DigiTech to focus on students verbally articulating their learning rather than just focusing upon their practical skill development. Harriet was also able to record "students' assessment for learning" (Document – Diary entry) and, hence, students were becoming more active in their learning. In other words, students were involved more in the process of identifying the knowledge they currently had, what they were working towards and how they could look to get there. This was also illustrated by Harriet in identifying that some of her most successful uses of DigiTech involved considering that it could be used to support learning in the cognitive domain. In this particular reflection, Harriet allowed the students to use the video on her table to peer-teach and provide feedback on each other's performance.

*I had them [the students] teaching each other to do handstands and they probably wouldn't have listened to me, but they listened to each other. Because one of them was holding it [the tablet] going "oh, you have to listen to me, I'm the coach", which*

*I remember quite vividly actually. The use of IT [DigiTech] was good. (Interview 2)*

Harriet had, therefore, learnt that through her use of DigiTech, that she could “not just use technology to make them [the students] interested, but to develop it as a learning tool” (Interview 2). Harriet explained further that she had learnt that DigiTech could benefit both her teaching and students’ learning by using DigiTech to aid assessment.

*I could use the video for me to look and go “ah this person is at this or has learnt this much” and this would still feedback into their learning because then I’d use that to plan the next lesson. But, equally, they [the students] would look at it and go “I’m at this level”. (Interview 5)*

Harriet learnt that her use of DigiTech could be multifaceted in the sense that the video could be used as a reference for her own assessment, but the students could also use the video for their own assessment of their learning. Harriet recorded these on-going reflections and learning regarding her and her students’ use of DigiTech in a diary. This is a practice that she had developed and embedded as a means to record and reflect on her use of DigiTech. A particular reflection documented in the diary highlighted that some of the ideas Harriet had used in her practice had not been sustained due to no longer having access to the piece of DigiTech they were originally used with. Within my own field notes, I also recorded how Harriet felt that she was “getting lost in using technology to assess learning in terms of the longer-term process. She was still involved in developing her older ideas in practice rather than developing ‘new’ practices” (Field notes). While she expressed her excitement of the potential of new ideas, she often felt that the reality of technology use can feel disjointed or gimmicky in practice if it was not sustained by resources or support. The ‘*accessibility of DigiTech*’ is explored in the next subtheme as a factor influencing Harriet’s pedagogical use of DigiTech.

### **8.4.3 Accessibility of DigiTech**

Harriet explained that whilst she had individually sought to develop DigiTech into her regular practice, one limiting factor in her ability to embed DigiTech into the culture of PE was to inconsistent access to DigiTech. As discussed, the regularity and consistency of practices and uses of DigiTech has been important in developing an approach towards viewing and using

DigiTech in a meaningful way towards teaching and learning. Harriet discussed how initially (i.e. in teacher training) her use had been dictated by deciding on what pieces of DigiTech were appropriate and considering trying out new ideas. In contrast, she described how currently “a major influence of my use of technology is the technology I have available” (Interview 2). Thus, Harriet’s ability to embed DigiTech into her practice was often limited by her access to DigiTech. This issue of access was explained further by the IT Manager.

*They [the school] are a little bit behind on technology here, so certain things are a bit of a struggle and there’s a fair bit of old equipment. So, I wouldn’t say it is quite as, I don’t know the right word, it’s not quite taught as much as it should be I don’t think because of the lack of equipment...I know they do use it to the best of their ability here because it’s lacking, it is not quite as, maybe as easy as it should be because they are having to work on older technology. (IT Manager)*

This finding reinforces Ertmer et al.’s (2012) argument that to initiate and sustain DigiTech use requires teachers to overcome first level barriers such as access. However, as stated above, developing an embedded culture of DigiTech use is not always under direct control of the teacher. As noted by Somekh (2008) it requires actions and support from a variety of different areas within and beyond the school (i.e. IT support and personal access to DigiTech).

Due to being able to access ‘old’ DigiTech, Harriet had sought to bring in her own personal device to supplement the access she had at the school. She had also recently “received a new laptop by the school, was having increasing access to interactive smartboards for classroom-based PE, could connect to a projector/screen in one of the indoor PE spaces to project videos and could use Bluetooth speakers (connected to her laptop) to play music” (Field notes Visit 1). The school was also upgrading the internet to ensure that the Wi-Fi was much faster and that it could be accessed in more spaces (such as the sports hall). Furthermore, the IT manager explained that they were “going to be putting in a system, Bring Your Own Device (BYOD) so that soon students will be able to bring their own devices in” (IT Manager). Thus, it would seem that the accessibility of DigiTech would be improving in the near future. However, as noted by other research literature (c.f. Albion and Ertmer, 2002; Prestridge, 2012) increased access to DigiTech does not equate to it being used pedagogically. For



instance, the work of Ertmer (2005) and Mama and Hennessy (2010) demonstrates that some teachers, despite limited access to DigiTech, still try to exploit the resources available in a pedagogically effective way compared to others who make little attempt to incorporate DigiTech. Mama and Hennessy (2013) argue that the essential difference between these two groups of teachers lies with their appreciation of DigiTech's role in teaching and learning. Harriet is arguably representative of this group of teachers that appreciate the role of DigiTech in teaching and learning and has made attempts to use DigiTech pedagogically, despite her limited access to it. Harriet explained however, that embedding DigiTech into the culture of PE needed to involve more than greater access to DigiTech devices.

*It would be useful to have someone in the background observing and giving me feedback and then some sort of CPD [continuing professional development]. So, if I had access to something that was like your use of IT [DigiTech] in PE, like a workshop or something that would be good. (Interview 3)*

A theme that has reiterated in these results chapters has been the practitioner positioning themselves as an on-going learner. Therefore, it is not surprising that Harriet considered access to observations/feedback on her performance and access to CPD as important learning experiences to develop into a culture to embed DigiTech into PE.

This subtheme has briefly discussed the importance of more than just access to DigiTech itself but has included some of the surrounding factors (i.e. the complex or carefully designed structure of seeking a pedagogical approach to DigiTech). Whilst access to DigiTech can somewhat constrain certain elements of practice (i.e. every child having access to a tablet) this subtheme has highlighted that access to supportive professional development and collaboration with other teachers on one's uses of DigiTech can be just as beneficial and influential on one's ability to utilise the DigiTech at their disposal in a pedagogically effective way. Developing regular access to DigiTech and teaching support is therefore important when seeking to embed a developing approach to DigiTech in order to try out new ideas and gain new knowledge.

### 8.5 Chapter Conclusion

This chapter has sought to provide an interpretation of Harriet's views and experiences regarding how and why she uses DigiTech in her practice.

DigiTech such as Class Charts aided Harriet in communicating with other staff members, parents and students. Starting with a simple practice and developing its use was something that Harriet felt helped her to distinguish when DigiTech was appropriate to aid students' learning. Whilst these practices may not be necessarily described as 'ground-breaking', they allowed Harriet to use DigiTech that did not detract from learning but supported it.

Harriet believed that DigiTech could be used to enhance students' learning and provide an alternative means for students to access the learning content. '*Tool for engagement*' discussed how Harriet used DigiTech as a tool to engage students. Furthermore, by using DigiTech as a novel strategy to peer-teach, Harriet reflected on how students can show greater engagement whilst also supporting conceptual understanding.

Harriet matched her choice of DigiTech and her use of it in ways that were relevant to the learner (i.e. their level of ability) and, thus, considered knowledge of the learner and their learning as an important step in deciding how and why to use DigiTech in her teaching. She also built reflection into her uses of DigiTech and came to the conclusion that her use of DigiTech needed to become a regular one in order for students and staff to understand the purpose of their use and for Harriet to begin to distinguish the appropriate pedagogical use of DigiTech. Having a routine of practice, both individually and within the department for Harriet, was viewed as a factor that could lengthen the impact of her DigiTech use and establish students' expectations of their use.

The subtheme '*consistency of strategies*' explored some of the teaching practices Harriet used consistently. This subtheme also discussed Harriet's beliefs regarding the need to develop consistency within the school and the department's approach to DigiTech. Harriet felt that this increase in consistency would support her individual use of DigiTech and increase her knowledge of where and when DigiTech can support her teaching.

'*Supporting communication*' described how Harriet sought to support her verbal and visual communication with students by providing different ways for students to access the lesson content. Harriet found that DigiTech provided an avenue for students to learn about different

aspects of the lesson and provide them with a reference point to support their learning. Thus, Harriet could communicate key aspects of the lessons with students through her use of DigiTech.

Harriet was guided in her reflection by important pedagogical questions (i.e. who's in charge of the piece of DigiTech?) which took time to translate into lesson plans and ideas. Despite the time taken to consider DigiTech pedagogically, Harriet felt able to answer some of these critical questions and identify where DigiTech could help her to fill gaps in her teaching.

In regard to different embedded cultures, Harriet held that the school's behaviour management system had been effective for behaviour management as it had become the norm and was used consistently across the school. Harriet sought a 'whole school approach' to DigiTech to support her individual use and to provide clear expectations for her individual practice. She, therefore, positioned herself as an on-going learner and made use of Twitter as a source of ideas and extends her knowledge of ideas to try.

Harriet perceived DigiTech as tool to learn through and a building block to building up her knowledge of how to refine her practice and develop her ideas. Harriet began to learn 'what worked' for her and her students by exploring the use of DigiTech for recording student assessment and for students' collaborative teaching. She sought to bring in her own devices to supplement this and, subsequently Harriet strived to make the most of the resources she had and use them towards a pedagogical benefit. This subtheme presented the importance of having a broader understanding of the support required to benefit the pedagogical use of DigiTech that runs extends beyond greater access to DigiTech devices.

This chapter concludes the presentation of findings. The four case study chapters have sought to present an interpretation of the views and experiences of each teacher in relation to their own perceptions and contexts. Whilst there has been some reference and analysis made in relation to the literature specific to each case, the forthcoming discussion chapter will seek to expand the themes presented across these cases in relation a larger discussion of the research literature and an analysis of pedagogies of technology. This will follow with a conclusion to the thesis which will involve a summary of key findings, implications for research and practice and a consideration of future research.

## Chapter Nine: Discussion

### 9.1 Introduction

The previous four chapters have charted the experiences and perceptions of four teachers who used DigiTech in PE. These chapters were further informed by the experiences of others in the teachers' schools. This combination helps us to see how the teachers developed, constructed and enacted their practice with DigiTech. The following discussion returns to the research questions and their sub questions (see below) and considers some of the broader implications of this study.

#### **(RQ1) How do PE teachers view and use DigiTech in their practice?**

How are these practices developed and/or sustained across their careers?

How do an individual's views and experiences of DigiTech shape the use of DigiTech in the school context?

#### **(RQ2) Why do PE teachers use DigiTech in their practice?**

What are the factors that prompt PE teachers to use DigiTech?

What role does the school context play in shaping teachers' DigiTech use?

This chapter aims to draw together findings from chapters five, six, seven and eight. It seeks to explore the underlining complexity of the teachers' experiences utilising DigiTech, the factors shaping/sustaining their practice, the processes of developing and sustaining DigiTech use in practice and the rationale behind their intentions when using DigiTech. I introduce the concept of pedagogies of technology; not only to summarise and present the main findings but also to broaden my discussion of the themes explored previously.

I use the concept of pedagogy in relation to emergent literature around 'pedagogies of technology'<sup>22</sup>; particularly as an analytical concept through which to discuss the overarching

---

<sup>22</sup> The phrase 'pedagogies of technology' still refers to digital technology (DigiTech). Due to the term 'DigiTech' not being used by Casey et al. (2017b) when referring to this concept, I have left it as technology.

findings and themes across cases. This pedagogical analysis allows me to identify commonality and difference across the cases of DigiTech use previously presented and further our understanding of how DigiTech use in PE might be enhanced.

At this juncture, it is important to reiterate the AI focus of thesis. Whilst it is acknowledged that there are a variety of barriers experienced by PE teachers and their use of DigiTech, the focus of this work has been upon seeking to appreciate the factors that support their construction and use of DigiTech. This not only addresses the call from many research articles mentioned in the literature review to move away from deficit-based or problem-initiated thinking in research but, also, to pursue some much needed “balance to the stories we construct of our field” (Enright et al., 2014 p. 922). This chapter is organised into two sections. First, it provides an overview of the key findings presented across the case study chapters in relation to the research questions and literature. Second, by drawing on existing knowledge and literature, it considers the key findings in terms of DigiTech use and pedagogies of technology.

The first section starts with the key findings in regard to RQ1; specifically, regarding how the teachers view and use DigiTech in their practice.

### **9.2 Teachers’ views and uses of DigiTech in their practice**

In addressing the first research question, DigiTech was viewed and used in a variety of different ways. Most of the teachers viewed DigiTech as a tool to engage students and to connect PE with students’ digital lives; i.e. to provide relevant learning experiences. More specifically, Dillon and Patrick viewed DigiTech as a tool to enhance both their own personal lives and students’ learning experiences of PE. This approach took considerable time to develop. Indeed, their beliefs about DigiTech were much different now than at the start of their careers (a time when DigiTech and PE were viewed as separate entities). The changeability of their beliefs about DigiTech is representative of Fullan’s (2015) argument that whilst a teacher may seem to uphold a particular belief or practice, this may exist in a varied form from the original. The relationship between pedagogical beliefs and practice is complicated (Higgins and Mosely, 2001) and, thus, whilst beliefs about teaching and learning are regularly seen as important in explaining the take up of DigiTech, it is important to

acknowledge that there are other factors that are influential in impacting DigiTech use (Hammond, 2011).

With little being known about how practices with DigiTech are shaped or changed over time (Prestridge, 2017), across cases we were given an insight into how trying out ideas, taking risks to develop confidence and positioning DigiTech as a learning tool might aid teachers to begin to see the potential value of and the different ways in which DigiTech could contribute towards their teaching. In this study, both Patrick and Dillon viewed DigiTech as a tool that could not only make their own lives more efficient and effective but could also, support students and their lifelong physical activity. Their views of PE were therefore similar to other PE teachers' views in the broader literature of preparing students for a lifetime of physical activity (McEvoy et al., 2017). Interestingly, while Harriet and Alice viewed DigiTech as a 'means to an end' they also viewed it as a tool to engage learners. In this sense, Harriet and Alice clearly exhibited value beliefs in the sense that they valued DigiTech when it could help them to achieve specific aims such as communication or engagement (c.f. Ottenbreit-Leftwich et al., 2010). Indeed, despite their limited access to DigiTech, both teachers' belief in the value in DigiTech spurred them to make the most of the resources they had available to them. Similar to Ertmer (2005) and Mama and Hennessy (2013), this finding highlights their "appreciation of technology's role in teaching and learning" (Mama and Hennessy, 2013, p.381). These findings are also in congruence with recent work in Spain which found that teachers' views towards DigiTech are mainly positive, particularly in terms of the characteristics and potential for learning which drives, in turn, their subsequent use (Gonzalez-Sanmamed et al., 2017). Furthermore, this study adds additional understanding with regard to teacher agency and increases awareness of some of the potential benefits of the use of DigiTech in PE teaching that may act as a catalyst by contributing practical ideas to other teachers. Fullan (1999) states that the uniqueness of the individual setting is crucial to understanding the starting points for change and argues that we must understand the actions of individuals to comprehend the bigger picture (i.e. the organisational factors that influence the process of change). As such, this study provides an enhanced understanding of the individual in order to begin to explore our appreciation of the bigger picture of DigiTech use in (physical) education.

Given the dearth in current literature concerning the use of DigiTech in PE (Gibbone et al., 2010; Tearle and Golder, 2008), especially with regard to the teacher's perspective (Casey et

al., 2017b; Krestchmann, 2015), this research provides further insight into contemporary PE teachers' use of DigiTech. In line with other literature in the field, DigiTech was viewed and used by all four teachers as a tool for engaging students in PE (see Casey and Jones, 2011; Hall, 2012; Goodyear et al., 2014a and Hastie et al., 2010). This may be because, as Sipila (2014) suggests, the more teachers use DigiTech, the more they seem to recognise and value its strong positive effects on students' learning, engagement and its connection to twenty-first-century competence. However, it may also be due to the perception that choosing to use DigiTech to facilitate students' motivation leads to higher engagement in the learning content and therefore to higher levels of learning (Rink, 2009).

Previous research demonstrates that some students can experience PE as difficult and problematic (Enright and O'Sullivan, 2010) and, therefore, students can become disengaged (Lyngstad et al., 2016). In contrast, when students are engaged in learning they invest behavioural, affective effort to the task (Bevans et al., 2010) and, as a result, are more likely to experience success in learning. Because of this association, it is not too great a leap to suggest that while the use of DigiTech in PE to enhance students' engagement may not directly impact upon learning, it can help some students to access learning opportunities. Therefore, the use of DigiTech for engagement is underpinned by a pedagogical intention. For example, Perrotta (2013) found that PE teachers reported that they felt students were more attentive when using DigiTech. Importantly, this research has contributed to our understanding regarding the pedagogical importance placed on using DigiTech as a tool to enhance engagement.

Building upon their views of the importance of DigiTech for teaching and learning, the teachers in this study used different pieces of DigiTech in a multitude of ways to enhance learning. In some ways they were implementing surface level change (Sparkes, 1990) in terms of using DigiTech in their teaching activities (for example, the use of video to support skill analysis). In others, however, they were making 'real' changes to their own understanding of their philosophy of DigiTech use and its use to support students' learning (e.g. Dillon and Patrick's change in beliefs from DigiTech as separate to physical activity to supporting physical activity). However, while there was diversity in views (e.g. the use of DigiTech to support physical activity), there was also some commonality in terms of the overarching ways in which DigiTech was implemented. All the teachers sought to use DigiTech in ways that were simple and straightforward for both themselves and the learner.

This meant that DigiTech use needed to be used routinely and consistently. The use of simple and consistent routines has been shown to be supportive when incorporating DigiTech into other pedagogical practices such as Cooperative Learning. Bodsworth and Goodyear (2017) found that routines of practice were important when supporting students' understanding of DigiTech and, were equally important for student familiarisation with DigiTech. It would, therefore, be pertinent for teachers to maintain their routines and consistency of uses of DigiTech to ensure students' (and also teachers') continued familiarity and comfort with DigiTech. This would allow teachers to increasingly use DigiTech more efficiently and effectively when seeking to optimise student learning.

DigiTech was used by Alice and Harriet in small and simple ways to support their teaching and their students' learning in PE. DigiTech was used predominantly either to support the delivery of content knowledge or to communicate information. Thus, their use of DigiTech was similar to Dillon and Patrick in that it indirectly supported physical activity. Yet, none of the teachers used DigiTech directly as a means for students to be physically active (for example by using exergames as a means for students to conduct a dance routine). This finding concurs with that of Villalba et al. (2017) who held that an obstacle to some teachers' use of DigiTech was a lack of knowledge for integrating DigiTech into physical activity settings. Furthermore, Villalba et al. (2017) stated that some of the biggest obstacles to teachers' DigiTech use in PE the loss of physical activity time (for students) in class. However, one must be mindful of literature which reminds us that due to the common belief that physical activity is the prominent learning outcome in PE (Cale et al., 2016) the pedagogical benefit of DigiTech may not be immediately obvious (Casey et al., 2017a; Kretschmann, 2015; Pill, 2015). Furthermore, as pointed out by Pyle and Esslinger (2014), DigiTech and PE are often viewed as being on opposite extremes of the spectrum with one associated with sedentary activity and the other with movement. Therefore, seeing the synchronicity or relationship between these two areas and being able to use DigiTech directly towards students' learning and physical activity is not straightforward. Thus, as Villalba et al. (2017) conclude, it is important that, as a field, we promote positive attitudes towards integrating DigiTech into teaching, should we choose to use it as a pedagogical tool.



### *9.2.1 How an individual's views and broader experiences of DigiTech shape the use of DigiTech in the school context*

The case study teachers' experiences and views of DigiTech, outside of the educational context have, to some degree, shaped their current pedagogical use of DigiTech. This section seeks to articulate the factors and context that supported and shaped the teachers' use of DigiTech.

The importance of experiences outside of the educational context came to the fore most explicitly in Patrick's case. Patrick explained how his interest in the benefits of DigiTech in his personal life increased when he saw the relevance to DigiTech in his own children's development. His use of and interest in DigiTech stemmed from personal experiences of using video games to socialise with friends and learn the rules of different sports. Furthermore, Patrick explained how he would often try out pedagogical ideas at home with his children (and vice versa) before using them in an educational context. Thus, his experiences of reflecting, playing with and learning through DigiTech outside of the school were supportive in developing his pedagogical practice with DigiTech.

For Dillon, his views regarding the value of DigiTech started when he worked in the health and fitness industry (i.e. when communicating with clients and advertising services) and developed as his interest in Apple products and performance analysis software developed. In this sense, these experiences helped Dillon to see the relevance of DigiTech for his teaching; particularly how DigiTech could be used to "monitor and benefit students' learning" (Dillon Interview 1). Thus, Dillon's view of the potential relevancy of DigiTech to teaching and learning was triggered by the use of DigiTech in his previous job and in his hobbies.

Alice explained that one of her main rationales for using DigiTech in her teaching was communication. She described how her use of DigiTech for communication in her personal life was very similar to ways she now used it in her teaching. She interpreted this as primarily concerned with DigiTech allowing her to communicate more efficiently and effectively with her family and friends and seeking to replicate these benefits in her teaching. Similarly, Harriet explained how she had used DigiTech in her personal life to support communication with others. These experiences of DigiTech had influenced her decision to use educational software such as 'Class Charts' and videos to communicate more efficiently with students. Harriet further identified that her teacher training and her experiences of DigiTech were

important in shaping her current practice. This experience allowed her to see the value of DigiTech for gaining and developing new ideas which seemed relevant to her developing practice with DigiTech.

For Patrick, Harriet and, to a lesser extent, Dillon, Twitter was an influential development tool. It influenced their idea development processes and shaped their use of DigiTech. For Dillon, Twitter was a space to celebrate successes and raise the profile of PE in the school. For Patrick and Harriet, Twitter was a space to gain ideas and reflect upon how to develop their practice. This use of Twitter is an example of a means in which teachers can keep up to date. It supports the findings of Goodyear et al. (2014b) and Carpenter and Krutka (2014) who found that social media is emerging as a powerful platform for CPD. Twitter is a place where teachers can engage in dialogue with researchers and fellow practitioners to learn, develop and change their practices (Gleddie et al., 2017). It has been reported that PE teachers can feel isolated in school because they have a small department or may be the only PE teacher (Tannehill et al., 2013). This was certainly the case for Harriet. Her exposure to Twitter during teacher training combined with later online opportunities afforded by Twitter, enabled her to access the professional networks that she could not access at her own school.

