Enhancing the use of Educational Technologies in the Early Years

JACK, CHRISTINE,LESLEY

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Abstract

A pragmatic action research approach was used to explore how educational technology (EdTech) is being used to support teaching and learning within early years settings and how practitioners can be supported to use it more effectively. The project had three phases. Interviews with twenty practitioners in the North East of England provided an overview of how EdTech is being used. A questionnaire allowed the findings from the interviews to be explored in more detail and on a larger scale (335 respondents). Action research projects with eight early years practitioners allowed me to explore how practitioners can be supported to use EdTech in a way that benefits them, their children and their settings.

My overarching aim was to inform my future practice as an educational consultant and determine whether action research is an appropriate way of providing support. I also wanted the research to have a positive impact on the practitioners involved in the action research projects. The participants were supported to use action research to explore how EdTech could be used to address a particular issue in their settings. All of the participants benefited from their involvement in this project, but questions remain about whether this would be a suitable approach for providing support to other groups.

The term ‘educational technology’ is examined and clarified. The research found that practitioners’ definitions were much broader than those used in the literature. The research considered whether EdTech is being used effectively in early years settings. Defining ‘effective use’ can be problematic, as it can vary depending on context and practitioners’ beliefs. Technological and pedagogical beliefs have not always been aligned, but this research shows that technologies are increasingly being used in ways that are compatible with Early Years Foundation Stage pedagogy.

Technology is becoming more physically and culturally embedded in early years settings. However, it is possible that it is still not being used to its full educational potential. The rationale given for using technology is often ‘social’ rather than ‘pedagogical’ (Hawkridge, 1990). It is often used because practitioners believe their setting needs to reflect the wider world, rather than to support a belief about its impact on teaching and learning.

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List of Abbreviations

BECTA – British Educational Communications and Technology Agency

BOS – Bristol Online Surveys

CBAM – Concerns Based Adoption Model

CERI – Centre for Educational Research and Innovation

CLC – City Learning Centre

CPD – Continuing Professional Development

EdTech – Educational Technology

ELG – Early