From these findings, it seems important to consider the “wider educational milieu” (Casey et al., 2017a, p.254) and experiences that surround teachers’ development of DigiTech use both inside and outside the formal classroom. Okojie et al. (2006) describe this as the need to view the use of DigiTech from a “wide perspective” (p.70) to see how DigiTech uses are influenced across both personal and educational contexts. Kirk and MacDonald (2001) suggest that material changes, such as those that might be induced by the introduction of DigiTech, are initiated at a local level. Coining the term “the local context of implementation” (p.551), Kirk and MacDonald (2001) argued that whilst policy (or in this case the use of educational DigiTech use) might be decided at state or national level, it was implemented in individual classrooms. Drawing on the work of Spillane (1999), they argue that curriculum materials, are interpreted for practice in “zones of enactment” (p.565) prior to their implementation in the local context. These zones can occur both in the home and at school and allow teachers (through the process of trial and error) to make sense of how DigiTech might relate to their past experiences and work in their local contexts. As such, DigiTech would seem to be first encountered and ‘made sense of’ in diverse contexts prior to local implementation. Importantly, it would seem that teachers, and their experiences of

DigiTech, both inside and outside of the classroom, aid them in considering the implementation of DigiTech in their practical contexts.

Alternatively, Casey (2015) has argued that experiences both inside and outside of the educational context can contribute to one's developing use of DigiTech. In this way, DigiTech use ceases to be about a specific item or device but is instead about the wider educational milieu that contributes towards this development. After all, understanding how teachers' beliefs evolve with regard to DigiTech is foundational for administrators and educators at all levels who have a role in supporting teachers' appropriation of DigiTech (Prestridge, 2017). As the teachers in this study have highlighted, individual approaches may be bespoke, with different degrees of access and intent resulting in different methods of teaching and learning (Gleddie et al., 2017). Understanding this complexity from a broader perspective (i.e. including the voices of head teachers, IT managers, senior leadership team members), however, allows us to appreciate the variety of experiences that both influence and support a teacher's developing practice with DigiTech.

### ***9.2.2 How are practices with DigiTech developed and sustained over time***

Throughout the case study chapters, it became apparent that there were a variety of factors contributing towards developing and sustaining practice with DigiTech. In developing their pedagogies of DigiTech, the case study teachers sought to experiment, over time, with different ideas. The importance of trial and error as a means to develop teachers' practice with DigiTech is found in the work of authors such as Ertmer et al. (2012), Hennessy et al. (2003), Ruggiero and Mong (2015) and Levin and Schrum (2013). The findings presented here add to the importance of trial and error in discipline or subject specific areas such as PE. This was also alluded to in the BECTA (2005) report on the use of DigiTech in PE. A teacher in this report explained that her usage evolved through trial and error. It would seem that a common mechanism for more informal learning about DigiTech continues, in some cases, to occur through this experiential learning process of 'trial and error'. As the statement suggests, this involved both successful and unsuccessful experiences. Hennessy et al. (2003) suggest that pedagogical strategies used to support the use of DigiTech in teaching seem to involve a process of trialling and refinement of successful activities, approaches and strategies and critical reflection upon their underlying aims and principles. Thus, teachers seem to develop

their use of DigiTech in an iterative process and hone ‘best’ practice through trial and error (Ruggeiro and Mong, 2015). However, in order to sustain this practice, it would seem, as the findings in this research and others such as Hennessy et al. (2003) suggest, that in order for the teachers to develop and subsequently sustain their subsequent pedagogical thinking in regard to DigiTech they have to “take a step back” (p.35). Hennessy et al. (2003) explain how the teachers in their case studies had to inevitably become novice practitioners that they had to develop and refine their attempts at using DigiTech and adapt them to meet their intended outcomes. In positioning themselves as learners and ‘non-experts’ these teachers also seemed to believe that by adopting this strategy they could develop and refine their practices.

The professional development literature suggests that a factor contributing towards successful professional development is teachers beginning to view themselves as learners (Patton and Parker, 2014). Consistent with Casey et al.’s (2017a) conclusions, the teachers in this research support the sentiment that practitioner learning is a significant and important aspect of any pedagogical approach to DigiTech. The evidence presented here extends our understanding by suggesting that teachers need to feel able to sustain their positioning as on-going learners and develop their individual processes of trial and error if they are to develop pedagogies of technology. That said, a crucial step in this process is reflecting upon the outcomes for students’ learning. For many of these teachers, their use of DigiTech has a pedagogical underpinning and their own processes of trial and error, but also the views of students and ideas found on Twitter. The use of Twitter and social media as a non-formal source of CPD has not received much attention in the research literature (c.f. Gleddie et al., 2017; Goodyear et al., 2017c) and could be a significant area of future study (see Chapter 10).

In PE, assisting teachers to view themselves as learners has been advocated as an essential part of professional development (Armour, 2010; 2017b). For the teachers in this study, this was important in developing and sustaining their pedagogical work with DigiTech. Feeling supported and able to continue these ongoing practices of reflection and learning seems to align with Armour et al.’s (2017b) notions regarding effective and contemporary CPD. In acknowledging DigiTech as an important focus for future CPD, Armour et al. (2017b) conclude that “the core focus of CPD is practice itself (i.e. embedded and contextualised); learning that is dynamic (active and requiring time for reflection); and it is never ending (continuing)” (p. 808). This builds upon previous suggestions by Armour et al. (2015) who

argue that CPD must allow teachers to nurture their career long growth as learners. Given that the teachers in this study valued reflection and the ability to use DigiTech through trial and error, it is important that these practices are sustained both inside and outside formal CPD with regards to DigiTech. Yet, as numerous PE-CPD studies have reported (see Parker and Patton, 2017 for example) few such opportunities are available to teachers. It is, therefore, interesting to explore how these teachers tended to develop routines of practice and sought to establish context specific ‘cultures’ of use. This, in turn, allowed the teachers to sustain their practice and make them the ‘norm’ in their contexts. It would seem that in order to continue to develop their own CPD, it would be pertinent for the teachers to feel they had the sustained autonomy to be able to enact such practices whilst feeling supported by a culture that allows these practices to occur. As these case study teachers demonstrate, perhaps the most important focus is being able to continue their development in practice that involves learning about DigiTech in a dynamic and reflective space.

Context was important for the teachers in this study. A lack of support within the local context (i.e. the school) has been argued to act as a powerful mediating factor in inhibiting teachers’ attempts to learning, change or develop (Fullan, 2013), either with or without CPD in place (Casey et al., 2017b). Across cases, the teachers’ practice with DigiTech involved seeking to embed a culture of use (both individually and/or in the department or whole school) and establish routines of practice (such as building expectations of use or teaching students how to use DigiTech). Goodyear et al. (2017a) highlight Fullan’s (2015) proposition that the sustainability of particular practices and/or beliefs can be conceptualised as a time point when change gets built into the school system and when a belief of practice becomes an ongoing part of a teacher’s routine. In reality, only Patrick’s case could be considered sustainable. Arguably, however, all the case study teachers could be representative of the second half of the statement, i.e. that the belief of practice (in this case regarding the use of DigiTech) becomes an enduring part of their routine. They were able to develop their own beliefs in relation to teaching and learning and then make decisions as to whether DigiTech was appropriate based on these beliefs, the learning and the context.

If we consider Fullan’s (2013) discussion on DigiTech and pedagogy, DigiTech are initially inferior to existing practice because they have not had enough time to develop. For this reason, DigiTech can have a “hard time catching on; however, this is only temporary until the new improvement cycle accelerates” (Fullan, 2013, p.29). Alice and Harriet’s experiences

particularly resonate with this perspective. Their developing practice has been met with difficulties, but as Fullan (2013) suggests, this is temporary. The starting point for all these teachers has been the desire to try and do something different in their practice, to make things more efficient, to better learning experiences and enhance engagement for students. Once their cycle of use accelerated (i.e. they used DigiTech more and reflected upon its use) their practice developed. Thus, the goals or views the teachers might have adopted initially have developed into different (and often more simple and effective) practices. This often occurred through learning from trial and error and applying this learning change to the next context.

However, the complexity and multidimensional nature of change, such as the use of DigiTech in teaching, has led to different perspectives about the context and nature of educational change. Sparkes (1990) and Fullan (2007), individually, suggest that there are three levels or components of change: change that occurs on the surface (i.e. the possible use of new materials or technologies); change that involves new teaching approaches (i.e. student-centred pedagogies or models); and change in beliefs and values (i.e. pedagogical assumptions or theories). They argue that the latter of these changes (change in beliefs and values) is classified as ‘real’ (Sparkes, 1990) or ‘fundamental’ (Fullan, 2007) change and is the most difficult to achieve. These three dimensions form the basis of educational change and all are necessary to achieve because together they represent the means of achieving a particular goal.

Developing and sustaining practice with DigiTech, as we have seen throughout the findings chapters, is a multidimensional process which includes DigiTech devices, teaching approaches and, possibly, altering beliefs (Fullan, 2015). As was represented in these case studies of teachers’ experiences, any individual teacher may implement none, one (i.e. surface change for Harriet and Alice in their use of technologies) two (Dillon and Patrick implementing DigiTech but also some differing teaching approaches such as flipped learning) or all three levels of change. Of course, in saying that change occurs at an individual level, it should be recognised that organisational changes are often necessary to support practice changes (Fullan, 2007; Sparkes, 1990). Thus, whilst change and a culture of DigiTech had not been built into the school system for all these teachers, their belief of pedagogical practice with DigiTech and learning from their uses had been embedded as an ongoing part of their routine. Developing the start of the cycle in terms of seeking to consider pedagogy before selecting DigiTech is a process of moving from ‘surface’ to ‘real’ change (Sparkes,

1990) and, for the case study teachers, it required a shift towards sustaining their practice in their local contexts (despite the use of DigiTech not always occurring in the broader school system). As changes in beliefs are the most difficult to achieve (Sparkes, 1990) this is an encouraging sign in these contexts.

Across all of the cases, the teachers moved beyond the initial point of implementation. This is what Goodyear and Casey (2015) describe as moving past the “honeymoon period” (p.188) of executing a practice. They have all, to some degree, developed elements of their practice with DigiTech beyond that which they had initially used or attempted to use. Sustaining practice further, would seem to involve teachers feeling able to continue their developing practice in a variety of ways that not only suits them and their needs but their preferences for learning. This could be through informal spaces such as Twitter or being able to sustain their autonomy to try new ideas and reflections of their outcomes in order to develop their practice and routines further.

### **9.2.3 Summary**

The overarching message in respect to the views of DigiTech and how it is used relate to not having a “one size fits all approach”. In fact, from these teachers’ experiences, it is clear that there is no recipe or linear process of using, developing or sustaining the use of DigiTech. In other words, there is a sense that teachers need to tailor their pedagogical use of DigiTech to their needs as the teacher, the student(s) and their context. In seeking to unpick what in these teachers’ practice “gives life to the system” (Cooperrider et al., 2008) of practice, across cases, the teachers’ viewed DigiTech as having the potential to support students’ learning but were also reflective of the realities of its use. Their use of DigiTech reflected this perspective and involved using DigiTech in ways that was efficient but effective, i.e. in simple ways for both the teachers and students, and, where possible, routinely and consistently. Through a process of trial and error both inside and outside the formal classroom the teachers were able to identify areas to improve their use of DigiTech (notably in simple ways) for teaching and students’ learning that was relevant to their context. This was supported and sustained by pedagogical reflection and positioning themselves as learners/developers (or ‘non-experts’) and their use of DigiTech as a learning process.

These cases also indicate that effective practices and pedagogies involve teachers engaging in an ongoing assessment of students' learning needs, where evidence drawn from the local context is used to drive subsequent pedagogical actions (Goodyear et al., 2017a). Nonetheless, it should be noted that the central premise of these chapters was to use DigiTech consistently, and the importance of embedding DigiTech into routines of practice (e.g. flipped learning). In addition, these routines needed to allow for flexibility and autonomy of DigiTech use by teachers and students. As expressed by all the teachers, these practices take considerable time to develop, especially in learning how to balance the need for both consistency and flexibility. Similar to some of the findings of Tondeur et al. (2016a), this would seem to suggest that developing a pedagogical approach to DigiTech should be considered as bi-directional. However, in contrast Tondeur et al. (2016), the bi-directional relationship suggested in this study involves both consistency and flexibility, but also trial and error. In considering teacher change, this would seem to relate to Fullan's (2007) suggestion that effective approaches to managing innovation such as DigiTech calls for a combination and balancing of factors that may appear to contradict each other (i.e. being consistent but also flexible and having variety). This differs from the perspective offered by Tondeur et al. (2016). By considering the bi-directional relationship between the teacher beliefs as a perceived enabler for DigiTech integration, and DigiTech as a perceived enabler for change in teachers' beliefs, we can perhaps start to explore some of the on-going complexities of teacher change regarding DigiTech use. This study shows that there is a need to further understand the nature of practices with DigiTech as bi-directional as well as a teacher's relationship with DigiTech.

### **9.3 Why teachers use DigiTech in their practice**

From the case study chapters, it is clear that, as Loveless and Williamson (2013) also considered, there is no one, shared and agreed rationale for the use of digital technologies to support learning and teaching. Further, teachers have expressed a range of different reasons why they think they incorporate them into their teaching. As a result, it is important to unpick some of the commonalities as to why DigiTech is used despite the fact that teachers are not required to (i.e. by the curriculum).



One of the main reasons the teachers used DigiTech in their teaching was because they wanted to. They believed in the value of DigiTech for teaching and learning and this desire drove them to use it. Given that there are no curricular or external requirements for teachers to use DigiTech in their teaching, this is particularly interesting. Fullan (2007) and Sparkes (1990) argue that the individual teacher - as the implementer of change - is crucial to understand. Yet, as Patton and Griffin (2007) highlight, few examples of teacher level changes have been published within physical education literature and few describe examples of school contexts or ways that school culture can support teacher level changes. The case study chapters (in particular, Patrick's) present some deeper understanding with regard to how developing an embedded and whole-school culture can be supportive in teacher change.

Ottenbreit-Leftwich et al. (2010) explain how whenever a new pedagogical approach is presented, teachers make value judgements about whether that tool is relevant to their goals. This is particularly true of DigiTech (Zhao et al., 2002). The more valuable teachers judge a tool to be in terms of helping them reach their intended outcomes, the more likely they are to use it (Ottenbreit-Leftwich et al., 2010). Thus, a factor promoting these teachers' use of DigiTech was that they saw the value in DigiTech for their teaching and students' learning. Ertmer, Ottenbreit-Leftwich and York (2006) explain that whilst this may seem superficial (or what Sparkes (1990) would term surface level change), teachers' beliefs regarding the value of DigiTech is an important factor in promoting its use and promoting change. They argue that teachers, including those who are faced with a limited amount of resources, can find ways to use the resources to improve student learning based on their strong personal investment in DigiTech and pedagogical beliefs about the power of DigiTech to enhance learning. This certainly seemed particularly prominent in the case of Harriet and Alice, especially given their limited access. The recent work of Jääskelä et al. (2017) showed similar findings in a higher education context in Sweden. The teachers in their study perceived DigiTech as meaningful for their intended pedagogical implementations which, in turn, drove their subsequent use.

There were, however, a variety of nuances in terms of the different values held by the teachers in this study. DigiTech was viewed as relevant and was valued because: it allowed them all to pursue their own and their students' interests; proved relevant to their intentions to enhance students' learning experiences; and in some cases, enabled them to communicate better with their students (Alice and Harriet). Comparable to the findings of Jääskelä et al.

(2017) the “value of technology was defined in relation both to the intended pedagogy and to the teachers own work” and desires (p.208). Arguably, all the teachers “desired to do something differently” (Casey et al., 2017a, p.6) whether simply for engagement, visualising performances or seeking to ‘flip’ the traditional classroom. However, it is clear that the adoption of DigiTech depends on the values and beliefs teachers have about the importance of DigiTech for learning (Webb and Cox, 2004). It therefore remains pertinent to understand “how an individual comes to grips with their reality”, as often we (as researchers) can vastly underestimate both what change is for an individual teacher and the factors/processes that account for this (Fullan, 2007, p.29).

Across the case study chapters, a strong rationale for the use of DigiTech was to enhance the learning experience for their students. DigiTech was sought out as a tool to enhance learning and students’ experiences of PE. Another common rationale was to provide relevant learning experiences for students (i.e. being able to see the relevance of their learning with DigiTech to their future lives). As explained by Beni et al. (2017), meaningful experiences in PE can be categorised as those that provide personally relevant learning whereby students are able to recognise the importance of what they are learning and make explicit connections between their current PE experiences and their future aspects of daily living outside of the school. DigiTech was talked about by Patrick, Dillon and Harriet as something that could provide a meaningful tool for students to learn about physical activity. Patrick was particularly explicit in this regard. His school made sure that students could explain “what they had been doing, why they were doing it and then reflecting on their use to improve next time” (a senior leadership team member). In this sense, the teachers’ intentions to use DigiTech to provide meaningful and relevant learning experiences for their students was in line with a pedagogical approach to DigiTech. This seems especially pertinent given that their focus was upon students’ learning and their knowledge of DigiTech in context with their future lives.

The consideration of why they were using DigiTech occurred not only in the planning stages of their DigiTech use but, also, as a focus of their reflection. The consideration of why DigiTech was being used was often pedagogical in nature (i.e. what are the learners learning? What happens when those students are not using the piece of DigiTech?). As Loveless (2011) explains, these considerations root understandings of pedagogy and DigiTech in terms of questioning why we are doing something. If, as these teachers demonstrate, one can position the use of DigiTech as an on-going learning process then progressively the use seems to

become more about the pedagogy (i.e. the meaningful learning) rather than the DigiTech. Put differently, a focus becomes managing the use of DigiTech for students' learning rather than focusing on the specific nature of the device itself. Furthermore, as shown by Dillon, if one can begin to articulate why you want to deliver or what you would like to achieve with DigiTech, one can be better supported with ideas of how to get there (i.e. by IT support).

Alternatively, if the practice does not work as intended, the teacher can build routines of reflection as to why it may not have worked. The teacher can then gain some valuable knowledge to take into further practice. In the case of Alice and her reflections of the AI interviews, this may be the first step in realising what has worked well in the past/why and how this could be used in the future. These cases, therefore, have begun to reveal that AI may be a useful basis for beginning to discover and identify areas of supportive practice that may have otherwise remained unarticulated or reflected on by the teacher. The opportunity or space to begin to question 'why' and consider questions of an AI nature, therefore, could be the starting point for teachers to reflect upon what in their particular setting "gives life" to their practice. In other words, and in terms of pedagogy, when and why is it most beneficial or positive? This may enable teachers to begin to use pedagogy as a starting point when trying DigiTech.

### ***9.3.1 The factors encouraging teachers to use DigiTech***

The findings presented in the case study chapters suggest that one of the main factors promoting DigiTech use was having (or seeking) a whole school approach to, or 'culture' around, DigiTech. For these teachers, this support was important (or perceived to be important) to help their individual and departmental use of DigiTech, to ensure consistent approaches towards how and why DigiTech was being used in regard to teaching and establishing students' expectations for learning with DigiTech. Ertmer et al. (2015) have suggested that factors such as a school culture towards DigiTech can serve as enablers for DigiTech use (c.f. Ertmer et al., 2006; Vanderlinde et al., 2010). Furthermore Tondeur et al. (2008) found that the development of practice with DigiTech is aided by a supportive organisational culture. Using Sparkes's (1990) terminology, this support is crucial in developing real change as DigiTech underpins the micro-politics of the school (i.e. their orientation or culture). One of the main reasons that change fails to initiate, is because the

individuals of the school are working at cross purposes (or in a negative school culture) (Fullan, 1999; 2007). The findings across the case study chapter highlight that whole school support is a factor that supports PE teachers and departments in their use of DigiTech. This is because it provided teachers with a means to relate their use of DigiTech to the broader focuses of the school and to establishing students' expectations (and value) with regards to DigiTech as a learning device. Whilst this has been highlighted in the educational literature as a pertinent factor in supporting teachers' efforts to integrate DigiTech (c.f. Fullan, 2007; Tondeur et al., 2016a), the findings in this research have also highlighted its importance to the context of PE. These cases therefore, show that regardless of subject context the support of the school serves as a catalyst to promote teachers' use of DigiTech.

In considering factors supporting DigiTech use outside of the school context, many of the teachers sought out ideas and support from social media. Ottenbreit-Leftwich et al. (2010) explains that when teachers' learning experiences are focused on the DigiTech itself (with no specific connection to grade or content areas), teachers are unlikely to incorporate DigiTech into their practices. In considering content specific knowledge regarding DigiTech, Gibbone et al. (2010) explain how many teachers do not know of other educators who use DigiTech or cannot interact with those within their close local networks. The findings in this study do not support this lack of interaction. Patrick and Harriet, in particular, found and experienced content specific uses of DigiTech through their use of Twitter. Twitter was a space whereby these teachers could individually access a broader variety of ideas, contacts, and PE related content. Albion and Ertmer (2002) explain that a factor promoting and influencing a teacher's use of DigiTech can be the visibility of the use DigiTech by other teachers. They explain how this can have a direct effect on an individual's use and behaviours regarding DigiTech (Albion and Ertmer, 2002). For the teachers in this study, a factor influencing and promoting their use would seem to be both in their own contexts (i.e. PE or schools) and online (i.e. on Twitter). Siemens (2005) also supports the suggestion that informal learning environments are becoming a significant aspect of learning experiences in the digital age. Learning now occurs in a variety of ways through both local and online networks (Siemens, 2005). As such, it would seem important to provide teachers with opportunities to access more informal spaces of professional development (such as Twitter) that support their DigiTech use. As Kirk and MacDonald (2001) suggest, it is important that different 'zones of enactment' are recognised as legitimate means through which a teacher may come to recognise the factors

that potentially influence practical possibilities when DigiTech is implemented in their own contexts. This is because sharing meaningful experiences of change (Fullan, 2007) and informal opportunities to learn with and from other teachers are pertinent to supporting ‘real’ and not just surface change (Sparkes, 1990).

Likewise, Armour et al. (2017b) remind us that effective CPD needs to take into account teachers as lifelong learners and that such effective CPD occurs in more than just formalised (and sometime not subject specific) settings. Extending this perspective, Parker and Patton (2017) argue that effective CPD is based on teachers’ needs and interests. In this sense, the teachers in this study developed their own individualised and informal CPD based upon their own and their students’ interest and learning. It is therefore important to promote effective CPD that suits and supports the teacher to gain the information they require so that they can support their learners (Armour et al., 2017b; Parker and Patton, 2017). For these teachers their use of Twitter as a source of professional learning paved the way for more successful pedagogical use of DigiTech. This is because factors related to the characteristics of change involve considering one’s own needs in relation to the importance and relevance of others’ needs (Fullan, 2007). Consequently, it is essential that these spaces are acknowledged as relevant and beneficial sources of teachers’ knowledge and could be used to complement more formal CPD activities.

However, these cases clearly suggest that developing the use of DigiTech involves both successful uses alongside errors or problems. We should not hide from these, but, instead see them as an important part of the learning process for teachers to develop and construct their pedagogical use of DigiTech. It is important, as Erwin (2016) suggests, that teachers are exposed to both the successes and failures if they are to gain a sense of authentic pedagogical practice with DigiTech. This is especially true when getting ideas online. Casey et al. (2015) warn that Twitter can start out as a place where teachers feel they need to only show their ‘best side’. It seems that it is not until a teacher’s Twitter identity as “innovators or big names are more secure, that they can open up and talk about their perceived failures as well as their successes” (Gleddie et al., 2017, p.132; Casey et al., 2015; Goodyear et al., 2015). Thus, it would seem, if one is to use Twitter as a tool or source of CPD then a pedagogical balance must be struck between disseminating information on successes and failure. Such a balance is crucial if teachers are going to be able to develop their own cultures of use.

In working towards achieving their intentions for DigiTech the teachers explained the need to establish consistent routines of practice to ensure that students became familiar with how and why they were using DigiTech. This finding is consistent with research conducted with pre-service teachers in the USA. Jones et al. (2017) found that pre-service teachers indicated that rules and routines of practice needed to be established and reinforced to support their own and students' use of DigiTech. Belland (2009) explains that until new practices are established and routinised, teachers are likely to perceive DigiTech as an additional burden on their time. This seemed to be the case with both Alice and Harriet who had yet to embed DigiTech into their daily routines.

The findings in these cases would also seem to suggest that building DigiTech into routines of practice is not only important for ensuring the teacher becomes more efficient and knowledgeable in the use of DigiTech but, also that the students become familiar and aware of its use and role for teaching and learning. The cases reported here illustrate that without these routines, even the best of intentions or ideas become difficult to implement. As a result, it is important that teachers are clear about their expectations and uses of DigiTech and ensure that use becomes consistent.

In addition, to school support, Patrick had regular access to devices and, many of the practices he used in PE were embedded and supported across the school. This finding is supported by the work of Ottenbreit-Leftwich et al. (2010) who found that teachers who had regular access to DigiTech or worked within a school where the culture has already redefined teachers' and students' roles regarding DigiTech, were able to take immediate advantage of these resources. An example from this study of students' roles were the 'digital leaders' at Patrick's school. These were students who were positioned as valued sources of knowledge and who provided support to both teachers and students alike. However, despite Dillon, Harriet and Alice's lack of a whole school approach to DigiTech or dedicated roles for students, they found support (from others online or their students) when embedding their own strategies to promote their pedagogical use of DigiTech. Therefore, whilst a whole school approach or culture towards DigiTech was important, these were not the sole arbiters of successful DigiTech use. Establishing routines, for example, explains how each teacher either used or aspired to use DigiTech within routines of practice despite (in Dillon, Alice and Harriet's case) a lack of school wide support. DigiTech use was ultimately driven by the teachers' desire to provide some form of structure to their use of DigiTech. These routines

included supporting communication or establishing expectations of use. Fink and Siedentop (1989) suggested that routines of practice allow for the smooth operation of the classroom without excessive attention being afforded to managerial or behavioural problems. For Patrick, routines of DigiTech use provided consistent messages for students and teachers in regard to expectations regarding the use of DigiTech for teaching. Thus, Patrick spent less time managing its use in subsequent lessons. When considering the findings in these cases, Harriet and Alice spent considerable time when beginning to establish routines and consider the management of their devices. As mentioned above, these reflections served as valuable practices to promote their use of DigiTech to support teaching and learning and to ensure that their use of DigiTech was driven by teaching and learning and not the device itself.

The theme of keeping tasks simple was also represented across cases and demonstrated how DigiTech was often used in simple and small ways to support teaching and learning. It involved identifying areas whereby DigiTech could be most impactful, such as a short online assessment, a video replay of their performance or a voice recording capturing what students had learnt. Despite the simplicity of some of their uses, there was a consensus that these simple things had the most impact on their teaching (i.e. summarising key points or delivering key information) and students' learning (gauging students' understanding or allowing them to verbally discuss their work). Often these uses were made relevant to the context by providing meaningful opportunities to support learning (for example whilst students were getting changed or used in students' rest periods). Casey et al. (2017a) similarly found that it is important to keep (or make) ideas simple if they are to stick and impact on the practices of others (i.e. students or other teachers). This may be because complex uses of DigiTech, as expressed by Patrick, can create more challenge and can detract from students' learning.

Golding (2000, p.171) suggests most forms of DigiTech allow "existing social action and processes to occur more speedily, efficiently or conveniently", rather than enabling wholly new practices. Keeping their uses of DigiTech simple enabled these teachers to make what Selwyn (2016) calls 'improvements' (i.e. improving learners by getting them engaged, motivated or able to learn explored in the tool for engagement subtheme). DigiTech acted as a "catalyst and facilitator of these changes" (Selwyn, 2016, p.7). Arguably, DigiTech did not transform or revolutionise teachers' practice, but showed us how they are experienced 'on the ground': i.e. in practice or *in situ*. In order to seek to sustain these simple uses of DigiTech

(i.e. as a tool for engagement) it seemed pertinent to use DigiTech consistently and to seek broader school support if they are to be sustained and continue to benefit from the use of DigiTech. However, in beginning to develop one's pedagogical use of DigiTech it also seems important to build simple routines and consistency into the "local context" (Somekh, 2008, p.454) that can also be defined at an individual and departmental level. This is in control of the teacher and can aid in promoting the use of DigiTech.

### ***9.3.2 The role of the school in shaping DigiTech use***

The role of the school, in terms of its views and use of DigiTech, was important in shaping the teachers' DigiTech use. Schools are spaces of possibility that support and encourage new ideas and which quickly draw teachers towards the centre of practice (Rossi et al., 2015). Tondeur et al. (2008; 2016a) posited that the DigiTech policies and the views of a school have a significant effect on an individual's use of DigiTech. From the findings presented in this study, the perceived support offered by the school was important in shaping the teachers' use of DigiTech. In Patrick's case, the school had embedded a DigiTech strategy into teaching and learning. As such, there were established and consistent pedagogical strategies that teachers used to guide their use of DigiTech in their specific subjects. It has been demonstrated elsewhere that a positive school culture towards change can contribute towards support for the individual teacher and, ultimately, real change (Fullan, 2007; Patton and Griffin, 2007). Patrick reflected that the culture of DigiTech use in the school meant that implementing changes in his own practice or department was quite simple. This was further supported by a 'whole school policy' towards DigiTech which has also been shown to support and shape a teacher's use of DigiTech (Tondeur et al., 2008). In essence, Patrick's case represented a culture whereby from the top (i.e. the school) right through to the department and his individual use, DigiTech was integrated into teaching and learning.

However, this was not the case for Dillon, Harriet or Alice. Whilst all were supported in the sense that they were able to adopt individual approaches to using DigiTech, they all felt that, in order to develop and sustain their use of DigiTech there was a need for broader school support. The school therefore, was seen as vital in shaping their potential to use DigiTech in PE. These findings are akin to the broader educational literature which suggests that most teachers lack organisational support to integrate DigiTech effectively (Fullan, 2013) and,



under such conditions, teachers can fail to think pedagogically about DigiTech (Casey et al., 2017a). Therefore, a lack of school support can impact on an individual's DigiTech use (Kretschmann, 2015; Villalba et al., 2017) and provide a powerful mediating factor in inhibiting teachers' attempts to change, learn and develop (Casey et al., 2017a; Fullan, 2013).

On a more encouraging note, these cases provide a different perspective to that of Fullan's (2013). Dillon, Harriet and Alice's schools did not have a structured approach or school culture to using DigiTech as a teaching and learning strategy. However, these teachers were willing and able to begin to create their own individual cultures that, whilst they may not have broader impact beyond their department, did support their teaching and their students' learning. These cases are also examples of teachers driving the use of DigiTech whilst, in some cases, finding support from top down initiatives driven by the school. It seems that developing and sustaining the use of DigiTech occurs when *both* 'top-down' support (i.e. whole school approaches to DigiTech) and 'bottom-up' support (i.e. drive and interest from the teacher) are employed (Macdonald, 2003).

However, there is a need to develop a more rounded understanding of the links between teachers' values, beliefs and practices regarding DigiTech and the different individual conditions they face within schools (Perrotta, 2013). Given the significance to sharing practice as a form of development (discussed by both Patrick and members of staff from his school) perhaps, as Casey et al. (2017b) suggest more effective school support could come from a more collaborative approach. These authors suggest that a more effective form of professional development for teachers could involve early adopters and those who are yet to use DigiTech being able to work together (Casey et al., 2017b). The ambition, in their eyes, would be to support both groups to challenge the views of the other, from the starting point that neither is inherently 'correct' (Casey et al., 2017b). Through the support of the school teachers could work towards the establishment of spaces where sharing knowledge of pedagogy or successful practices with DigiTech could occur. Such discussions have the potential to support teachers' practice with DigiTech. This would also ensure that the individual teacher's knowledge as a learner and a teacher is supported by considering and reflecting upon the points of view of others in different subjects who hold different views or at different career stages. Fullan (2007) suggests that if we can constantly remind ourselves that educational change is a *learning experience for the adults involved* (i.e. the teachers), as well as for the students, we go a long way towards understanding the dynamics of the factors

of change. As has been a common theme in this discussion, this may occur on a localised context, but given the uses, experiences and developments in these teachers' practices, it is clear that the desire and drive to do something differently can be a good starting point for enacting further change in terms of school support.

### *9.3.3 Summary*

In exploring why DigiTech was used by the teachers, and therefore, the intentions and rationales behind this use, it was apparent that these teachers used DigiTech because they wanted to, not because they were required to by their school, curriculum, or department. Changes associated with DigiTech are not inevitable and these teachers clearly believed in the value of DigiTech to meaningfully contribute to students' learning in PE. Given this belief and beneficial outcomes of their use (such as students' engagement, increasing time for PE and their ability to connect school PE to both their own, and students' life experiences) it is important that these views are shared and made apparent to both the school and other teachers. When shared on a broader-scale, teachers can begin to develop their cultures of use and may be able to increase their own and others' use. As such, it is important that we focus on both the 'big' or 'global' (i.e. the context of DigiTech change) and 'little' or 'local' (i.e. the teachers' reality in the classroom) pictures in order to fully appreciate both how and why DigiTech is used.

Fullan (2013) reminds us that the most effective source of help or ideas for teachers tends to be other teachers. Therefore, being able to articulate their rationale for using DigiTech and sharing this with others is important. Indeed, as Selwyn (2014a) argues, genuine individual benefit with DigiTech tends to depend on a sustained sense of collectivism. We have seen that the factors that support and promote these teachers' use of DigiTech are perceived school support, a whole school culture of use and the need to establish consistent expectations and routines of use. Those strategies that are successful with teachers become routinized and allow teachers to feel relatively secure in the classroom (Sparkes, 1990). By focusing on the individual and maintaining a perspective of the "wider picture beyond the immediate concerns of the technological artefacts themselves" (Selwyn, 2011a, p.163) it is hoped that both the individual and others can gain a more holistic understanding of DigiTech and make more sense of why DigiTech might or might not be used pedagogically. As Selwyn (2011c)

argues it should also be possible to make better sense of how technologies may be ‘better’ used in the future in line with one’s pedagogical outcomes.

Other factors coming to the fore for these teachers focus on the ‘milieu’ that surrounds and underpins a teacher’s DigiTech use in PE. They are what Selwyn (2011a) describes as the “here and now realities rather than future possibilities and potentials” (p.177) that influence why DigiTech is being used. It shows schools are not the sole arbiters of DigiTech use. That said, a school’s perception of DigiTech is a key factor when it comes to the possibilities regarding how DigiTech is developed, constructed and given meaning for both teachers and students.

Teachers’ reasons for using DigiTech usually relate to their beliefs that DigiTech can address important teaching and learning needs (Zhao and Frank, 2003). Zhao et al. (2002) and Ottenbreit-Leftwich et al. (2010) present an example that is similar to the case of Alice and Harriet. For example, teachers may find that using DigiTech to communicate and prepare for instruction addresses their most immediate needs, while other activities such as student-to-student communication or student inquiry are best served through face-to-face-activities (Zhao et al., 2002). For Harriet, DigiTech use such as the camera on her tablet, supported her students to capture and verbally assesses their work. In this sense, DigiTech may not have enabled them to do something radically different, but it did allow them to record this information more efficiently and effectively. Their use of DigiTech did not (and was not intended) to “change the nature of instruction” (Herrington et al., 2008) but, to support their teaching and students’ learning. Thus, the reasons why DigiTech is used does not have to create new practices or pedagogies but can, simply, be used to support outcomes such as communication. Therefore, acknowledging and promoting uses of DigiTech that align with teachers’ intentions and valued beliefs can work towards supporting teachers to use DigiTech that supports learning and can be beneficial and relevant to one’s context.

The previous sections have discussed the key findings presented across the case study chapters in relation the research questions and literature. In the final section I use the concept and literature around the concept of ‘pedagogies of technology’ as an analytical concept through which to discuss the overarching findings across the cases.

### 9.4 A pedagogical approach to DigiTech

In considering pedagogy as a conceptual platform, Casey et al. (2017a) argue that whilst acknowledging the power and importance of the largely negative and pessimistic views that have prevailed in the literature in relation to DigiTech and pedagogy (c.f. Gard, 2014; Lupton, 2015; Williamson, 2015), an alternative view can be presented that considers the value that a pedagogically driven approach to the topic of DigiTech in PE could offer. This discussion has sought to extend these conversations not only in appreciating the value of DigiTech for PE, but also in considering both the development and construction of DigiTech as a pedagogical process. Casey et al. (2017a, p.6) define pedagogies of technology as:

Pedagogies of technology are critically aware and technically competent pedagogies that can be developed in practice to maximise the latent potential of technologies to accelerate learning in meaningful ways that meet the individual needs to diverse learners. The starting point for a pedagogy of technology is a desire to do something differently, rather than to do the same things using ‘flashy’ tools and gizmos.

Using this definition as a basis for this conclusion, I return to some key points from this definition which is highlighted below in italics.

The case study teachers in this study did not represent unity in their perceptions of how or why to use DigiTech pedagogically. In fact, from these teachers’ experiences it would seem that there is no one method or “one size fits all solution” (Selwyn, 2016, p.159) in which to use DigiTech pedagogically. As Levin and Wadmany (2005) indicate, educational change involving DigiTech is an individual process, unique to each teacher. Whilst this study can therefore, not provide a perfect recipe for the pedagogical use of DigiTech, it can provide possible tenets of a pedagogical approach to DigiTech based upon this definition.

The teachers showed that their *critical awareness* of DigiTech was informed by developing a culture of trial and error in which to develop their pedagogical practice. Furthermore, their critical awareness of DigiTech positioned it as a learning process. They were aware that to be able to develop their DigiTech use, they needed to be willing to trial it in the classroom and critically reflect on what they (and their students) had learnt from its use. Furthermore, we see from these case study teachers that their pedagogical use of DigiTech had been *developed* (or was developing) *in practice*. This involved trial, error and reflection to ensure that their uses of DigiTech were contributing towards their pedagogical intentions. These practices

took considerable time to not only develop but, in some cases, to initially begin to see the value. In support of their uses of DigiTech, the teachers sought to develop (and over time come to establish) routines of practice that ‘worked’ for them. It was only through this process that the teachers began to *maximise the potential for DigiTech to aid student learning*. On the whole, the teachers’ use of DigiTech was focused towards students’ learning. Keeping tasks simple was a strategy used to support their use of DigiTech and to ensure that the learning intentions for the students were not lost. In meeting the needs of *diverse learners*, variety in the methods of DigiTech use and identifying factors lending to DigiTech use ensured that the use of DigiTech could be tailored towards the learner and the learning environment. Consistency in terms of culture, approaches and routines was key, but having the flexibility and awareness to adapt their approaches when it was appropriate was representative of a pedagogy of technology.

Casey et al. (2017a) state that the starting point in developing pedagogies of technology is the *desire to do something differently*. It was clear that all these teachers exhibited this desire to do something different in their practice. Arguably, whilst these teachers had not fully formulated a pedagogical approach to DigiTech, their desire to use DigiTech towards learning differently is representative of a notion that they were developing along a pedagogical path to DigiTech.

Through these cases we have become increasingly aware that achieving the goal of ‘meaningful’ and pedagogical DigiTech use (i.e. using DigiTech to support teaching and learning) does not depend solely on DigiTech related factors (Ertmer, 2005; Tondeur et al., 2008). Teachers’ personal pedagogical beliefs play a key role in the pedagogical decision-making regarding whether and how to integrate DigiTech (Prestridge, 2012; 2017). As Levin and Wadamy (2005) have documented, change in beliefs is primarily an experientially-based learning process for teachers. At times, it can be argued that these teachers may have seen their developing use of DigiTech as an uneven learning process; one that involved both attempting ideas and experiencing difficulties. However, this does not mean that is not pedagogic.

Thus, in moving towards a pedagogical approach to DigiTech use in PE, it is important to consider the pedagogical framework of teachers and teaching, the learner and learning and the knowledge in context (Armour, 2011). In considering teachers and teaching; these cases

showed how teachers made different choices in terms of the content and form of DigiTech based on their values and interests, the simplicity of the device for them to use, and their ambitions to engage and support their students' learning. Fletcher et al. (2017) remind us that DigiTech are tools that are drawn upon by teachers when they are most appropriate. In the same vein, if a situation would best be served by not using DigiTech then that is still a pedagogical path taken (Fletcher et al., 2017). Therefore, DigiTech cannot be viewed narrowly in terms of those who use and those who do not use it. This overlooks a key pedagogical decision.

For the teachers and their teaching, this research has shed light on what Becker (2000) describes as allowing teachers to define what makes DigiTech integration meaningful to them. Thus, rather than expecting DigiTech to change the nature of teaching and learning, it may be beneficial to help teachers use DigiTech to enhance teaching (and learning) in ways they see fit (Ottenbreit-Leftwich et al., 2010). Ottenbreit-Leftwich et al. (2010) explain further how teachers' values regarding DigiTech integration are rarely included in conversations on their effective educational DigiTech practices. Thus, if teachers' values continue to be under-represented and teachers continue to be labelled as incapable of effectively integrating DigiTech as the literature reviews suggests (c.f. Perrotta et al., 2013; Orlando, 2015; Underwood and Dillon, 2011) this may have an impact on their professional development in regard to DigiTech and their beliefs of their own practice. Instead, as Rink (2009) puts forwards, we need to focus upon the nature of the teachers' pedagogical processing to really understand what is happening and what is valued in terms of their teaching with DigiTech, not merely the products of the process (i.e. the DigiTech or student outcomes) in order to 'effectively' teach with DigiTech.

In focusing upon the learner and their learning (which in this case focuses on the teacher and their developing use of DigiTech) one might question "does the teacher require specific information on how or why to use DigiTech?" The answer is, not always. That said, sometimes finding an idea through Twitter, sharing ideas of where and why DigiTech had worked, or identifying pedagogical frameworks such as flipped learning to optimise physical activity time support teachers' use. These case study teachers, in different ways, demonstrated that their engagement and belief in DigiTech drove their development. Yet, more informal processes such as reflection, establishing routines and consistency were

factors that supported their understanding of what would work in their teaching, contexts and for their learners.

In positioning the knowledge in context, for these teachers it became apparent that because the application of the DigiTech occurred in the classroom, the teacher tended to learn through their use of DigiTech *in situ* through the process of trial and error. Whilst they could trial this use themselves, or in their own time, the problems of transferring this into a classroom setting were minimised when they gained knowledge in practice. They began to distinguish that they needed to have clear expectations and routines of use, keeping tasks simple so that how and why DigiTech was being used was clear and reinforcing these messages through developing their embedded culture of use.

When viewing teachers' DigiTech use from this pedagogical perspective, we have a better way to build a knowledge base that changes our focus to the perspectives and rationales that underpin how and why DigiTech is viewed and used rather than recycling the message of specific pieces of DigiTech. This allows us to get to the crux of understanding the use of DigiTech in PE. From an AI perspective this means not judging or evaluating it as being right or wrong but understanding it and the value it offers in certain contexts. After all, as Rink (2009) suggests,

You don't want to know simply that something works – you want to know why it works and how it works in different conditions. Knowing why it works and how it works allows you to develop pedagogy that is consistent with that why (p.162).

Involving pedagogies of technology in these discussions is, therefore, important if we are to understand the choices behind teachers' use and help them to make more informed decisions that are more personally, pedagogical in nature.

### 9.5 Conclusion

The findings of this research have foregrounded teachers' perspectives in terms of exploring their views of how and why they use DigiTech in PE. It has highlighted the importance of how teachers' views and beliefs regarding the value of DigiTech, and their desire to bring the benefits that they have found in their own experiences into the classroom has driven their current use. The value given to DigiTech was situated around its ability to engage students, to

support their learning and physical activity, and connect students' learning to its broader context. Whilst the teachers' views and rationales were important in dictating their use of DigiTech, there were large varieties in their respective uses. More importantly, however, were the underpinning approaches as to why they believed they have been able to develop and construct their uses of DigiTech. Pedagogical reflection, simple uses, establishing expectations and routines, consistency, trial and error and perceived support all played an important role in supporting the use of DigiTech towards, what they believed, were meaningful learning experiences for their students. Furthermore, the role of the school was discussed as an important catalyst in shaping DigiTech, but it is important, at an individual and practical level, to create one's own and more localised cultures and routines of use with DigiTech. Thus, whilst understanding how DigiTech is used is important, it is vital to focus on how these practices continue to be influenced, supported and structured in order to understand how they are developed and sustained.

It was further argued that, by using a pedagogical analysis and pedagogy as the starting point to consider the use and rationales of DigiTech use, we can begin to unpick and formulate future ways in which DigiTech use can support the delivery of PE. If we continue to focus on pieces of DigiTech instead of their pedagogical underpinnings, then we are in danger of re-enforcing *gimmicky* uses of DigiTech that are in danger of continuing to put the 'cart before the horse'. "We need to intervene with educational ideas, not simply technological ones" (Watson, 2001, p.264).



## Chapter Ten: Conclusion

### 10.1 Introduction

In concluding this thesis, it is important to revisit what I set out to achieve. My starting point for this study was the desire to develop our understanding of PE teachers' views, experiences and practices with DigiTech. Specifically, I sought to understand the pedagogical use of DigiTech from the teachers' perspective, which included the factors and experiences that influence how and why PE teachers use DigiTech.

In line with these aims and following my review of the literature, I developed the following research questions.

*(RQ1) How do physical education teachers view and use digital technology in their practice?*

How are these practices developed and/or sustained across their careers?

How do an individual's views and experiences of digital technology shape the use of digital technology in the school context?

*(RQ2) Why do physical education teachers use digital technology in their practice?*

What are the factors that prompt PE teachers to use digital technology?

What role does the school context play in shaping teachers' digital technology use?

Throughout the literature review, I demonstrated the need for a better understanding of how PE teachers view and use DigiTech in their practice and the factors that contribute to DigiTech use. I identified a gap in the literature in terms of the focus on pieces of DigiTech, rather than a focus on the pedagogy behind teachers' use of DigiTech. It was argued that research, in regard to teachers' knowledge and beliefs regarding DigiTech, had persistently focused on the barriers of DigiTech use and viewed teachers as "the problem" (Orlando, 2015, p.52). I argued that there was a need to move away from documenting the barriers to, and problems with, teachers and their DigiTech practices; focusing instead on the pedagogy behind the teachers' use of DigiTech and those factors that enable and, support a teacher's DigiTech use.

## Chapter Ten: Conclusion

Having established a ‘gap’ in the literature, I then provided an overview of AI in chapter three, which I positioned as a philosophical approach that would help me to explore the topic of PE teachers’ views and use of DigiTech. This chapter discussed AI a lens through which to appreciate teachers’ negotiations with DigiTech in PE and pedagogy. Chapter Four justified the use and appropriateness of a case study approach and the use of a constructivist grounded theory when seeking to understand the teachers’ DigiTech use from their own perspectives.

Predominantly focusing on the findings chapters (5, 6, 7 and 8) and the discussion, the purpose of this conclusion is to consider how the key findings helped me to address both the research questions and aims I set out to explore. Primarily, it discusses how the findings can inform practice and research in terms of a contribution to knowledge, whilst allowing me to reflect on the research process and, finally, consider future directions for research and practice.

In keeping with the notion of AI, it seemed appropriate to structure the conclusion by using the terms synonymous with this approach. I have, therefore, structured this chapter by utilising the AI constructs of discovery, design, dream and destiny.

**‘Discovery’** – the key findings and what has been explored and ‘discovered’ in terms of our understanding of PE teachers’ views, experiences and practices with DigiTech.

**‘Design’** – implications of the findings on research and practice, alongside some critical reflections on the research process.

**‘Dream and Destiny’** – considering future directions for research and practice.

### 10.2 Discovery – what gave ‘life’ to PE teachers’ use of DigiTech?

In seeking to answer how and why PE teachers view and use DigiTech, we learnt, perhaps unsurprisingly, that - while both teachers’ views and beliefs regarding DigiTech differ - these change over time, especially in regard to DigiTech use and maximising students’ physical activity time. Teachers valued DigiTech when it could help them to achieve specific educational aims such as physical activity, engagement or communication. They viewed DigiTech as a tool to support students’ learning and sought to use DigiTech in line with these beliefs. Significantly, teachers used DigiTech because they wanted to - not because they had to.

In considering what contributions to knowledge this study has made, we have learnt that it is important to acknowledge that there are a number of factors that are influential in impacting PE teachers' DigiTech use (Hammond, 2011). DigiTech, for many teachers, is viewed as a device that can enable them to work towards “doing something differently” (Casey et al., 2017a, p.6) especially with regard to student outcomes such as engagement (c.f. Casey and Jones, 2011, Hall, 2012, Goodyear et al., 2014a and Hastie et al., 2010), to provide relevant learning experiences and to enhance communication. However, we gained more insight of under-explored uses of DigiTech such as ‘flipping’ students’ learning in line with teachers’ beliefs to maximise students’ physical activity time. This is particularly pertinent, given the desire to maximise the limited time allocated in the curriculum to PE (some of which is inevitable lost in the changing rooms) and the perceived need for students to be physically active in lessons (Cale et al., 2016). Indeed, the use of DigiTech in conjunction with flipped learning closely aligns with many teachers’ views regarding the purpose of school PE, i.e. to maximise in-class physical activity time (McEvoy et al., 2017).

Overall, we have learnt that teachers value, and are largely positive about their use of DigiTech to enhance students’ learning. Whilst all the case study teachers experienced barriers, the process of trial and error with DigiTech helped them to view these experiences as more of a learning process, rather than as something that impeded their progress. They were reflective and, through reflection, saw simple strategies they could implement that would help them to develop and sustain their pedagogical use of DigiTech. The promising findings of this research suggests that, whilst not all of the teachers experienced the broader culture of DigiTech in their schools, developing an individual culture of use (c.f. Tondeur et al., 2016a) involved a desire to use DigiTech pedagogically and a willingness to develop and sustain use through routines of practice such as reflection and idea generation, via Twitter.

This research provided examples and insights into PE teachers’ use of DigiTech, such as iPads, apps, videos and social media. We also saw how such pedagogical practices are developed through routine use, consistency and finding simple ways of supporting students’ learning. In turn, this simple use of DigiTech allowed teachers to develop their own, and students’ comfort when using DigiTech. Developing practice with DigiTech involved a sustained sense of *in situ* autonomy. This sense of teacher autonomy largely occurred through

a process of trial and error. That said, a crucial step in this developing autonomy was teachers' pedagogical reflections around what they believed students were learning and identifying how these pedagogical and technological ideas could be enhanced. This was expedited by feelings of support by a school culture that allowed developmental and experiential learning processes to occur.

In moving towards meaningful DigiTech use (in terms of teachers and their teaching, students and their learning and the knowledge in context, Armour (2011)), it was considered how moving towards a pedagogical perspective of DigiTech use in PE makes greater contributions to the furtherment of our knowledge and understanding of teachers' use of DigiTech in PE. This is because it allows us to build a knowledge base that changes our focus to the perspectives and rationales that underpin how and why DigiTech is viewed and used, rather than recycling the messages about specific pieces of DigiTech and/or the barriers to use.

In an attempt to not be “dazzled by the tech wizardry and focus instead on the ways in which digital technologies can be used by practitioners” (Casey et al., 2017a, p.1) it is important to recognise that many ideas for future uses of DigiTech never come to fruition. It is not my intention in the section that follows to prescribe or predict specific future uses of DigiTech for PE teachers. However, I do suggest some broad ideas based on this study for both practice and research that may initiate new thoughts or learning pathways.

### **10.3 Design – questioning, what could be?**

This study has focused on four PE teachers and their schools in England. Therefore, the findings from this study cannot be too broadly generalised. However, this was not the aim of this research and goes against the epistemological tenets of the constructivist paradigm: which cites that one's understanding of reality is viewed to be relative to their context and experience (Guba and Lincoln, 1994; Markula and Silk, 2011). Nevertheless, it is hoped that the depth and detail of the teachers' views lend themselves to “naturalistic generalisations” (Stake, 1978, p.6) across other PE teachers' experiences in the UK and beyond. In this sense, the findings may offer possibilities and reflections that may resonate with the reader when examining and appreciating their own approaches, practices and contexts.

### *10.3.1 Implications of this research for practice*

The aim of this research was not to judge ‘good’ or ‘bad’ teaching with DigiTech. Nor, was the study an attempt to present current teaching practice as something to be ‘fixed’. These teachers were already using and aspiring to use DigiTech in ways that would increasingly support students’ learning. Conversely, the aim was to document and understand how and why DigiTech had been used towards what the teachers believed were meaningful pedagogical ends. A number of interrelated implications for practice and research emerge from this study as explored below.

Firstly, the main implication of this research, in terms of teachers’ practice, is considering the pedagogical processes that occur prior to using DigiTech. One may see that these case study teachers began the process of using DigiTech by identifying, articulating and providing expectations of how or why to use DigiTech. This allowed these teachers to consider DigiTech in relation to students’ learning, their own teaching and learning and their specific context. In addition, it seemed that if these practices can be shared with others (i.e. students, members of staff, IT managers etc.) then one may be able to formulate more progressive, pedagogical and productive ways to use DigiTech in their teaching. This is a development unique to each individual, but if one is interested in DigiTech and has the desire to try something different. then pedagogical decision-making needs to be the starting point.

Developing a pedagogical approach to DigiTech use would seem to involve trying out DigiTech ideas (both at home and in practical contexts) and being aware that this is an on-going learning process involving both trial and error. As Patton and Griffin (2007) highlight, teacher change can seem to be driven by experimenting with new practices, which may lead to a change in teaching approaches or beliefs. Whilst the importance of trial and error has also been shown in other work (Ertmer et al., 2012; Hennessy et al., 2003; Ruggeiro and Mong, 2015 and Levin and Schrum, 2013) this research has provided new ideas regarding the uses of DigiTech, what teachers’ use of DigiTech allows them to achieve, and how the use of DigiTech can be developed in practice (e.g. through trial and error, reflecting upon routines of practice and trying out ideas outside of the classroom). If teachers can reflect on their uses of DigiTech in terms of their teaching, students’ learning and their curriculum context, then

## Chapter Ten: Conclusion

their engagement with DigiTech can be seen as a learning process. Subsequently, they can seek to identify areas to question, plan, organise and hopefully respond to emerging circumstances when using DigiTech.

On an individual level, this research has implications for teachers/practice in considering what cultures of DigiTech use, specific to their “local context” (Somekh, 2008, p.454) could be considered (or built) in order to enhance their own and students’ familiarity and comfort with DigiTech. In some cases, this could simply be identifying contexts in which DigiTech by itself could be used to enhance student learning and engagement (including those students who are not actively taking part in the physical performance). This could also be extended by exploring informal spaces such as Twitter as a possible platform to gain ideas, reflect on what others have attempted and to extend teachers’ professional networks. With Twitter being increasingly used by PE teachers as an informal source of professional development (c.f. Carpenter and Krutka, 2014; Goodyear et al., 2014b; Harvey and Pill, 2016) it is important that there is acknowledgment of, and access to, more informal or less structured forms of CPD. Teachers can use these spaces (both inside and outside the classroom) to develop how and why they might attempt to use DigiTech. It is equally important that, if this is to be used as a source of CPD, practitioners are open to sharing information about their trials, errors and reflections (in terms of pedagogy), as this information is likely to be the most use to others. This, in turn, would also help practitioners to stay up to date, to feel connected to their local communities and to find simple strategies that they may attempt to adopt in their local contexts. If, as Casey et al. (2017a) suggest, we can begin to position ourselves as learners and build this into routines of use, then this could be a stepping stone in sustaining pedagogical development.

In reflecting on my own practice as a researcher, I believe that this study has changed my perspective of DigiTech, particularly with regard to recognising its multifaceted nature and potential to support the delivery of PE. This study has allowed me to observe the practical application of teachers’ DigiTech use; some aspects of which I had not previously considered. Seeing the value they placed on DigiTech has prompted me to consider my own uses in future teaching practices, such as flipped learning, video feedback and the development of learning resources. I have endeavoured to write in an interesting and accessible manner about teachers’ real-life experiences with DigiTech which, I hope, other

teachers can identify with. Nonetheless, if I was conduct the study again I would consider the opportunity to conduct larger observations of practice to support some of the teachers' reflections of their practice. In addition, I believe that conducting focus groups with the teachers in this study, and with other colleagues/voices at each school, could have been an interesting and worthwhile practice in order to support discussion and the elaboration of knowledge. My future research endeavours will, as a result of this study, seek to (1) be open to the wide possibility of uses (i.e. through seeking to understand and appreciate one's practice), (2) spend longer 'in the field' to observe and make sense of the 'milieu' of DigiTech use and (3) seek the perspectives of different voices – especially those of pupils.

### *10.3.2 Implications and reflections for future research using AI*

In order to construct these findings, the principles of AI enabled this research to focus on appreciating the teachers' (and others' in their school) perspectives on how and why they believe DigiTech 'worked' for them. It provided the 'frame' or 'scaffolding' to structure the application of a case study methodology. The case study methodology allowed a focus on contemporary and real-life experiences through a variety of sources and captured, how and why teachers viewed and used DigiTech. Given that many of the messages provided by the literature focus on the barriers of DigiTech integration, it is important, as Villalba et al. (2017) suggest that, we also promote positive attitudes and perspectives towards this area. AI is, therefore, an important means of exploring "what gives life" (Bushe, 2010, p.235) to different practices and being able to identify the starting points for further change. In the cases of Harriet and Alice in particular, AI allowed me to appreciate the ways in which they had experienced some success and the elements of practice with DigiTech that worked. A different perspective may have emphasised the limits in their approach and suggested that they were beset with barriers. Metaphorically speaking, AI allowed me to 'shine a light' and 'put under the spotlight' the factors that already supported their use of DigiTech. Thus, it provided insight into a significantly under-researched aspect of teachers' pedagogical use of DigiTech.

Casey et al. (2017a) state that we must be brave in the ways we think about pedagogy and DigiTech. As some of the teachers in this research identified, this also involves being forward thinking, being prepared to take risks and recognising that development involves both trial

and error. These are messages that this research sought to take on board and the approach certainly spurred me to reflect upon the ways in which I had previously approached questions from a negative perspective. I would argue that I tend to approach many areas of my life, not just in a research setting, with a negative outlook. Questioning, perhaps, what could go wrong, pre-empting issues or, metaphorically speaking, seeing a 'glass half empty'. AI has allowed me to consider my own viewpoint and how this can, at times, render me temporarily blurred to the optimistic or beneficial aspects. Being mindful of the AI philosophy and its principles in my personal life and future research, is an aspect of this study that I will take forward. Thus, given the generative potential of AI to move away from such barrier focused agendas, it is important that more research explores this approach to provide a counteraction to dominant narratives and ways of framing the research we compile (Enright et al., 2014).

Using the principles and ideas of AI enabled me to explore the views and experiences of PE teachers in a way that was reflexive of the issues, barriers or problems that the teachers encountered. It did not seek to ignore or silence these perspectives but, instead, focused on seeing the detail behind the ways that their practice had been initiated, developed and supported. In using this approach and guiding participants to reflect upon their practice in this way, several reflective comments were made by some of the teachers in this study. Alice commented on how she had realised that some of her practice with DigiTech worked well and had benefited her practice. However, in her current situation, she had not reflected upon those successes nor sought to replicate this practice in other lessons. Through our conversations, she had begun to identify how and why this had worked in the past and commented on how this was something that she wanted to attempt again. Conversely, through reflecting on the need to ensure students understand the purpose of their DigiTech use and responsibility for the devices, Dillon created a new student role which he called 'digital managers'. The students' roles as a 'digital manager' involved setting up pieces of DigiTech prior to the lesson and managing videos for reflection or flipped learning tasks. This change in Dillon's practice was not an anticipated aspect or intention of our discussion. Yet, Dillon felt that through our discussion he had further identified outcomes he wanted to achieve and how he had been supported in previous scenarios; this was a DigiTech change that would enable him to attempt to reach this expanded goal. The impact of my research may, therefore, stretch beyond what is reported in this thesis.



## Chapter Ten: Conclusion

Importantly, there are some significant areas to critically reflect upon. Given the dominance of deficit narratives in educational research exploring teachers' use of DigiTech (e.g. Perrotta, 2013, Orlando, 2015), AI may be a pertinent philosophy or approach with which to counter some of these narratives. In addition, the sparsity in educational research using AI to examine teachers' practice (as highlighted by Gray et al., 2017) means that there are even fewer critical reflections on its use. Adopting a seemingly paradoxical perspective of critique, as Grant and Humphries (2006) suggest that it is important to both evaluate AI in order to provide a deeper insight into the use of the approach and to consider our future research endeavours.

AI (and case study) as a tool sought to reveal the complexities of these teachers' experiences, by focusing on the factors that support, enable and shape their practices. However, as is the case with most research, I chose how to present the individual stories and chose which data to include and exclude. I also had control over the questions that were asked and the ways in which they were asked. I focused on 'appreciating' the teachers' practice in line with my aims, but I also attempted to include the "negative stuff" (van der Haar and Hosking, 2004, p.14). For example, the experiences regarding accessibility and problems that the teachers initially experienced. Yet, it was particularly interesting that, even though the teachers were aware of the research focus and had been asked to reflect on why they believed a particular practice had been successful, many of their answers used a negative as a starting point. As such, AI did, at times, feel a little unnatural to both myself and the teachers. On reflection, it seems important to strike a balance between introducing the concepts and focus of the research to teachers, whilst also allowing them to speak freely about their experiences. Thus, being able to use AI as a starting point whilst "maintaining a momentum for change" (Michael, 2005, p.229) for both the researcher and the teacher may, therefore, require us to reflect upon our own, enduring ontological and epistemological perspectives.

In addition, Grant and Humphries (2006) and Ridley-Duff and Duncan (2015) challenge researchers to use critical theory and AI. In combining the two, they suggest, as a field, we may begin to better understand not just how AI develops in research, but also the knowledge and power influences which might be negotiated as the process unfolds. This may not only allow for a deeper understanding of teachers' practices with DigiTech from a greater variety of perspectives but, also, deepen our investigation of the research process itself. By treating

the apparent contradictions of AI and critical theory as a paradox, Grant and Humphries (2006) argue that we can begin to explore the potential of both perspectives and tensions rather than allowing ourselves to be constrained by them. As such, I think this is a fruitful combination to be explored in future research as it has implications not only for what we seek to know, but also how it came to be.

### **10.4 Dream and Destiny – what could change and how could this be done?**

As teachers are key actors in the use and development of DigiTech in PE, “there is a need for further study to obtain evidence regarding the influence of teacher beliefs on their use of technology in pedagogical practices” (Jääskelä et al., 2017, p.209). Thus, future research could provide a deeper exploration into teachers’ intentions and the impact of these intentions on students’ learning; Casey et al. (2017b) suggested similar future research avenues. Such studies, as this research has begun to articulate, should focus on identifying and describing the key elements of teachers’ on-going mastery of DigiTech, their knowledge construction and, the strategies they and their schools use to develop and sustain their pedagogical use of DigiTech. The themes regarding cultures of DigiTech use, establishing routines and making uses of DigiTech simple, suggest that it is important to understand what one’s intentions and beliefs are, and then considering if, how and why DigiTech can aid teachers and students to reach these. This deeper, pedagogical exploration could be conducted through longitudinal research (as also recommended by scholars such as Orlando, 2009; Ottenbreit-Leftwich et al., 2010; and Prestridge, 2017) into what PE teachers define as their pedagogical beliefs, their pedagogical use of DigiTech, and “what works” for them and why. PE teachers using DigiTech could also seek to examine their own pedagogical practices using teacher-focused methodologies such as self-study or autoethnography. Self-studies (see Fletcher and Bullock, 2015; and Fletcher and Casey, 2014) can be used as a methodological approach to examine one’s experiences (as teachers) and the different types of knowledge required to teach about the “hows and whys” of a pedagogical approach to DigiTech use (Fletcher and Casey, 2014, p.403). Given the similarities of this research’s focus in terms of how and why teachers use DigiTech, this methodological approach would seem to suit future research in this area. The implications of using AI to examine one’s own practice with DigiTech may help to ‘shine a light’ on those (albeit sometimes small) uses that have benefited teachers’ practice and students’ learning. However, this would only offer a narrow perspective and involving the

voices of others to complement this understanding, or the use of critical friends to challenge these reflections, would further support the use of this approach.

It would also be particularly interesting to follow-up with these teachers to see if, how or why their practices have developed. For example, many of the teachers' reasons as to why they used DigiTech were to support students' digital lives beyond the school and to provide them with meaningful and relevant learning experiences. It is, therefore, as Goodyear et al. (2017b) state, important to encourage further thought and consideration about the on-going role of DigiTech in schools and PE. If it is, as these teachers suggest, important to connect their use of DigiTech with students' actual digital lives, then it is pertinent that we are aware of the wider educational milieu (i.e. both inside and outside the formal classroom) that surround both teachers and students' developing use of DigiTech. For teachers, positioning themselves as a learner and their use of DigiTech as an on-going learning process towards pedagogy is vital in this regard. However, it seems increasingly pertinent to question and reflect upon the impact and use of DigiTech on students' lives and identities.

In reference to the broader educational literature (c.f. Fullan and Langworthy, 2014) it seems increasingly important that teachers, students, and other school members work together to further develop and refine insights into each other's uses, perceptions and rationales for using DigiTech in PE. This could occur by discussing each group's interests, aspirations and the learning that has taken place. Collaborating and co-constructing information could be a starting point for building more opportunities for knowledge construction and problem-solving and be a means by which to identify what is working to engage and advance students' and teachers' learning. This could occur through adopting the AI philosophy to guide the construction of research/interview questions, analysis and representation of knowledge as this research has demonstrated, through processes such as action research (c.f. Edwards-Groves and Kemmis, 2016; Enright and O'Sullivan, 2012a) or adopting a student voice perspective (c.f. Enright and O'Sullivan, 2012b; MacPhail and O'Sullivan, 2010). This may involve making the familiar 'strange', (i.e. what we believe to be true or the case regarding teachers' and students' use/perceptions of DigiTech) or, what Ertzberger and Martin (2016, p.396) call "demystifying" DigiTech. However, given the value these approaches place on working *with* students and teachers' participation in the research process, they may provide a lucrative avenue for future research approaches.

In considering future directions for research and practice it would seem apt to focus on the ‘realities of practice’. Such research would involve researchers being aware of the context and milieu of practice with DigiTech. Put differently, as Dron (2012, p.36) argued, we need to be aware of “the larger slower moving machine of which the technologies of learning and teaching are just a part”. The ultimate goal of research with teachers is not to force change upon them but, to provide information, ideas and practices that allow teachers to make the most of their interests and desires to connect their own and students’ digital lives to their educational ones. As can be seen in this research, whilst the use of DigiTech offers many possibilities, its use should not be unstructured. In order to begin to connect with students’ actual digital lives and to provide learning opportunities that may be purposeful in impacting students’ future lives, we must ensure that we are mindful that teachers’ and students’ use of DigiTech in schools has a pedagogical foundation or starting point. This allows us to develop the strategies capable of creating valuable learning opportunities for both teachers and students in their current and future lives.

### 10.5 Concluding comments

In this final chapter, I have revisited my research questions and the discussions that occurred in chapter 9 to provide an overview of the key findings that have been constructed from my study. In particular, I have documented how PE teachers view and use DigiTech and provide reasons as to why they use DigiTech in different ways. This thesis has shone light on the often-complex views, beliefs and experiences of PE teachers and their negotiation of how and why to use DigiTech in their practice. That said, the decision as to whether the pedagogical use of DigiTech in PE is, as Fullan and Langworthy (2014, p.79) suggest “a rich seam worth opening”, is your decision.

## References

- Abbitt, J. and Klett, M., (2007). Identifying influences on attitudes and self-efficacy beliefs towards technology integration among pre-service educators. *Electronic Journal for the integration of technology in Education*. 6, 28–42.
- Albion, P. and Ertmer, P.A., (2002). Beyond the foundations: The role of vision and belief in teachers' preparation for integration of technology. *TechTrends*. 46(5), 34–38.
- Amade-Escot, C., (2000). The Contribution of Two Research Programs on Teaching Content: 'Pedagogical Content Knowledge and Didactics of Physical Education'. *Journal of Teaching in Physical Education*. 20, 78–101.
- Amade-Escot, C., (2006). Student learning within the didactique tradition. In: D. Kirk, D. MacDonald, and M. O'Sullivan (Eds.). *The Handbook of Physical Education*. London: Sage. pp. 347–365.
- Anderson, S. and Maninger, R., (2007). Preservice teachers' abilities, beliefs, and intentions regarding technology integration. *Journal of Educational Computing Research*. 37(2), 151–172.
- Andrews, T., (2012). What is social constructionism? *The Grounded Theory Review*. 11(1), 39–46.
- Angeli, C. and Valanides, N., (2009). Epistemological and methodological issues for the conceptualization, development, and assessment of ICT-TPCK: Advances in technological pedagogical content knowledge (TPCK). *Computers & Education*. 52(1), 154–168.
- Angen, M.J., (2000). Evaluating interpretive inquiry: Reviewing the validity debate and opening the dialogue. *Qualitative Health Research*. 10(3), 378–395.
- Apple, M., (1986). *Teachers and Texts: A political economy of class and gender relations in education*. New York: Routledge.
- Apple, M.W., (1992). Is the new technology part of the solution or part of the problem in education? In: J. Beynon and H. MacKay (Eds.). *Technological Literacy and the Curriculum*. London: Falmer Press. pp.105–124.
- Armour, K.M., (2010). The physical education profession and its professional responsibility ... or ... why '12 weeks paid holiday' will never be enough. *Physical Education and Sport Pedagogy*. 15(1), 1–13.
- Armour, K.M., (2011). What is 'sport pedagogy' and why study it? In: K. Armour (Eds.).

- Sport pedagogy: An introduction for teaching and coaching*. Essex: Pearson. pp.11-24.
- Armour, K.M., (2014). New directions for research in physical education and sport pedagogy. *Sport, Education and Society*. 19(7), 853–854.
- Armour, K.M., Evans, G., Bridge, M., Griffiths, M. and Lucas, S., (2017a). Gareth: the beauty of the iPad for revolutionising learning in physical education. In: A. Casey, V.A. Goodyear, and K.M. Armour (Eds.). *Digital Technologies and Learning in Physical Education: Pedagogical cases*. London: Routledge. pp. 213-231.
- Armour, K.M., Quennerstedt, M., Chambers, F. and Makopoulou, K., (2017b). What is 'effective' CPD for contemporary physical education teachers? A Deweyan framework. *Sport, Education and Society*. 22(7), 799-811.
- Arthur, B., (2009). *The nature of technology: What it is and how it evolves*. New York: Free Press.
- Australian Curriculum, Assessment and Reporting Authority., (2015). *Digital Technologies: Sequence of content F-10*. [Online]. Available from: [http://www.acara.edu.au/\\_resources/Digital\\_Technologies\\_\\_Sequence\\_of\\_content.pdf](http://www.acara.edu.au/_resources/Digital_Technologies__Sequence_of_content.pdf).
- Baert, H., Winiecki, T., Madden, M., Bryan, R. and MacDonald, C., (2017). Tom: Using digital technology in physical education to transform pedagogy. In: A. Casey, V.A. Goodyear, and K.M. Armour (Eds.). *Digital Technologies and Learning in Physical Education: Pedagogical cases*. London: Routledge. pp. 191–212.
- Barker, D., Nielsen, J., Whalstrom, M., Barker-Ruchti, N., Carlen, U. and Maivorsdotter, N., (2017). Jacob and Martin: developing digital technology competence in physical education teacher education. In: A. Casey, V.A. Goodyear, and K.M. Armour (Eds.). *Digital Technologies and Learning in Physical Education: Pedagogical cases*. London: Routledge. pp. 231–247.
- Bauer, J. and Kenton, J., (2005). Toward Technology Integration in the Schools: Why it isn't happening. *Journal of Technology and Teacher Education*. 13(4), 519–546.
- Baxter, P. and Jack, S., (2008). Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. *The Qualitative Report*. 13(4), 544–559.
- Bazeley, P. and Jackson, K., (2013). *Qualitative data analysis with NVivo*. 2nd ed. London: Sage.
- Becker, H.J., (1994). How exemplary computer-using teachers differ from other teachers: Implications for realising the potential of computers in schools. *Journal of Research on Computing in Education*. 26(3), 291–321.

- Becker, H.J., (2000). Who's Wired and Who's Not: Children's Access to and Use of Computer Technology. *Children and Computer Technology*. 10(2), 44–75.
- Becta., (2004). *What the research says about portable ICT devices in teaching and learning*. [Online]. Coventry: British Educational Communications and Technology Agency. Available from: [http://mirandanet.ac.uk/wp-content/uploads/2016/04/wtrs\\_03\\_portable\\_devices.pdf](http://mirandanet.ac.uk/wp-content/uploads/2016/04/wtrs_03_portable_devices.pdf).
- Becta., (2005). *Body and Mind: A report on the use of ICT in Physical Education (PE)*. Coventry: British Educational Communications and Technology Agency. [Online]. Available from: doi:10.1093/mind/os-XIII.52.627.
- Belland, B.R., (2009). Using the theory of habitus to move beyond the study of barriers to technology integration. *Computers and Education*. 52(2), 353–364.
- Beni, S., Fletcher, T. and Chroinin, D., (2017). Meaningful experiences in physical education and youth sport: A review of the literature. *Quest*. 69(3), 291–312.
- Benjamin, L.T., (1988). A History of Teaching Machines. *American Psychologist*. 43(9), 703–712.
- Bergmark, U. and Kostenius, C., (2009). 'Listen to me when I have something to say': students' participation in research for sustainable school improvement. *Improving Schools*. 12(3), 249–260.
- Bevans, K., Fitzpatrick, L.A., Sanchez, B. and Forrest, C.B., (2010). Individual and Instructional Determinants of Student Engagement in Physical Education. *Journal of Teaching in Physical Education*. 29(4), 399–416.
- Beynon, J. and Mackay, H., (1992). *Technological Literacy and the curriculum*. London: Falmer Press.
- Biesta, G., (2007). Why 'what works' won't work: Evidence-based practice and the democratic deficit in educational research. *Educational Theory*. 57(1), 1–22.
- Bindl, U.K. and Parker, S.K., (2011). Proactive work behaviour: Forward-thinking and change-oriented action in. In: S. Zedeck (Eds.). *APA Handbook of Industrial and Organizational Psychology*. Washington, DC: American Psychological Association.
- Bodsworth, H. and Goodyear, V.A., (2017). Barriers and facilitators to using digital technologies in the Cooperative Learning model in physical education. *Physical Education and Sport Pedagogy*. 22(6), 563–579.
- Boghossian, P., (2006). Behaviorism, Constructivism, and Socratic Pedagogy. *Educational Philosophy and Theory*. 38(6), 713–722.

- Boody, R., (2001). On the relationships of education and technology. In: R. Muffoletto (Eds.). *Education and Technology: Critical Reflective Practices*. Cresskill, NJ: Hampton Press. pp. 5–22.
- Boyd, N.M. and Bright, D.S., (2007). Appreciative inquiry as a mode of action research for community psychology. *Journal of Community Psychology*. 35(8), 1019–1036.
- Bozkurt, A., (2011). A classroom observation-based evaluation of elementary teachers' use of technology in the classrooms in Turkey. *Educational Research and Reviews*. 6(4), 367–373.
- Brantley-Dias, L. and Ertmer, P.A., (2013). Goldilocks and TPACK. *Journal of Research on Technology in Education*. 46(2), 103–128.
- Bringer, J.D., Johnston, L.H. and Brackenridge, C.H., (2004). Maximizing Transparency in a Doctoral Thesis: The Complexities of Writing About the Use of QSR NVivo within a Grounded Theory Study. *Qualitative Research*. 4(2), 247–265.
- Bringer, J.D., Johnston, L.H. and Brackenridge, C.H., (2006). Using Computer-Assisted Qualitative Data Analysis Software to Develop a Grounded Theory Project. *Field Methods*. 18(3), 245–266.
- Bryant, A. and Charmaz, K., (2007). Introduction: Grounded theory research methods and practice. In: A. Bryant and K. Charmaz (Eds.). *The Sage Handbook of Grounded Theory*. London: Sage. pp. 1-29.
- Bryman, A., (2008). The End of the Paradigm Wars? In: P. Alasuutari, L. Bickman, and J. Brannen (Eds.). *The Sage Handbook of Social Research Methods*. London: Sage. pp.13-26.
- Bryman, A., (2016). *Social research methods*. Oxford: Oxford University Press.
- Bulfin, S., Johnson, N. and Bigum, C., (2015). *Critical perspectives on technology and education*. New York: Palgrave Macmillian.
- Bunker, L., (1994) Virtual reality: Movement's centrality. *Quest*. 46, 456–474.
- Burke, S., (2017). Rethinking 'validity' and 'trustworthiness' in qualitative inquiry. In: B. Smith and A. Sparkes (Eds.). *Routledge Handbook of Qualitative Research in Sport and Exercise*. London: Routledge. pp.330–339.
- Burns, M., (2013). Success, failure, or no significant difference: Charting a course for successful educational technology integration. *International Journal of Emerging Technologies in Learning (iJET)*. 8(1), 38–45.
- Burrell, G. and Morgan, G., (1979). *Sociological Paradigms and Organisational Analysis*:



- Elements of the Sociology of Corporate Life*. Hants, England: Heinemann Educational Books.
- Bushe, G.R., (2007). Appreciative Inquiry Is Not (Just) About The Positive. *Organisational Development Practitioner*. 39(4), 30–35.
- Bushe, G.R., (2010). Commentary on ‘Appreciative Inquiry as a Shadow Process’. *Journal of Management Inquiry*. 19(3), 234–237.
- Bushe, G.R.. (2011). Appreciative inquiry: Theory and critique. In: D. Boje, B. Burnes, and J. Hassard (Eds.). *The Routledge Companion to Organizational Change*. Oxford: Routledge. pp. 87–103.
- Calabrese, R.L., (2006). Building social capital through the use of an appreciative inquiry theoretical perspective in a school and university partnership. *International Journal of Educational Management*. 20(3), 173–182.
- Cale, L., Harris, J. and Duncombe, R., (2016). Promoting physical activity in secondary schools. *European Physical Education Review*. 22(4), 526–544.
- Carnell, E., (2005). Understanding and enriching young people’s learning: Issues, complexities and challenges. *Improving Schools*. 8(3), 269–284.
- Carpenter, J.P. and Krutka, D.G., (2014). How and Why Educators Use Twitter: A Survey of the Field. *Journal of Research on Technology in Education*. 46(4), 414–434.
- Carter, B., (2006) ‘One expertise among many’ working appreciatively to make miracles instead of finding problems: Using appreciative inquiry as a way of reframing research. *Journal of Research in Nursing*. 11(1), 48–63.
- Casey, A., (2014). Rethinking IT in physical education: pedagogy before technology. *Cultura, Ciencia y Deporte*. 9(25), pp.3-4.
- Casey, A., (2015). Developing a theory of technology for physical education pedagogy. In: *British Educational Research Association’s Annual Conference*. 2015 Queens: Belfast, 3-5 September.
- Casey, A., Goodyear, V.A. and Armour, K.M., (2017a). *Digital Technologies and Learning in Physical Education :Pedagogical Cases*. London: Routledge.
- Casey, A., Goodyear, V.A. and Armour, K.M., (2017b). Rethinking the relationship between pedagogy, technology and learning in health and physical education. *Sport, Education and Society*. 22(2) 288-304.
- Casey, A. and Jones, B., (2011). Using digital technology to enhance student engagement in physical education. *Asia-Pacific Journal of Health, Sport and Physical Education*. 2(2),

51–67.

- Cavanaugh, C., Hargis, J., Munns, S. and Kamali, T., (2012). iCelebrate Teaching and Learning: Sharing the iPad Experience. *Journal of Teaching and Learning with Technology*. 1(2), 1–12.
- Chambers, F.C., Sherry, J., Murphy, O., O'Brien, W. and Breslin, G., (2017). James: physical education teacher. In: A. Casey, V.A. Goodyear, and K.M. Armour (Eds.). *Digital Technologies and Learning in Physical Education: Pedagogical cases*. London: Routledge. pp. 49-69.
- Charmaz, K., (2000). Grounded theory: Objectivist and constructivist methods. In: N. Denzin and Y. Lincoln (Eds.). *The Handbook of Qualitative Research*. Thousand Oaks, CA: Sage.
- Charmaz, K., (2006). *Constructing Grounded Theory: A practical guide through qualitative analysis*. Thousand Oaks, California: Sage.
- Charmaz, K., (2008). Constructionism and the Grounded Theory Method. In: J.A Holstein and J.F Gubrium (Eds.). *Handbook of Constructionist Research*. New York: The Guilford Press. pp. 397–412.
- Charmaz, K., (2014). *Constructing Grounded Theory*. 2nd ed. London: Sage.
- Clarke, H., Egan, B., Fletcher, L. and Ryan, C., (2006). Creating case studies of practice through Appreciative Inquiry. *Educational Action Research*. 14(3), 407–422.
- Cochrane, T., Ako, T.P. and Oldfield, J., (2013). iPadagogy: Appropriating the iPad within pedagogical contexts. *International Journal of Mobile Learning and Organisation*. 7(1), 48–65.
- Coghlan, A.T., Preskill, H. and Tzavaras Catsambas, T., (2003). An overview of appreciative inquiry in evaluation. *New Directions for Evaluation*. (100), 5–22.
- Cohen, L., Manion, L. and Morrison, K., (2007). *Research methods in education*. 6th edition. Oxon: Routledge.
- Cook, T., (2009). The purpose of mess in action research: Building rigour through a messy turn. *Educational Action Research*. 17(2), 227–291.
- Cooperrider, D., (1986). *Appreciative Inquiry: Toward a methodology for understanding and enhancing organisational innovation*. PhD thesis. Case Western Reserve University.
- Cooperrider, D., (2013). A Contemporary Commentary on Appreciative Inquiry in Organizational Life. *Advances in Appreciative Inquiry*. 4, 3–67.

- Cooperrider, D. and Srivastva, S., (1987). Appreciative Inquiry in organizational life. In: R. Pasmore and W. Woodman (Eds.). *Research in organizational change and development, volume 1*. Greenwich: JAI Press. pp.129–169.
- Cooperrider, D. and Whitney, D., (1999). *Appreciative Inquiry*. San Francisco: Berrett-Koehler.
- Cooperrider, D. and Whitney, D., (2001). A positive revolution in change: Appreciative inquiry. *Public administration and public policy*. 1–36.
- Cooperrider, D. and Whitney, D., (2005). *Appreciative inquiry: A positive revolution in change*. San Francisco: Berrett-Koehler.
- Cooperrider, D., Whitney, D. and Stavros, D., (2008). *The appreciative inquiry handbook: For leaders of change*. San Francisco, CA: Berrett-Koehler.
- Corbin, J. and Strauss, A., (2008). *Basics of qualitative research: Techniques and procedures for developing grounded theory*. 3rd ed. London: Sage.
- Cox, S. and Graham, C.R., (2009). Diagramming TPACK in practice: Using an elaborated model of the TPACK framework to analyze and depict teacher knowledge. *TechTrends*. 53(5), 60–69.
- Cox, M., Webb, M., Abbott, C., Blakeley, B., Beauchamp, T. and Rhodes, V., (2003). *ICT and pedagogy: A review of the research literature*. Westminster: Department for Education and Skills.
- Creswell, J.W., (2009). *Research design: Qualitative, Quantitative, and Mixed Methods Approaches*. Thousand Oaks, CA: Sage.
- Creswell, J.W., (2013). *Qualitative inquiry*. 3rd ed. Thousand Oaks, CA: Sage.
- Crook, C., Cummings, J., Fisher, T. and Graber, R., (2008) *Web 2.0 technologies for learning: The current landscape – opportunities, challenges and tensions*. Becta.
- Cuban, L., (1986). *Teachers and machines: The classroom use of technology since 1920*. New York: Teachers College Press.
- Cuban, L., (2001). *Oversold and underused: Computers in the classroom*. Cambridge, Massachusetts: Harvard University Press.
- Cummings, T. and Worley, C., (2001). *Organisational development and change*. 7th ed. Ohio: South Western College Publishing.
- Curtner-Smith, M.D., Hastie, P.A. and Kinchin, G.D., (2008) Influence of occupational socialization on beginning teachers' interpretation and delivery of sport education. *Sport, Education and Society*. 13(1), 97–117.

- Denzin, N. and Lincoln, Y., (2003). The discipline and practice of qualitative research. In: N. Denzin and Y. Lincoln (Eds.). *Strategies of qualitative inquiry*. Thousand Oaks: Sage. pp.1-46.
- Department for Education., (2015). *Physical Education: GCE AS and A level subject content*. [Online]. Available from: <https://www.gov.uk/government/publications/gce-as-and-a-level-physical-education>.
- Department for Education., (2013). *Physical education programmes of study: Key Stages 3 and 4: National Curriculum in England*. [Online]. Available from: doi:FE-00190-2013.
- Derry, J., (2008). Technology-Enhanced Learning: A Question of Knowledge. *Journal of Philosophy of Education*. 42 (3–4), 505–519.
- Dexter, S., Anderson, R. and Becker, H., (1999). Teachers' views of computers as catalysts for changes in teaching practice. *Journal of Research on Computing in Education*. 31 (3), 221–238.
- Diaz, D. and Bontenbal, K.F., (2000). Pedagogy-based technology training. In: P. Hoffman and D. Lemke (Eds.). *Teaching and Learning in a networked world*. Amsterdam: 105 Press. pp. 50–54.
- Dron, J., (2013). Soft is hard and hard is easy: Learning technologies and social media. *Form@re - Open Journal per la formazione in rete*. 13 (1), 32–43.
- Dron, J., (2012). The Pedagogical-Technological Divide and the Elephant in the Room. *International Journal on E-Learning*. 11(1), 23–38.
- Edwards-Groves, C. and Kemmis, S., (2016). Pedagogy, Education and Praxis: understanding new forms of intersubjectivity through action research and practice theory. *Educational Action Research*. 24 (1), 77–96.
- Edwards, A., (2012). *New technology and education: Contemporary issues in education studies*. London: Continuum.
- Egan, T.M. and Lancaster, C.M., (2005). Comparing Appreciative Inquiry to Action Research: *Organization Development Journal*. 23(2), 29–49.
- Ellison, D.W. and Woods, A.M., (2016). Deliberate Practice as a Tool for Effective Teaching in Physical Education. *Journal of Physical Education, Recreation and Dance*. 87(2), 15–19.
- Enright, E., Hill, J., Sandford, R. and Gard, M., (2014). Looking beyond what's broken: towards an appreciative research agenda for physical education and sport pedagogy. *Sport, Education and Society*. 19(7), 912–926.

- Enright, E. and O'Sullivan, M., (2010). 'Can I do it in my pyjamas?' Negotiating a physical education curriculum with teenage girls. *European Physical Education Review*. 16(3), 203–222.
- Enright, E. and O'Sullivan, M., (2012a). Listening to young people's voices in physical education and youth sport research. In: K. Armour and D. MacDonald (Eds.). *Research Methods in Physical Education and Youth Sport*. Oxon: Routledge. pp.120–133.
- Enright, E. and O'Sullivan, M., (2012b). 'Producing different knowledge and producing knowledge differently': Rethinking physical education research and practice through participatory visual methods. *Sport, Education and Society*. 17(1), 35–55.
- Enright, E., Robinson, J., Hogan, A., Stylianou, M., Hay, J., Smith, F., Ball, A., (2017). Jarrod: the promise and messy realities of digital technology in physical education. In: A. Casey, V.A. Goodyear, and K.M. Armour (Eds.). *Digital Technologies and Learning in Physical Education: Pedagogical cases*. London: Routledge. pp. 173-191.
- Eow, Y.L., Wan Zah, W.A., Rosnaini, M. and Roselan, B., (2010). Appreciative Learning Approach: A New Pedagogical Option. In: *Proceedings of the 18th International Conference on Computers in Education*. 2010 Putrajaya, Malaysia. pp. 607–614.
- Ertmer, P.A., (1999). Addressing first and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development*. 47(4), 47–61.
- Ertmer, P.A., (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development*. 53(4), 25–39.
- Ertmer, P., (2015). Technology Integration. In: J.Spector (Eds.). *The Sage Encyclopedia of Educational Technology*. Thousand Oaks, CA: Sage. pp.748–751.
- Ertmer, P., Gopalakrishnan, S. and Ross, E., (2001). Technology-using teachers: Comparing perceptions of exemplary technology use to best practice. *Journal of Research on Technology in Education*. 33 (5).
- Ertmer, P. and Ottenbreit-Leftwich, A.T., (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education*. 42 (3), 255–284.
- Ertmer, P. and Ottenbreit-Leftwich, A., (2013). Removing obstacles to the pedagogical changes required by Jonassen's vision of authentic technology-enabled learning. *Computers and Education*. 64, 175–182.

- Ertmer, P.A., Ottenbreit-Leftwich, A.T., Sadik, O., Sendurur, E. and Sendurur., (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education*. 59(2), 423–435.
- Ertmer, P., Ottenbreit-Leftwich, A. and Tondeur, J., (2015). Teachers' beliefs and uses of technology to support 21st century teaching and learning. In: H. Fives and M. Gregoire Gill (Eds.). *International Handbook of research on teachers' beliefs*. New York: Routledge.
- Ertmer, P., Ottenbreit-Leftwich, A. and York, C., (2006). Exemplary Technology-using Teachers: Perceptions of Factors Influencing Success. *Journal of Computing in Teacher Education*. 23(2), 55–61.
- Ertzberger, J. and Martin, F., (2016). Use of Fitness Bands by Teachers in the Classroom. *Tech Trends*. 60, 392–397.
- Erwin, H., (2016). The Use of Social Media by Physical Educators: How Do We Ensure Quality Control? *Journal of Physical Education, Recreation & Dance*. 87(2), 3–4.
- Evans, J. ,(1990). Defining a subject: the rise and rise of the new PE. *British Journal of Sociology of Education*. 11, 155–169.
- Feenberg, A., (1999). *Questioning technology*. London: Routledge.
- Ferester, B., (2014). *Teaching machines: Learning from the intersection of education and technology*. Baltimore: John Hopkins University Press.
- Fink, J. and Sidentop, D., (1989). The Development of Routines, Rules, and Expectations at the Start of the School Year. *Journal of Teaching in Physical Education*. 8(3), 198-212.
- Finkenberg, M.E., Fiorentino, L.H. and Castelli, D., (2005) Creating a Virtual Gymnasium. *Journal of Physical Education, Recreation & Dance*. 76(4), 16–18.
- Fiorentino, L.H., (2012). Positive Perspectives on the Profession: Reframing through Appreciative Inquiry. *Quest*. 64(4), 209–228.
- Fitzgerald, S.P., Oliver, C. and Hoxsey, J.C., (2010). Appreciative Inquiry as a Shadow Process. *Journal of Management Inquiry*. 19(3), 220–233.
- Fletcher, T. and Bullock, S.M., (2015). Reframing pedagogy while teaching about teaching online: A collaborative self-study. *Professional Development in Education*. 41(4), 690–706.
- Fletcher, T. and Casey, A., (2014). The challenges of models-based practice in physical education teacher education: A collaborative self-study. *Journal of Teaching in Physical Education*. 33(3), 403–421.

- Fletcher, T., Vasily, A., Bullock, S., Kosnik, C., Ni Chronin, D., (2017). Andy: blogging with students. Educational visions and digital realities. In: A. Casey, V.A. Goodyear, and K.M. Armour (Eds.). *Digital Technologies and Learning in Physical Education: Pedagogical cases*. London: Routledge. pp.104–120.
- Flick, U., (2002). *An introduction to Qualitative Research*. 2nd ed. London: Sage.
- Fontana, A. and Frey, J., (2008). The interview. In: N. Denzin and Y. Lincoln (Eds.). *Collecting and interpreting qualitative materials*. Los Angeles: Sage. pp. 115–159.
- Forkhosh-Baruch, A., Mioduser, D., Rafi, N. and Dorit, T., (2005). “Islands of Innovation” and “School-wide Implementations. Two patterns of ICT-Based pedagogical innovations in schools. *Human Technology: An Interdisciplinary Journal on Humans in ICT Environments*. 1(2), pp.202-215.
- Freeman, C. and Louca, F., (2001). *As time goes by: From the industrial revolution to the information revolution*. Oxford: Oxford University Press.
- Frohrnan, M., Sashkin, M. and Kavanaugh, M., (1976). Action-research as applied in organisation development. *Organisation and Administrative Sciences*. 1, 129–161.
- Fullan, M. (1999)., *Changing forces: The sequel*. London: Falmer Press.
- Fullan, M., (2007). *The New Meaning of Educational Change*. Routledge Falmer: London.
- Fullan, M., (2013). *Stratosphere: Integrating technology, pedagogy and change knowledge*. Toronto: Pearson.
- Fullan, M., (2015). *The new meaning of educational change*. New York: Teachers College Press.
- Fullan, M. and Langworthy, M., (2014). *A Rich Seam: How New Pedagogies Find Deep Learning*. [Online]. Available from: doi:10.1002/hast.292.
- Fullan, M. and Langworthy, M., (2013). *Towards a new end: New pedagogies for deep learning*. Available from: [http://www.newpedagogies.nl/images/towards\\_a\\_new\\_end.pdf](http://www.newpedagogies.nl/images/towards_a_new_end.pdf)
- Future Foundation, (2015). *The class of 2035: Promoting a brighter and more active future for the youth of tomorrow*. London: Future Foundation.
- Gard, M., (2014). eHPE: a history of the future. *Sport, Education and Society*. 19(6), 827–845.
- Geist, E., (2011). The game changer: Using iPads in college teacher education classes. *College Student Journal*. 758–769.
- Gergen, K., (1978). Toward a generative theory. *Journal of Social Psychology*. 36, 1344–1360.

- Gibbone, A., Rukavina, P. and Silverman, S., (2010). Technology Integration in Secondary Physical Education: Teachers' Attitudes and Practice. *Journal of Educational Technology Development and Exchange*. 3(1), 27–42.
- Glaser, B., (1978). *Theoretical sensitivity: Advances in the methodology of grounded theory*. Mill Valley, CA, Sociology Press.
- Glaser, B., (1992). *Basics of grounded theory analysis: Emergence v forcing*. Mill Valley: Sociology Press.
- Glaser, B. & Strauss, A., (1967). *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Chicago, IL: Aldine Publishing.
- Gleddie, D., Feith, J., Howe, D., Larsson, H., Cale, L., Casey, A., (2017). Joey: Social media as a tool for professional development. In: A. Casey, V.A. Goodyear, and K.M. Armour (Eds.). *Digital Technologies and Learning in Physical Education: Pedagogical cases*. London: Routledge. pp.121-137.
- Golding, P., (2000). Forthcoming features: Information and communications technologies and the sociology of the future. *Sociology*. 34(1), 165–184.
- Gonzalez-Sanmamed, M., Sangra, A. and Munoz-Carril, P.C., (2017). We can, we know how. But do we want to? Teaching attitudes towards ICT based on the level of technology integration in schools. *Technology, Pedagogy and Education*. 26(5), 633-647.
- Goodman, N., (1978). *Ways of worldmaking*. Indianapolis: Hackett.
- Goodman, N., (1984). *Of mind and other matters*. Cambridge: Harvard University Press.
- Goodson, I. and Mangan, M., (1995). Subject cultures and the introduction of classroom computers. *British Educational Research Journal*. 21(5), 613-628.
- Goodyear, V.A., Casey, A. and Kirk, D., (2014a). Hiding behind the camera: social learning within the Cooperative Learning Model to engage girls in physical education. *Sport, Education and Society*. 19(6), 712–734.
- Goodyear, V.A., Casey, A. and Kirk, D., (2014b). Tweet me, message me, like me: using social media to facilitate pedagogical change within an emerging community of practice. *Sport, Education and Society*. 19(7), 927–943.
- Goodyear, V.A. and Casey, A., (2015). Innovation with change: developing a community of practice to help teachers move beyond the 'honeymoon' of pedagogical renovation. *Physical Education and Sport Pedagogy*. 20(2), 186–203.
- Goodyear, V.A., Blain, D., Quarmby, T. and Wainright, N., (2017a). Dylan: The use of



- mobile apps within a tactical inquiry approach. In: A. Casey, V.A. Goodyear, and K.M. Armour (Eds.). *Digital Technologies and Learning in Physical Education: Pedagogical cases*. London: Routledge. pp.13-31.
- Goodyear, V.A., Kerner, C. and Quennerstedt, M. (2017b). Young people's uses of wearable healthy lifestyle technologies; surveillance, self-surveillance and resistance. *Sport, Education and Society*. 1–14.
- Goodyear, V.A., Casey, A. and Quennerstedt, M., (2017c). Social media as a tool for generating sustained and in-depth insights into sport and exercise practitioners' ongoing practices. *Qualitative Research in Sport, Exercise and Health*. 1–16.
- Graham, C.R., (2011). Theoretical considerations for understanding technological pedagogical content knowledge (TPACK). *Computers & Education*. 57(3), 1953–1960.
- Graham, C.R., Boup, J. and Smith, N.B., (2012). Using TPACK as a Framework to Understand Teacher Candidates' Technology Integration Decisions. *Journal of Computer Assisted Learning*, 28(6), 530-546.
- Grant, S. and Humphries, M., (2006). Critical evaluation of appreciative inquiry Bridging an apparent paradox. *Action Research*. 4(4), 401–418.
- Gratton, C. and Jones, I., (2010). *Research methods for sports studies*. 2nd ed. London: Routledge.
- Gray, D., (2014). Theoretical perspectives and research methodologies. In: *Doing Research in the Real World*. 3rd ed. London: Sage.
- Gray, S., Treacy, J. and Hall, E.T., (2017). Re-engaging disengaged pupils in physical education: an appreciative inquiry perspective. *Sport, Education and Society*. 1–15.
- Grieten, S., Lambrechts, F., Bouwen, R., Huybrechts, J., Fry, R., Cooperrider, D., (2017). Inquiring into appreciative inquiry: A conversation with David Cooperrider and Ronald Fry. *Journal of Management Inquiry*. 27(1), 1–15.
- Gronseth, S., Brush, T., Ottenbreit-leftwich, A., Strycker, J., Abaci, S., Easterling, W., Roman, T., Shin, S. and van Leusen, P., (2010). Equipping the Next Generation of Teachers: Technology Preparation and Practice. *Journal of Digital Learning in Teacher Education*. 27(1), 30–36.
- Guba, E. and Lincoln, Y., (1994). Competing Paradigms in Qualitative Research. In: N. Denzin and Y. Lincoln (Eds.). *Handbook of qualitative research*. London: Sage. pp.105–117.
- Guba, E. and Lincoln, Y., (1989). *Fourth generation evaluation*. Thousand Oaks: Sage.

- Guba, E. and Lincoln, Y., (2005). Paradigmatic controversies, contradictions and emerging confluences. In: N. Denzin and Y. Lincoln (Eds.). *Handbook of qualitative research*. 3rd edition. London: Sage. pp.191–216.
- van der Haar, D. and Hosking, D.M., (2004). Evaluating Appreciative Inquiry: A Relational Constructionist Perspective. *Human Relations*. 57 (8), 1017–1036.
- Hadley, M. and Sheingold, K., (1993). Commonalities and distinctive patterns in teachers' integration of computers. *American Journal of Education*. 101, 261–315.
- Hall, T., (2012) Emplotment, embodiment, engagement: Narrative technology in support of physical education, sport and physical activity. *Quest*. 64, 105–115.
- Hamilton, D., (1999). The pedagogic paradox (or why no didactics in England?). *Pedagogy, Culture & Society*. 7(1), 135–152.
- Hammond, M., (2011). Beliefs and ICT: What can we learn from experienced educators? *Technology, Pedagogy and Education*. 20(3), 289–300.
- Hammond, M. and Alotaibi, B., (2016). Theorising the take-up of ICT: Can Valsiner's three zones framework make a contribution? *Technology, Pedagogy and Education*. 26(2), 139-155.
- Hammond, S., (1998). *The thin book of appreciative inquiry*. Plano, TX: Thin Book publishing.
- Hammond, S. and Royal, C., (2000). *Lessons from the field: Applying appreciative inquiry*. Plano, TX: Think Book/Practical Press.
- Harris, B.E., (2009). Visual technology in physical education using Dartfish video analysis to enhance learning: An overview of the Dartfish project in New Brunswick. *Physical and Health Education Journal*. 7(4), 24-25.
- Harrison, L.M. and Hasan, S., (2013). Appreciative Inquiry in Teaching and Learning. *New Directions for Student Services*. 143, 65–75.
- Harvey, S. and Pill, S., (2016). Comparisons of Academic Researchers' and Physical Education Teachers' Perspectives on the Utilization of the Tactical Games Model. *Journal of Teaching in Physical Education*. 35, 313–323.
- Haßler, B., Major, L. and Hennessy, S., (2016). Tablet use in schools: A critical review of the evidence for learning outcomes. *Journal of Computer Assisted Learning*. 32(2), 139–156.
- Hastie, P.A., Casey, A. and Tarter, A., (2010). A case study of wikis and student-designed games in physical education. *Technology, Pedagogy and Education*. 19(1), 79–91.

- Haydn, T., (2014). How do you get pre-service teachers to become ‘good at ICT’ in their subject teaching? The views of expert practitioners. *Technology, Pedagogy and Education*. 23(4), 455–469.
- Hayes, E. and Silberman, L., (2007). Incorporating video games into physical education. *Journal of Physical Education, Recreation and Dance*. 18(24), 18–24.
- Hennessy, S., Ruthven, K. and Brindley, S., (2005). Teacher Perspectives on Integrating ICT into Subject Teaching: Commitment, Constraints, Caution, and Change. *Journal of Curriculum Studies*. 37 (2), 155–192.
- Hennessy, S., Ruthven, K. and Deaney, R., (2003). *Pedagogic strategies for using ICT to support subject teaching and learning: An analysis across 15 case studies*. Available from: <https://www.educ.cam.ac.uk/research/projects/istl/TiPS031.pdf>.
- Herrington, J., Mantei, J., Herrington, A., Olney, I. and Ferry, B., (2008). New technologies, new pedagogies: Mobile technologies and new ways of teaching and learning. In: *Annual Conference for the Australasian Society for Computers in Learning in Tertiary Education*. 2008 Melbourne, Australia. p.419-427. Available from: <http://ro.uow.edu.au/edupapers/303/>.
- Hew, K.F. and Brush, T., (2006). Integrating technology into K-12 teaching and learning: current knowledge gaps and recommendations for future research. *Educational Technology Research and Development*. 55(3), 223–252.
- Higgins, S. and Moseley, D., (2001). Teachers’ thinking about information and communications technology and learning: Beliefs and outcomes. *Teacher Development*. 5, 191–210.
- Hill, J., Sandford, R. and Enright, E., (2015). ‘It has really amazed me what my body can now do’ : boundary work and the construction of a body-positive dance community. *Sport in Society*. 19(5), 667-679.
- Holloway, I., (1997). *Basic concepts for qualitative research*. Oxford: Blackwell Science.
- Holt, N., Knight, C. and Tamminen, K., (2012). Grounded theory. In: K. Armour and D. MacDonald (Eds.). *Research Methods in Physical Education and Youth Sport*. Oxon: Routledge. pp.276–295.
- Howard, S.K., Chan, A. and Caputi, P., (2015a). More than beliefs: Subject areas and teachers’ integration of laptops in secondary teaching. *British Journal of Educational Technology*. 46 (2), 360–369.
- Howard, S.K., Chan, A., Mozejko, A. and Caputi, P., (2015b). Technology practices:

- Confirmatory factor analysis and exploration of teachers' technology integration in subject areas. *Computers & Education*. 90, 24–35.
- Hsu, P.S., (2016). Examining Current Beliefs, Practices and Barriers About Technology Integration: A Case Study. *TechTrends*. 60(1), 30-40.
- Hutchison, A.J., Johnston, L.H. and Breckon, J.D., (2010). Using QSR-NVivo to facilitate the development of a grounded theory project: an account of a worked example. *International Journal of Social Research Methodology*. 13(4), 283–302.
- Hwang, G.J., Lai, C.L. and Wang, S.Y., (2015). Seamless flipped learning: a mobile technology-enhanced flipped classroom with effective learning strategies. *Journal of Computers in Education*. 2(4), 449–473.
- Jääskelä, P., Häkkinen, P., Rasku-Puttonen, H., (2017). Teacher Beliefs Regarding Learning, Pedagogy, and the Use of Technology in Higher Education. *Journal of Research on Technology in Education*. 49(3-4), 198-211.
- James, I., Blomberg, K. and Kihlgren, A., (2014). A meaningful daily life in nursing homes - a place of shelter and a space of freedom: A participatory appreciative action reflection study. *BMC Nursing*. 13(19), 1–13.
- Jimoyiannis, A. and Komis, V., (2007). Examining teachers' beliefs about ICT in education: Implications of a teacher preparation programme. *Teacher Development*. 11(2), 149–173.
- Johnston, L., (2006). Software and Method: Reflections on Teaching and Using QSR NVivo in Doctoral Research. *International Journal of Social Research Methodology*. 9(5), 379–391.
- Jonassen, D., (1996). *Computers in the classroom: Mindtools for critical thinking*. California: Merrill.
- Jones, A., (2004). A Review of The Reserach Literature on Barriers to the Uptake of ICT by Teachers. *British Educational Communications and Technology Agency (Becta)*. 1 (June), 1–29.
- Jones, A., (2010). Looking in classrooms: Researching school use of information technology for teaching and learning. In: A. McDougall, J. Murnane, A. Jones, and N. Reynolds (Eds.). *Researching IT in education: Theory, practice and future directions*. Oxon: Routledge. pp.169–177.
- Jones, E.M., Baek, J. and Wyant, J.D., (2017). Exploring Pre-Service Physical Education Teacher Technology Use During Student Teaching. *Journal of Teaching in Physical*

- Education*. 36(2), 173–184.
- Jones, I., (2015). *Research methods for sports studies*. 3rd ed. London: Routledge.
- Jones, I., Brown, L. and Holloway, I., (2013). *Qualitative Research in Sport and Physical Activity*. London: Sage.
- Kadi-Hanifi, K., Dagman, O., Peters, J., Snell, E., Tutton, C. and Wright, T., (2013). Engaging students and staff with educational development through appreciative inquiry. *Innovations in Education and Teaching International*. 51 (6), 584–594.
- Kerner, C. and Goodyear, V.A., (2017). The Motivational Impact of Wearable Healthy Lifestyle Technologies: A Self-determination Perspective on Fitbits With Adolescents. *American Journal of Health Education*. 48 (5), 287–297.
- Kim, C., Kim, M.K., Lee, C., Spector, J.M. and DeMeester, K., (2013) Teacher beliefs and technology integration. *Teaching and Teacher Education*. 29, 76–85.
- Kim, Y., (2010). The Pilot Study in Qualitative Inquiry: Identifying Issues and Learning Lessons for Culturally Competent Research. *Qualitative Social Work*. 10(2), 190–206.
- Kirk, D., (2010). *Physical education futures*. London: Routledge.
- Kirk, D. and Haerens, L., (2014). New research programmes in physical education and sport pedagogy. *Sport, Education and Society*. 19(7), 899–911.
- Kirk, D. and MacDonald, D., (2001). Teacher voice and ownership of curriculum change. *Journal of Curriculum Studies*. 5(33), 551–567.
- Kirk, D., MacDonald, D. and O’Sullivan, M., (2006). *Handbook of Physical Education*. London, Sage.
- Koehler, M. J., and Mishra, P., (2009). What is technological pedagogical content knowledge? Contemporary Issues in Technology and Teacher Education, 9(1), 60-70.
- Koh, J.H.L., Chai, C.S. and Tsai, C.C., (2013). Examining practicing teachers’ perceptions of technological pedagogical content knowledge (TPACK) pathways: a structural equation modeling approach. *Instructional Science*. 41(4), 793–809.
- Kopcha, T.J., (2012). Teachers’ perceptions of the barriers to technology integration and practices with technology under situated professional development. *Computers and Education*. 59(4), 1109–1121.
- Kozik, P.L., Cooney, B., Vinciguerra, S., Gradel, K., Black, J., (2008). Promoting Inclusion in Secondary Schools through Appreciative Inquiry. *American Secondary Education*. 38(1), 77–91.
- Krause, J., Franks, H. and Lynch, B., (2017). Current technology trends and issues among

- health and physical education professionals. *Physical Educator*. 74, 164–180.
- Krause, J.M. and Lynch, B.M., (2018). Faculty and student perspectives of and experiences with TPACK in PETE. *Curriculum Studies in Health and Physical Education*, 9(1), 58–75.
- Kretschmann, R., (2010). Physical Education 2.0. In: M. Eber and Schiefner, M., *Looking Toward the Future of Technology-Enhanced Education: Ubiquitous Learning and the Digital Native*. pp.432-454.
- Kretschmann, R., (2015). Physical education teachers' subjective theories about integrating information and communication technology (ICT) into physical education. *Turkish Online Journal of Educational Technology*. 14(1), 68–96.
- Kritt, D. and Winegar, L., (2007). Technological determinism and human agency. In: *Education and Technology: Critical perspectives, possible futures*. Plymouth: Lexington books. pp.3–31.
- Krumsvik, R., (2006). The digital challenges of school and teacher education in Norway: Some urgent questions and the search for answers. *Education Information Technology*. 11, 239–256.
- Kuhn, T., (1962). *The structure of scientific revolutions*. 1st ed. Chicago: University of Chicago Press.
- Latchem, C., (2014). BJET Editorial: Opening up the educational technology research agenda. *British Journal of Educational Technology*. 45(1), 3-11.
- Laurillard, D., (2007). Technology, pedagogy and education: concluding comments. *Technology, Pedagogy and Education*. 16(3), 357–360.
- Leijen, Ä., Admiraal, W.F., Wildschut, L. and Robert-Jan Simons, P., (2008). Pedagogy before technology: What should an ICT intervention facilitate in practical dance classes? *Teaching in Higher Education*. 13(2), 219–231.
- Lempert, L.B., (2010). Asking questions of the data: Memo writing in the grounded theory tradition. In: A. Bryant & K. Charmaz (Eds.). *The Sage Handbook of Grounded Theory*. Paperback. London: Sage. pp.245-264.
- Levin, B.B. and Schrum, L., (2013). Using Systems Thinking to Leverage Technology for School Improvement: Lessons Learned from Award-Winning Secondary Schools/Districts. *Journal of Research on Technology in Education*. 46(1), 29-51.
- Levin, T. and Wadmany, R., (2005). Changes in educational beliefs and classroom practices of teachers and students in rich technology-based classrooms. *Technology, Pedagogy*

- and Education*. 14(3), 281–307.
- Lewis, S., Passmore, J. and Cantore, S., (2016). *Appreciative Inquiry for Change Management: Using AI to facilitate organisational development*. 2nd ed. London: Kogan Page.
- Lincoln, Y. and Guba, E., (1985). *Naturalistic Inquiry*. Newbury Park. CA: Sage.
- Lincoln, Y.S., (2010). ‘What a Long, Strange Trip It’s Been...’: Twenty-Five Years of Qualitative and New Paradigm Research. *Qualitative Inquiry*. 16(1), 3–9.
- Lincoln, Y.S., Lynham, S. and Guba, E., (2011). Paradigmatic controversies, contradictions and emerging confluences revisited. In: N. Denzin & Y.Lincoln (Eds.). *The Sage Handbook of Qualitative Research*. 4th ed. Thousand Oaks, CA: Sage. pp. 97–127.
- Livingstone, S., (2012). Critical reflections on the benefits of ICT in education. *Oxford Review of Education*. 38(1), 9–24.
- Locke, L.F., (1992). Changing Secondary School Physical Education. *Quest*. 44(3), 361–372.
- Lofland, J. and Lofland, H., (1995). *Analysing social settings: A guide to qualitative observation and analysis*. Belmont, CA: Wadsworth Publishing Company.
- Loveless, A., (2003). *The interaction between primary teachers’ perceptions of ICT and their pedagogy*. *Education and Information Technologies*. 8, 313–326.
- Loveless, A., (2011). Technology , pedagogy and education: Reflections on the accomplishment of what teachers know, do and believe in a digital age. *Technology, Pedagogy and Education*. 20(3), 301–316.
- Loveless, A. and Williamson, B., (2013). *Learning identities in a digital age: Rethinking creativity, education and technology*. Oxon: Routledge.
- Ludema, J., (2002). Appreciative storytelling: a narrative approach to organization development and change. In: R. Fry, F. Barrett, J. Seiling and D. Whitney (Eds.). *Appreciative Inquiry and Organizational Transformation: Reports from the Field*. Westport, CT: Quorum Books.
- Ludema, J. and Fry, R., (2008). The practice of appreciative inquiry. In: P. Reason and H. Bradbury (Eds.). *The Sage handbook of action research*. London: Sage. pp. 280–295.
- Lupton, D., (2015). Data assemblages, sentient schools and digitised health and physical education (response to Gard). *Sport, Education and Society*. 20(1), 122–132.
- Lyngstad, I., Hagen, P.M. and Aune, O., (2016). Understanding pupils’ hiding techniques in physical education. *Sport, Education and Society*. 21(8), 1127–1143.
- Macdonald, D., (2003). Curriculum change and the post-modern world: Is the school

- curriculum-reform movement an anachronism? *Journal of Curriculum Studies*. 35(2), 139–149.
- MacPhail, A. and O’Sullivan, M., (2010). *Young people’s voice in physical education and youth sport*. London: Routledge.
- Mama, M. and Hennessy, S., (2013). Developing a typology of teacher beliefs and practices concerning classroom use of ICT. *Computers and Education*. 68, 380–387.
- Markula, P. and Silk, M., (2011). *Qualitative research for physical culture*. Basingstoke: Palgrave Macmillian.
- Mayes, T. and de Freitas, S., (2007). Learning and e-learning: the role of theory. In H. Beetham and R. Sharp (Eds). *Rethinking pedagogy for a digital age. Designing and delivering e-learning* (pp.13-25). Abingdon: Routledge.
- McCuaig, L. and Quennerstedt, M., (2016). Health by stealth – exploring the sociocultural dimensions of salutogenesis for sport, health and physical education research. *Sport, Education and Society*. 1–12.
- McDougall, A. and Jones, A., (2006). Theory and history, questions and methodology: current and future issues in research into ICT in education. *Technology, Pedagogy and Education*. 15(3), 353–360.
- McEvoy, E., Heikinaro-Johansson, P. and MacPhail, A., (2017). Physical education teacher educators’ views regarding the purpose(s) of school physical education. *Sport, Education and Society*. 22 (7), 812–824.
- McKnight, K., O’Malley, K., Ruzic, R., Horsley, M.K., Franey, J. and Basset, K., (2016). Teaching in a Digital Age: How Educators Use Technology to Improve Student Learning. *Journal of Research on Technology in Education*. 48(3), 194–211.
- Melhuish, M., Falloon, G. and Melhuish, K., (2010). Looking to the future: M-learning with the iPad. *Computers in New Zealand Schools Learning Leading Technology*. 22(3), 1–16.
- Merriam, S., (1988). *Case study research in education: A qualitative approach*. San Francisco: Jossey-Bass.
- Michael, S., (2005). The promise of Appreciative Inquiry as an interview tool for field research. *Development in Practice*. 15(2), 222–230.
- Mills, J., Bonner, A. and Francis, K., (2006). The Development of Constructivist Grounded Theory. *International Journal of Qualitative Methods*. 5(51).
- Miranda, H.P. and Russell, M., (2012). Understanding factors associated with teacher-



- directed student use of technology in elementary classrooms: A structural equation modeling approach. *British Journal of Educational Technology*. 43(4), 652–666.
- Mishra, P., and Koehler, M.J., (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017-1054.
- Mohnsen, B., (1995). *Using technology in physical education*. Champaign, IL, Human Kinetics.
- Mohnsen, B., (2003). *Using technology in physical education*. Champaign, IL, Bonnie's fitware.
- Morse, J.M., (2007). Sampling in Grounded Theory. In: A. Bryant & K. Charmaz (Eds.). *The Sage Handbook of Grounded Theory*. London: Sage.
- Mulhall, A., (2003). In the field: Notes on observation in qualitative research. *Journal of Advanced Nursing*. 41(3), 158–174.
- National Association for Sport and P.E., (2009). *Appropriate use of instructional technology in physical education*. Reston: National Association for Sport and Physical Education.
- Neiderhauser, D. and Stoddart, T., (2001). Teachers' instructional perspectives and use of educational software. *Teaching and Teacher Education*. 17(1), 15–31.
- Neiss, M., (2005). Preparing teachers to teach science and mathematics with technology: Developing a technology pedagogical content knowledge. *Teaching and Teacher Education*. 21, 509–523.
- Nichol, J. and Watson, K., (2003). Editorial: Rhetoric and reality - the present and the future of ICT in education. *British Journal of Educational Technology*. 34(2), 131–136.
- Nye, D., (2007) *Technology matters: Questions to live with*. Cambridge, MA: MIT Press.
- O'Connor, J., Jeanes, R. and Alfrey, L., (2014). Authentic inquiry-based learning in health and physical education: A case study of 'r/evolutionary' practice. *Physical Education and Sport Pedagogy*. 21(2), 201–216.
- O'Sullivan, M., (2006). Teachers, teaching and teacher education in physical education. In: D. Kirk, D. MacDonald, and M. O'Sullivan (Eds.). *The Handbook of Physical Education*. London: Sage. pp.347–365.
- pp. 367–368.
- Organisation for Economic Cooperation and Development., (2015). *Students, Computers and Learning: Making the Connection*. [Online]. Available from: doi:10.1787/9789264239555-en [Accessed: 3 April 2017].

- Office for Standards in Education (OfSTED)., (2011). *ICT in schools 2008–11: An evaluation of information and communication technology education in schools in England 2008-11*. Available from: <https://www.gov.uk/government/publications/ict-in-schools-2008-to-2011>.
- Office of Education Technology., (2016). *Future Ready Learning: Reimagining the role of technology in education*. Available from: <https://tech.ed.gov/files/2015/12/NETP16.pdf>.
- Öhman, M., Almqvist, J., Meckbach, J. and Quennerstedt, M., (2014). Competing for ideal bodies: A study of exergames used as teaching aids in schools. *Critical public health*. 24(2), 196–209.
- Ohman, M. and Quennerstedt, M., (2012). Observational studies. In: K. Armour and D. MacDonald (Eds.). *Research Methods in Physical Education and Youth Sport*. Oxon: Routledge. pp. 189–204.
- Okojie, M. Olinzock, A. and Okojie-boulder, T.C., (2006). The pedagogy of technology integration. *The Journal of Technology Studies*. 32(2), 66–71.
- Oppenheimer, T., (2003). *The flickering mind: The false promise of technology in the classroom and how learning can be saved*. New York: Random House.
- Orlando, J., (2015). Extending understandings of educational technology: Teachers' critiques of educational technology as important intellectual capital for researchers. In: S. Bulfin, N. Johnson, and C. Bigum (Eds.). *Critical perspectives on technology and education*. New York: Palgrave Macmillian. Pp.51-68.
- Orlando, J., (2013). ICT-mediated practice and constructivist practices: Is this still the best plan for teachers' uses of ICT? *Technology, Pedagogy and Education*. 22(2), 231–246.
- Orlando, J., (2014). Teachers' changing practices with information and communication technologies: An up-close, longitudinal analysis. *Research in Learning Technology*. 22, 1-15.
- Østerlie, O., (2016). Flipped learning in physical education: Why and how? In: D. Novak and Antala, B., *Physical Education and New Technologies*. Croatia Kinesiology Association. pp.166-176.
- Ottenbreit-Leftwich, A.T., Glazewski, K.D., Newby, T.J. and Ertmer, P.A., (2010). Teacher value beliefs associated with using technology: Addressing professional and student needs. *Computers & Education*. 55(3), 1321–1335.
- Palao, J.M., Hastie, P.A., Cruz, P.G. and Ortega, E., (2015). The impact of video technology on student performance in physical education. *Technology, Pedagogy and Education*.

24(1), 51–63.

Papacharissi, Z., Streeter, T. and Gillespie, T., (2013). Culture Digitally: Habitus of the New. *Journal of Broadcasting and Electronic Media*. 57(4), 596–607.

Papageorgaki, Z.K., (2017). Researching the lived experience of physical education: Some pedagogical insights. *Sport, Education and Society*. 1–12.

Papastergiou, M., (2009). Exploring the potential of computer and video games for health and physical education: A literature review. *Computers and Education*. 53, 603–622.

Papert, S., (1980). *Mindstorms: Children, computers and powerful ideas*. New York: Harvester Press.

Papert, S., (1993). *The children's machine: Rethinking school in the age of the computer*. New York: Basic books.

Park, S.H. and Ertmer, P.A., (2007). Impact of Problem-Based Learning (PBL) on Teachers' Beliefs Regarding Technology Use. *Journal of Research on Technology in Education*. 40(2), 247–267.

Parker, M., Morrison, J., Patton, K., Babkes Stellino, M., Hinchion, C. and Hall, K., (2017). Jamie: 'I couldn't teach without technology' A teacher and student learning journey. In: A. Casey, V.A. Goodyear, and K.M. Armour (Eds.). *Digital Technologies and Learning in Physical Education: Pedagogical cases*. London: Routledge. pp. 31–49.

Parker, M. and Patton, K., (2017). What research tells us about effective continuing professional development for physical education teachers. In: E. Catherine (Ed.). *Routledge Handbook of Physical Education Pedagogies*. Oxon: Routledge. pp. 447–460.

Patton, K. and Griffin, L., (2007). Examining teacher change: two teachers' experiences and patterns of change in a physical education teacher development project. *Journal of Teaching in Physical Education*, 27(3), 272–291.

Patton, K. and Parker, M., (2014). Moving from 'things to do on Monday' to student learning: physical education professional development facilitators' views of success. *Physical Education and Sport Pedagogy*. 19(1), 60–75.

Patton, M., (2002). *Qualitative research and evaluation methods*. 3rd ed. Thousand Oaks, CA: Sage.

Pearson, M. and Somekh, B., (2006). Learning transformation with technology: A question of sociocultural contexts? *International Journal of Qualitative Studies in Education*. 19(4), 519–539.

Perrotta, C., (2013). Do school-level factors influence the educational benefits of digital

- technology? A critical analysis of teachers' perceptions. *British Journal of Educational Technology*. 44(2), 314–327.
- Piantanida, M., Tananis, C.A. and Grubs, R.E., (2004). Generating grounded theory of/for educational practice: the journey of three epistemorphs. *International Journal of Qualitative Studies in Education*. 17(3), 325–346.
- Pierson, M.E., (2001). Technology Integration Practice as a Function of Pedagogical Expertise. *Journal of Research on Computing in Education*. 33(4), 413–430.
- Pill, S., (2014). Game Play: What Does It Mean for Pedagogy to Think Like a Game Developer? *Journal of Physical Education, Recreation and Dance*. 85(1), 9–15.
- Pill, S., (2015). Using Appreciative Inquiry to explore Australian football coaches' experience with game sense coaching. *Sport, Education and Society*. 20(6), 799–818.
- Pinto, L.E., (2016). Spectres of Educational Technology: Ghost-Busting as a Curricular Response. *Antistasis*. 6(1), 6–9.
- Pluim, C. and Gard, M., (2016). Physical education's grand convergence: *Fitnessgram*®, big-data and the digital commerce of children's health. *Critical Studies in Education*. 1–18.
- Prensky, M., (2001). Digital Natives, Digital Immigrants. *From On the Horizon*. 9(5), 1–6.
- Preskill, H. and Tzavaras Catsambas, T., (2006). *Reframing evaluation through appreciative inquiry*. Thousand Oaks, California: Sage.
- Prestridge, S., (2017). Examining the shaping of teachers' pedagogical orientation for the use of technology. *Technology, Pedagogy and Education*. 26(4), 367–381.
- Prestridge, S., (2012). The beliefs behind the teacher that influences their ICT practices. *Computers and Education*. 58(1), 449–458.
- Puente dura, R., (2006). Transformation, technology, and education [Blog post]. Retrieved from <http://hippasus.com/resources/tte/>.
- Pyle, B. and Esslinger, K., (2014). Utilizing Technology in Physical Education: Addressing the Obstacles of Integration. *Delta Kappa Gamma Bulletin*. 80(2), 35.
- Quennerstedt, M., (2013). PE on YouTube – investigating participation in physical education practice. *Physical Education and Sport Pedagogy*. 18(1), 42–59.
- Quennerstedt, M., Gibbs, B., Almqvist, J., Nilsson, J. and Winther, H., (2017). Beatrice: dance video games as a resource for teaching dance. In: A. Casey, V.A. Goodyear, and K.M. Armour (Eds.). *Digital Technologies and Learning in Physical Education: Pedagogical cases*. London: Routledge. pp.69–86.

- Quennerstedt, M. and Larsson, H., (2015). Learning movement cultures in physical education practice. *Sport, Education and Society*. 20(5), 565–572.
- Raymond, E.M. and Hall, M., (2008). The Potential for Appreciative Inquiry in Tourism Research. *Current Issues in Tourism*. 11(3), 281–292.
- Reynolds, D., Treharne, D. and Tripp, H., (2003). ICT-the hopes and the reality. *British Journal of Educational Technology*. 34(2), 151–167.
- Richardson, L., (2000). New writing practices in qualitative research. *Sociology of Sport Journal*. 17, 5–20.
- Ridley-Duff, R.J. and Duncan, G., (2015). What is critical appreciation? Insights from studying the critical turn in an appreciative inquiry. *Human Relations*. 68(10), 1579–1599.
- Rink, J., (2009). Investigating the assumptions of pedagogy. In: R. Bailey and D.Kirk (Eds.). *The Routledge Physical Education Reader*. Oxon: Routledge.
- Robertson, S., Shortis, T., Todman, N., John, P. and Dale, R., (2004). ICT in the classroom: The pedagogical challenge of respatialisation and reregulation. In: M. Olssen (Ed.). *Culture and learning: Access and opportunity in the curriculum*. Westport, CT: Greenwood Press.
- Rogers, E., (1995). *Diffusion of innovations*. 4th ed. New York: Free Press.
- Rogers, P. and Fraser, D., (2003). Appreciating appreciative inquiry. In: *Using appreciative inquiry in evaluation*. San Francisco, CA., Jossey-Bass. pp. 75–84.
- Ross, S.M., Morrison, G.R. and Lowther, D.L., (2010). Educational Technology Research Past and Present: Balancing Rigor and Relevance to Impact School Learning. *Contemporary Educational Technology*. 1(1), 17–35.
- Rossi, T., lisahunter, Christensen, E. and Macdonald, D., (2015). *Workplace learning in physical education: Emerging teachers stories from the staffroom and beyond*. London: Routledge.
- Roth, K., (2014). Technology for Tomorrow's Teachers. *Journal of Physical Education, Recreation & Dance*. 85(4), 3–5.
- Rowntree, D., (1974). *Educational technology in curriculum development*. London: Harper and Row.
- Ruggiero, D. and Mong, C.J., (2015). The Teacher Technology Integration Experience: Practice and Reflection in the Classroom. *Journal of Information Technology Education: Research*. 14, 161–178.

- Ryan, F.J., Soven, M., Smither, J., Sullivan, W.M. and Vanbuskirk, W.R., (1999). Appreciative inquiry: Using personal narratives for initiating school reform. *The Clearing House*. 72(3), 164–167.
- Ryba, K. and Brown, M.E., (2000). How proficient IT teachers integrate computers into the curriculum. *Journal of Computing in Teacher Education*. 16(4), 6–11.
- Sabiston, C.M., McDonough, M.H. and Crocker, P., (2007). Psychosocial experiences of breast cancer survivors involved in a dragon boat program: exploring links to positive psychological growth. *Journal of Sport and Exercise Psychology*. 29(4), 419–438.
- Sampson, H., (2004). Navigating the waves: the usefulness of a pilot in qualitative research. *Qualitative Research*. 4(3), 383–402.
- Sargent, J., Casey, A. and Rich, E., (2015). ‘iPadagogy’: A visual investigation into the use of the iPad as a pedagogical tool by secondary school, physical education teachers. Paper presented at the *British Educational Research Conference*, 2015 15-17<sup>th</sup> September, Belfast.
- Schall, E., Ospina, S., Godsoe, B. and Dodge, J., (2004). Appreciative Narratives As Leadership Research: Matching Method To Lens. *Advances in Appreciative Inquiry*. 1, 147–170.
- Shulman, L., (1986). Those who understand. Knowledge and growth in teaching. *Educational Researcher*, 15(2), 4-22.
- Shulman, L., (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*. 57(1), 1-22.
- Schwandt, T., (1998). Constructivist, interpretivist approaches to human inquiry. In: N. Denzin and Y. Lincoln (Eds.). *The Landscape of Qualitative Research: Theories and Issues*. Thousand Oaks: Sage.
- Selwyn, N., (2000). The National Grid for Learning Initiative: Connecting the learning society? *School Leadership and Management*. 20(4), 407–414.
- Selwyn, N., (2002). *Telling Tales on Technology: Qualitative Studies of Technology and Education*. Aldershot: Ashgate Publishing.
- Selwyn, N., (2007). Plus ça change, plus c’est la même chose - considering the probable futures of education technology. In: D. Kritt and L. Winegar (Eds.). *Education and Technology: Critical perspectives, possible futures*. Plymouth: Lexington books.
- Selwyn, N., (2010). Looking beyond learning: notes towards the critical study of educational technology. *Journal of Computer Assisted Learning*. 26(1), 65–73.

- Selwyn, N., (2011a). *Education and technology: Key issues and debates*. London: Continuum.
- Selwyn, N., (2011b). *Schools and schooling in the digital age: A critical analysis*. London: Routledge.
- Selwyn, N., (2011c). Editorial: In praise of pessimism-the need for negativity in educational technology. *British Journal of Educational Technology*. 42(5), 713–718.
- Selwyn, N., (2012a). Making sense of young people, education and digital technology: the role of sociological theory. *Oxford Review of Education*. 38(1), 81–96.
- Selwyn, N., (2012b). Ten suggestions for improving academic research in education and technology. *Learning, Media and Technology*. 37(3), 213–219.
- Selwyn, N., (2013). *Education in a digital world: Global perspectives on technology and education*. New York: Routledge.
- Selwyn, N., (2014a). *Distrusting educational technology: Critical questions for changing times*. London: Routledge.
- Selwyn, N., (2014b). Technology and education - why it's crucial to be critical. In: S. Bulfin, N. Johnson and C. Bigum (Eds.). *Critical perspectives on technology and education*. New York: Palgrave MacMillan.
- Selwyn, N., (2015). Minding our language: Why education and technology is full of bullshit...and what might be done about it. *Learning, Media and Technology*. 41 (1).
- Selwyn, N., (2016). *Educational technology: Key issues and debates*. 2nd ed. London: Bloomsbury.
- Sheridan, L., (2016). Examining Changes in Pre-service Teachers' Beliefs of Pedagogy. *Australian Journal of Teacher Education*. 41(3), 1–20.
- Siemens, G., (2005). Connectivism: A Learning Theory for the Digital Age. *International Journal of Technology and Distance Learning*. 2(1).
- Sinclair, A., (2009). Provocative Pedagogies in e-Learning: Making the Invisible Visible. *International Journal of Teaching and Learning in Higher Education*. 21(2), 197–209.
- Sinelnikov, O.A., (2012). Using the iPad in a Sport Education Season. *Journal of Physical Education, Recreation and Dance*. 83(1), 39–45.
- Sipilä, K., (2011). No Pain, No Gain? Teachers' Implementing ICT in Instruction. *Interactive Technology and Smart Education*. 8(1), 39–51.
- Sipilä, K., (2014). Educational use of information and communications technology: teachers' perspective. *Technology, Pedagogy and Education*. 23(2), 225–241.

- Skinner, B.F., (1958). Teaching Machines. *Science*. 128, 969–977.
- Smith, B. and Caddick, N., (2012). Qualitative methods in sport: A concise overview for guiding social scientific sport research. *Asia Pacific Journal of Sport and Social Science*. 1(1), 60–73.
- Smith, B. and Deemer, D., (2000). The problem of criteria in the age of relativism. In: N. Denzin and Y. Lincoln (Eds.). *Handbook of Qualitative Research*. 2nd ed. London: Sage. pp. 877–896.
- Smith, B. and McGannon, K., (2017). Developing rigor in qualitative research: Problems and opportunities within sport and exercise psychology. *International Review of Sport and Exercise Psychology*. 1-21
- Snoeyink, R. and Ertmer, P., (2001). Thurst into technology: How verteran teachers respond. *Journal of Educational Technology Systems*. 30, 85–111.
- Somekh, B., (2008). Factors Affecting Teachers’ peadgogical adoption of ICT. In: J. Voogt and G. Knezek (Eds.). *International Handbook of Information Technology in Primary and Secondary Education*. Springer Science. pp. 449–460.
- Somekh, B., Davies, R. and Davies, R., (1991). Towards a pedagogy for information technology. *Curriculum Journal*. 2(2), 153–170.
- Sparkes, A., (1989). Paradigmatic confusions and the evasion of critical issues in naturalistic research. *Journal of Teaching in Physical Education*. 8, 131–151.
- Sparkes, A., (1990). *Curriculum change and physical education: towards a micropolitical understanding*. Deakin University Press: Victoria.
- Sparkes, A. and Smith, B., (2009). Judging the quality of qualitative inquiry: Criteriology and relativism in action. *Psychology of Sport and Exercise*. 10, 491–497.
- Sparkes, A. and Smith, B., (2014). *Qualitative research methods in sport, exercise and health: From process to product*. London: Routledge.
- Stake, R., (1978). The Case Study Method in Social Inquiry. *Educational Researcher*. 7(2), 5–8.
- Stake, R., (1995). *The art of case study research*. Thousand Oaks, CA: Sage.
- Stake, R., (2000). Case studies. In: N. Denzin and Y. Lincoln (Eds.). *Handbook of qualitative research*. 2nd ed. New York: Sage. pp. 435–454.
- Stake, R., (2003). Case studies. In: N. Denzin and Y. Lincoln (Eds.). *Strategies of qualitative inquiry*. 2nd ed. Thousand Oaks, CA: Sage. pp. 134–165.
- Starkey, L., (2011). Evaluating learning in the 21st century: A digital age learning matrix.



- Technology, Pedagogy and Education*. 20(1), 19–39.
- Stavros, J., Godwin, L.N. and Cooperrider, D., (2016). Appreciative Inquiry: Organization development and the strengths revolution. In: W. Rothwell, J. Stavros and R. Sullivan (Eds.). *Practicing Organisation Development: Leading Transformation and Change*. 4th ed. Hoboken, NJ: John Wiley and Sons Inc. pp. 96–116.
- Sternberg, B.J., Kaplan, K. and Borck, J.E., (2007). Enhancing adolescent literacy achievement through integration of technology in the classroom. *Reading Research Quarterly*. 42 (3), 416–420.
- Stidder, G. and Capel, S., (2010). Using information and communications technology to support learning and teaching in PE. In: S. Capel and M. Whitehead (Eds.). *Learning to Teach Physical Education in the Secondary School*. 3rd ed. Oxon: Routledge.
- Strauss, A. and Corbin, J., (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. London: Sage.
- Sutton, K. and DeSantis, J., (2016). Beyond change blindness: Embracing the technology revolution in higher education. *Innovations in Education and Teaching International*. 54(3), 223–228.
- Tannehill, D., MacPhail, A., Halbert, G. and Murphy, F., (2013). *Research and Practice in Physical Education*. London: Routledge.
- Tapscott, D., (1996). *The digital economy: Promise and peril in the age of networked intelligence*. New York: McGraw-Hill.
- Tearle, P., (2003). ICT implementation: What makes the difference? *British Journal of Educational Technology*. 34(5), 567–583.
- Tearle, P. and Golder, G., (2008). The use of ICT in the teaching and learning of physical education in compulsory education: How do we prepare the workforce of the future? *European Journal of Teacher Education*. 31(1), 55–72.
- The Flipped Learning Network., (2014). *What is Flipped Learning?* Available from: [https://flippedlearning.org/wp-content/uploads/2016/07/FLIP\\_handout\\_FNL\\_Web.pdf](https://flippedlearning.org/wp-content/uploads/2016/07/FLIP_handout_FNL_Web.pdf) [Accessed: 12 December 2017].
- Thomas, A. and Stratton, G., (2006). What we are really doing with ICT in physical education: A national audit of equipment, use, teacher attitudes, support, and training. *British Journal of Educational Technology*. 37(4), 617–632.
- Thomas, G., (2011). A Typology for the Case Study in Social Science Following a Review of Definition, Discourse, and Structure. *Qualitative Inquiry*. 17(6), 511–521.

- Thomas, G., (2016). *How to do your case study*. 2nd edition. London: Sage.
- Thorpe, M., (2012). Educational technology: Does pedagogy still matter? *Educational Technology Magazine The Magazine for Managers of Change in Education*. 52(2), 10–14.
- Tinning, R., (1991). Teacher Education Pedagogy: Dominant Discourses and the Process of Problem Setting. *Journal of Teaching in Physical Education*. 11, 1–20.
- Tinning, R., (1992). Teacher education pedagogy: Dominant discourses and the process of problem setting. In: T. Williams, L. Almond and A. Sparkes (Eds.). *Sport and physical activity: Moving towards excellence*. London: E&FN Spon. pp. 23–40.
- Tinning, R., (2008). Pedagogy, Sport Pedagogy, and the Field of Kinesiology. *Quest*. 60(3), 405–424.
- Tinning, R., (2010). *Pedagogy and human movement: Theory, Research and Practice*. Oxon: Routledge.
- Tjora, A.H., (2006). Writing small discoveries: An exploration of fresh observers' observations. *Qualitative Research*. 6(4), 429–451.
- Toffler, A., (1984). *The third wave*. New York: Bantam.
- Tondeur, J., van Braak, J. and Valcke, M., (2007). Curricula and the use of ICT in education: Two worlds apart? *British Journal of Educational Technology*. 38(6), 962–976.
- Tondeur, J., van Braak, J., Ertmer, P. and Ottenbreit-Leftwich, A., (2016a). Understanding the relationship between teachers' pedagogical beliefs and technology use in education: a systematic review of qualitative evidence. *Educational Technology Research and Development*. 65(3), 555–575.
- Tondeur, J., Pajare Roblin, N., van Braak, J., Voogt, J. and Prestridge, S. (2016b). Preparing beginning teachers for technology integration in education: Ready for take-off? *Technology, Pedagogy and Education*. 26(2), 157–177.
- Tondeur, J., van Keer, H., van Braak, J. and Valcke, M., (2008). ICT integration in the classroom: Challenging the potential of a school policy. *Computers & Education*. 51(1), 212–223.
- Tondeur, J., Krug, D., Bill, M., Smulders, M. and Zhu, C., (2015). Integrating ICT in Kenyan secondary schools: An exploratory case study of a professional development programme. *Technology, Pedagogy and Education*. 1–20.
- Tracy, S.J. (2010) Qualitative Quality: Eight 'Big-Tent' Criteria for Excellent Qualitative Research. *Qualitative Inquiry*. 16(10), 837–851.

- Trout, J. and Christie, B., (2007). Interactive video games in physical education. *Journal of Physical Education, Recreation & Dance*. 78(5), 29–45.
- Tschannen-Moran, M. and Tschannen-Moran, B., (2011). Taking a Strengths-Based Focus Improves School Climate. *Journal of School Leadership*. 21, 422–449.
- Twining, P., (2010). Educational information technology research methodology: Looking back and moving forward. In: A. McDougall, J. Murnane, A. Jones and N. Reynolds (Eds.). *Researching IT in education: Theory, practice and future directions*. Oxon: Routledge. pp. 154–168.
- Ulichny, P. and Schoener, W., (2010). Teacher-Researcher Collaboration from Two Perspectives. In: W. Luttrell (Ed.). *Qualitative Educational Research: Readings in Reflective Methodology and Transformative Practice*. New York: Routledge. pp. 421–448.
- Underwood, J., (2004). Research into information and communications technologies: where now? *Technology, Pedagogy and Education*. 13(2), 135–145.
- Underwood, J. and Dillon, G., (2011). Chasing dreams and recognising realities: teachers' responses to ICT. *Technology, Pedagogy and Education*. 20(3), 317–330.
- Van Driel, J.H., Bulte, A.M. and Verloop, N., (2007). The relationships between teachers' general beliefs about teaching and learning and their domain specific curricular beliefs. *Learning and Instruction*. 17(2), 156–171.
- Vanderlinde, R., Van Braak, J. and Tondeur, J., (2010). Using an online tool to support school-based ICT policy planning in primary education. *Journal of Computer Assisted Learning*. 26(5), 434–447.
- Veen, W., (1993). How teachers use computers in instructional practice: Four case studies in a dutch secondary school. *Computers and Education*. 53(2), pp.1-8.
- Villalba, A., González-Rivera, M. IDolores and Díaz-Pulido, B., (2017). Obstacles Perceived by Physical Education Teachers to Integrating ICT. *The Turkish Online Journal of Educational Technology*. 16(1).
- Voogt, J., Fisser, P., Pareja Roblin, N., Tondeur, J. and van Braak, J., (2012). Technological pedagogical content knowledge - a review of the literature. *Journal of Computer Assisted Learning*, 29(2), 109-121.
- Wachira, P. and Keengwe, J., (2011). Technology Integration Barriers: Urban School Mathematics Teachers Perspectives. *Journal of Science Education and Technology*. 20 (1), 17–25.

- Watkins, J. and Mohr, B., (2001). *Appreciative inquiry: Change at the speed of imagination*. San Francisco, CA: Jossey-Bass.
- Watkins, C. and Mortimore, P., (1999). Pedagogy: What do we know? In: P. Mortimore (Ed.). *Understanding pedagogy and its impact on learning*. London: Paul Chapman. pp. 1–20.
- Watkins, J. and Cooperrider, D., (2000). Appreciative Inquiry : A Transformative Paradigm. *Journal of the Organisational Development Network*. 32, 6–12.
- Watson, D.M., (2001) Pedagogy before technology: Re-thinking the relationship between ICT and teaching. *Education and Information Technologies*. 6(4), 251–266.
- Watson, W., Watson, S. and Reigeluth, C., (2012). A systemic integration of technology for new-paradigm education. *Educational Technology*. 52(5), 25–29.
- Webb, M., (2011). Changing models for researching pedagogy with information and communications technologies. *Journal of Computer Assisted Learning*. 29(2), 53–67.
- Webb, M. and Cox, M., (2004). A Review of Pedagogy Related to Information and Communications Technology. *Technology, Pedagogy and Education*. 13(3).
- Weed, M., (2016). Capturing the essence of grounded theory: The importance of understanding commonalities and variants. *Qualitative Research in Sport, Exercise and Health*. 9(1).
- Weir, T. and Connor, S., (2009). The use of digital video in physical education. *Technology, Pedagogy and Education*. 18(2), 155–171. doi:10.1080/14759390902992642 [Accessed: 1 December 2015].
- Whitefield, T., (2012). Pedagogy in the Evolving Tech Environment –What Has Changed? *Icicte 2012*. 283–291.
- Whitney, D. and Trosten-Bloom, A., (2010). *The power of appreciative inquiry*. San Francisco, CA: Berrett-Koehler.
- Wieviorka, M., (1992). Case studies: history or sociology? In: C. Ragin and H.S. Becker (eds.). *What is the case? Exploring the Foundations of Social Inquiry*. Cambridge: Cambridge University Press.
- Williamson, B., (2015). Algorithmic skin: health-tracking technologies, personal analytics and the biopedagogies of digitized health and physical education. *Sport, Education and Society*. 20(1), 133–151.
- Willoughby, G. and Tosey, P., (2007). Imagine ‘Meadfield’. Appreciative Inquiry as a Process for Leading School Improvement. *Educational Management Administration and*

- Leadership*. 35(4), 499–520.
- Wohlwill, J., (1962). The Teaching Machine: Psychology's New Hobbyhorse. *Teachers College Record*. 64(2), 139–146.
- Wolcott, H., (2009). *Writing up qualitative research*. 3rd ed. Thousand Oaks: Sage.
- Woods, M.L., Karp, G.G., Miao, H. and Perlman, D., (2008). Physical educators' technology competencies and usage Physical Educators' Technology Competencies and Usage. *The Physical Educator*. 65(2), 82–99.
- Wrench, A. and Garrett, R., (2012). Identity work: Stories told in learning to teach physical education. *Sport, Education and Society*. 17(1), 1–19.
- Wyant, J.D., Jones, E.M. and Bulger, S.M., (2015). A mixed methods analysis of a Single-Course Strategy to Integrate Technology Into PETE. *Journal of Teaching in Physical Education*. 34, 131–151.
- Yballe, L. and O'Connor, D., (2000). Appreciative Pedagogy: Constructing Positive Models for Learning. *Journal of Management Education*. 24 (4), 474–483.
- Yin, R., (2014). *Case Study Research: Design and Methods*. 5th ed. Thousand Oaks, CA: Sage.
- Zhao, Y. and Frank, K.,(2003). Factors affecting technology users in schools: An ecological perspective. *American Educational Research Journal*. 40, 807–840.
- Zhao, Y., Pugh, K., Sheldon, S. and Byers, J., (2002). Conditions for classroom technology innovations. *Teachers College Record*. 104, 807–840.

# Appendices

## Appendix i: Information Letter



### "Pedagogies of Technology in PE" Participant Information Sheet

**Primary researcher:** Miss Julia Sargent, Sir John Beckworth Centre for Sport, School of Sport, Exercise and Health Sciences, Loughborough University, Loughborough, LE11 3TU, [j.sargent@lboro.ac.uk](mailto:j.sargent@lboro.ac.uk).

**Supervisor:** Dr Ashley Casey, ZZ1.08 - Matthew Arnold Building, School of Sport, Exercise and Health Sciences, Loughborough University, Loughborough, LE11 3TU, Email: [A.J.B.Casey@lboro.ac.uk](mailto:A.J.B.Casey@lboro.ac.uk), Tel: (01509) 226314.

#### What is the purpose of the study?

This study aims to explore how PE teachers' view and use technology in their teaching practices. It also seeks to investigate wider experiences and factors that influence how these practices are constructed and sustained. The purpose is to work with PE teachers who use technology in their teaching practice to understand more deeply the development and construction of how and why technology is used in teaching PE.

#### Who is doing this research and why?

This research is being conducted by Julia Sargent as part of a PhD student research project supported and funded by Loughborough University. The project is being supervised by Dr Ashley Casey and Professor John Evans.

#### Are there any exclusion criteria?

No.

## **What will I be asked to do?**

### *Anticipated engagement*

#### **Phase 1:** 4 x 1 hour interviews (approx.)

Julia will conduct these four interviews will be focused on exploring your technology views and use both inside and outside of the school context alongside your current and future use. As a participant you will be required to be available to be interviewed.

**Phase 2:** Will involve maximum of two days school visit and involve further interviews and lesson observations.

## **Once I take part, can I change my mind?**

Yes. After you have read this information and asked any questions you may have we will ask you to complete an Informed Consent Form, however if at any time, before, during or after the sessions you wish to withdraw from the study please just contact the main investigator. You can withdraw at any time, for any reason and you will not be asked to explain your reasons for withdrawing.

## **Will I be required to attend any sessions and where will these be?**

The principle investigator will be conducting the study with you either by electronic format (i.e. Skype, FaceTime etc.) or at your school during the school day and at a mutual convenient time. Subsequently you will not be required to attend any sessions outside of your school environment unless you wish to do so.

## **How long will it take?**

As a participant, the anticipated engagement will be as follows:

**Phase 1:** 4 x 1 hour interviews (online or in person)

**Phase 2:** Visitation of the school twice for one day per visit (maximum). Visit involving lesson observations and interviews with members of staff.

Total time required: Approximately 12 hours

## **What personal information will be required from me?**

No personal details beyond your age, gender and your educational/training experience.

**Are there any risks in participating?**

No. A thorough risk assessment has been conducted as part of the University ethical procedures and any identified risks have been assessed and adequately controlled to ensure the safety of all participants.

**Will my taking part in this study be kept confidential?**

Yes. All information on participants are treated as confidential and you will not be identifiable in any aspect of the research project. Any transcripts or audio recordings of participants will be kept in a locked cabinet and will be only accessible to the primary investigators. All audio recordings will be destroyed within 10 years of project completion.

**I have some more questions; who should I contact?**

In the first instance, please contact Julia Sargent ([j.sargent@lboro.ac.uk](mailto:j.sargent@lboro.ac.uk)) or the supervisor of the project Dr Ashley Casey ([a.j.b.casey@lboro.ac.uk](mailto:a.j.b.casey@lboro.ac.uk), (01509 226314).

**What will happen to the results of the study?**

The results of the study will be used as data to inform a doctoral thesis. It is anticipated that the data will also be used in conference papers and associated publications in research journals.

**What if I am not happy with how the research was conducted?**

If you are not happy with how the research was conducted, please contact Ms Jackie Green, the Secretary for the University's Ethics Approvals (Human Participants) Sub-Committee:

Ms J Green, Research Office, Hazlerigg Building, Loughborough University, Epinal Way, Loughborough, LE11 3TU. Tel: 01509 222423. Email: [J.A.Green@lboro.ac.uk](mailto:J.A.Green@lboro.ac.uk)



The University also has a policy relating to Research Misconduct and Whistle Blowing which is available online at  
[http://www.lboro.ac.uk/admin/committees/ethical/Whistleblowing\(2\).htm](http://www.lboro.ac.uk/admin/committees/ethical/Whistleblowing(2).htm).

## Appendix ii: Informed Consent Form



### Pedagogies of technology in PE

#### INFORMED CONSENT FORM

(to be completed after Participant Information Sheet has been read)

##### Taking Part

Please initial box

The purpose and details of this study have been explained to me. I understand that this study is designed to further scientific knowledge and that all procedures have been approved by the Loughborough University Ethics Approvals (Human Participants) Sub-Committee.

☐

I have read and understood the information sheet and this consent form.

☐

I have had an opportunity to ask questions about my participation.

☐

I understand that I am under no obligation to take part in the study, have the right to withdraw from this study at any stage for any reason, and will not be required to explain my reasons for withdrawing.

☐

I agree to take part in this study. Taking part in the project will include being interviewed and recorded (audio or video).

☐

##### Use of Information

I understand that all the personal information I provide will be treated in strict confidence and will be kept anonymous and confidential to the researchers unless (under the statutory obligations of the agencies which the researchers are working with), it is judged that confidentiality will have to be breached for the safety of the participant or others or for audit by regulatory authorities.

☐☐

I understand that anonymised quotes may be used in publications, reports, web pages, and other research outputs.

I understand that anonymised data may be made available to other researchers through a data access committee.

☐

I agree for the data I provide to be securely archived at the end of the project.


☐

_____	_____	_____
Name of participant	[printed]	Signature
_____	_____	_____
Researcher	[printed]	Signature
_____	_____	_____
		Date

## Appendix iii: Ethical clearance

### Ethical Clearance

ssehs res ent

 You replied to this message on 13/01/2016 10:31.

Sent: Wed 13/01/2016 10:15

To: Ashley Casey

Cc: Julia Sargent

---

Dear Dr Casey,

Reference number is SSEHS-1932

I can confirm that your ethics checklist:

*Pedagogies of technology in physical education*

Has been approved. The reference number is SSEHS-1932

Kind regards

**Charlotte Barradell**

Finance and Research Office, JB0.16

School of Sport, Exercise and Health Sciences

Loughborough University

Loughborough

Leicestershire LE11 3TU

Tel: +44 (0) 1509 226416

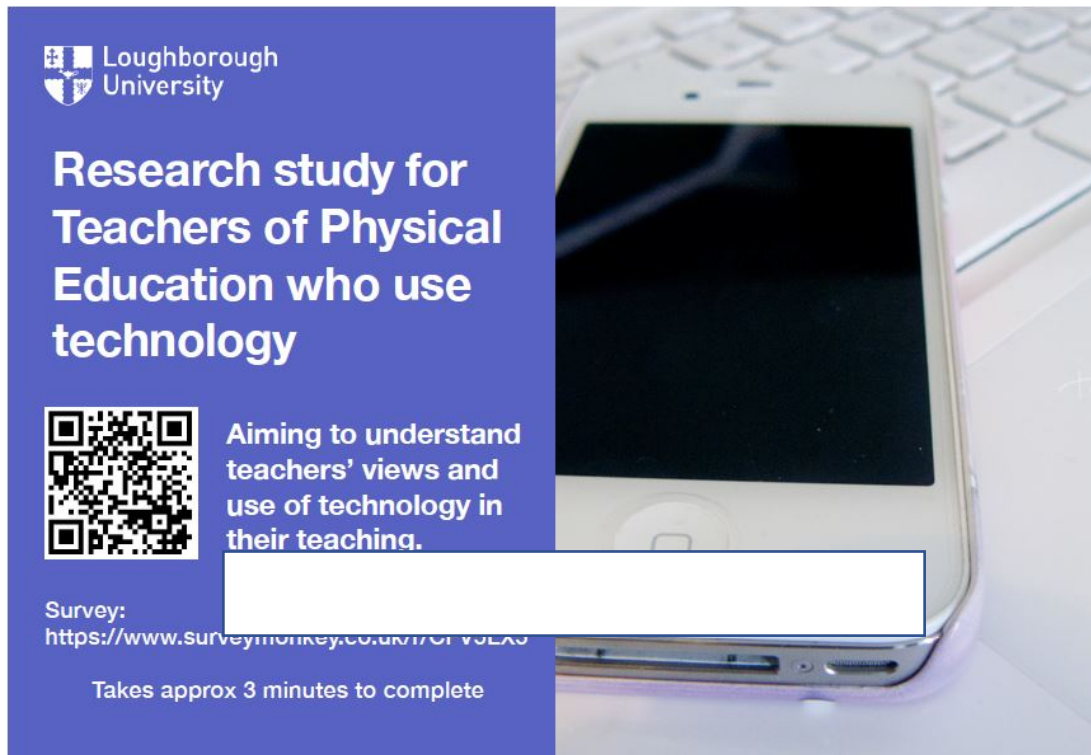



**Loughborough  
University**




**Athena  
SWAN**  
**Silver Award**

## Appendix iv: Research flyers and advertisement

A research flyer for Loughborough University. The left side has a blue background with white text. The right side shows a close-up of a white smartphone on a keyboard. A white rectangular box redacts a portion of the flyer.

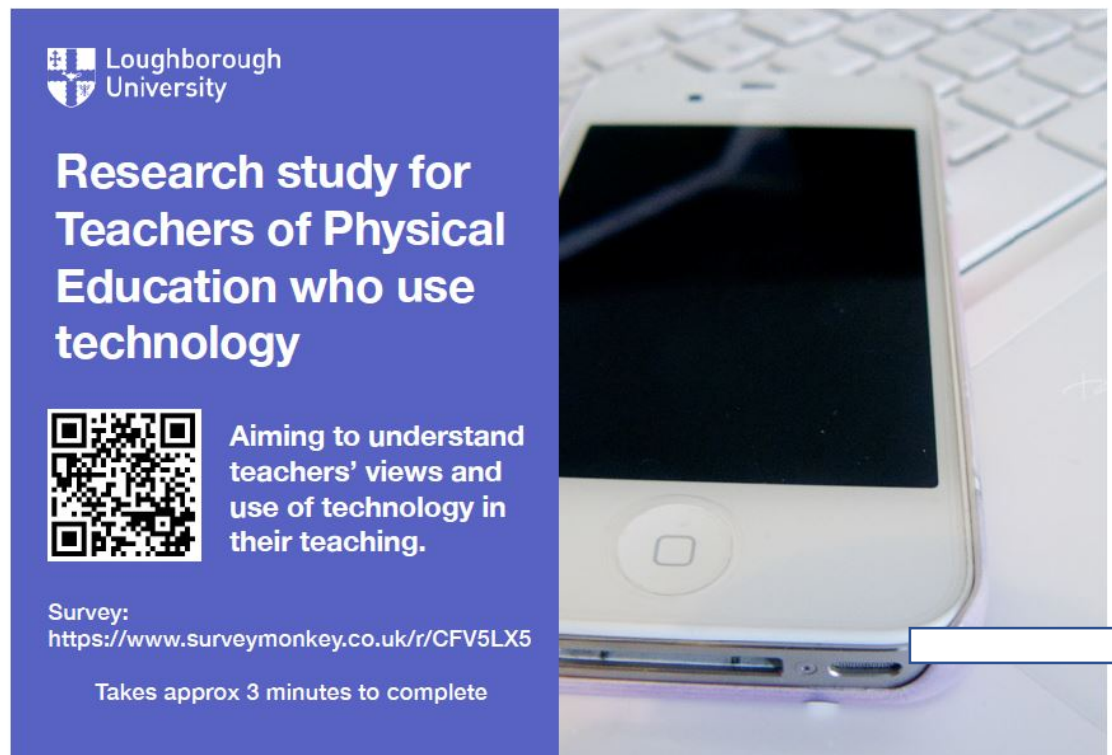
 Loughborough University


### Research study for Teachers of Physical Education who use technology

 Aiming to understand teachers' views and use of technology in their teaching.


Survey:  
<https://www.surveymonkey.co.uk/r/CFV5LX5>

Takes approx 3 minutes to complete

A research flyer for Loughborough University, identical to the one above. The left side has a blue background with white text. The right side shows a close-up of a white smartphone on a keyboard. A white rectangular box redacts a portion of the flyer.

 Loughborough University

### Research study for Teachers of Physical Education who use technology

 Aiming to understand teachers' views and use of technology in their teaching.

Survey:  
<https://www.surveymonkey.co.uk/r/CFV5LX5>

Takes approx 3 minutes to complete

## **Appendix v: Example Interview Schedule**

Interview schedule: Harriet (Phase 3) Interview 1

### **Views:**

“It’s not about what technology can do for you but what technology is” ... could you discuss this is a little bit more?

What end is technology a means to?

Not driven by your interest in technology more to address a problem... what problems can technology help you to solve?

When is technology appropriate? When has your use been appropriate?

How do you think these views was developed? Why do you think has influenced you to see technology in this way?

View as a teaching and learning tool – what do you mean by tool in terms of teaching? And then learning?

Initially couldn’t see the value but, now sees the value (i.e. Twitter) Why do you think this value has changed overtime? How has the value developed?

### **Use:**

Main use for you and your teaching? Main use for students and learning?

Different with different groups – how and why?

Technology for presenting information or delivering information in a different way to differentiate? In what way is this different? Why do you do this to differentiate?

Diary – use to video progress (why?)

Starting video with GCSE group worked better - why better with this group?

Using with more interested students –why with this group?

Particularly useful in athletics – why useful in athletics?

### **Experiences outside of school influenced use inside school**

Feeling inclined to use phone less – influenced use of technology in school?

Constant use of laptop outside influenced use inside?

### **Practices developed/sustained**

Why have you found trying technology and finding ideas through twitter helpful to your practice?

How has seeing other people using technology influenced your practice?

Developing progress in diary – reflection process in terms of what they learnt... what did you want them to learn? – developing through use of technology?

### **Why use technology**

Regularly use videos... why?

“Different emphasis” what does this mean? In terms of teaching or accessing learning?

Through a different platform?

Different twist? How is technology different?

Does your use of technology allow you to do more of anything? In what way?

Matches learning needs – what learning needs match the use of technology?

Prolonging learning/supporting.. expanding? Why?

How do you decide what will work in a lesson? Why do you choose to use technology?

### **Factors promoting use**

Experiencing something new or different? - what does this experience or feeling, mean for your practice?

Seeing impact – with lower ability students – what impact? Can you describe this in more detail?

What successes have you experienced that may have influenced your use of technology?

## **Appendix vi: Analysis video**

Link to video: <https://youtu.be/QTILVrqYHQ4>

Alternative link: <https://tinyurl.com/v8gbvtmg>



## Appendix vii: Document sources

The table below shows the selection of documents collected with each teacher/site.

Teacher (school)	Number of documents obtained	Document types
Patrick (Newton)	52	7 x YouTube videos 7 x Flipped learning resources 1x PowerPoint slides 3 x App posters 1 x iPad Development Plan 1 x 2016 iPad impact statement 1 x Online register 2 x Padlet wall 3 x iPad booklet 1 x School vision document 1 x Google Map of school 1 x Year 7 student feedback 1 x Homework assessment 2 x Theory document 1 x App ideas for students/teachers 1 x iTunes U training 4 x SLT training 1 x Technology company draft 4 x Student feedback 1 x Government document 1 x Extra- curricular activities 1 x School priorities 2 x QR codes 1 x Google Drive Folder 1 x Online quiz 1 x SCITT CPD Assessment 1 x School values
Dillon (Wurburton)	30	1 x news report 1 x progress document 1 x image of TV in sports hall 1 x faculty teaching and learning improvement plan 1 x GCSE intervention plan 1 x image of google hangout screen

		1 x flipped learning Prezi presentation 1 x image of school PE goals 2 x posters in school hall 2 x images of hall space 1 x student demographics 1 x teacher timeline of DigiTech development 1 x GCSE key processes 5 x YouTube video 2 x ShowBie presentation 1 x GCSE revision booklet 1 x student Instagram comments 1 x school prospectus 1 x resource on methods of training 1 x image of TV in changing rooms 1 x picture of staff social media 2 x scheme of work
Alice (Lutterford)	2	1 x Staff poster 1 x Staff flyer
Harriet (Birchwood)	5	1 x Circuit training student resource 1 x Yoga student resource 1 x School Long-Term planning 15-16 1 x School Long Term planning 16-17 1 x ICT in PE Audit

**END OF MATTER**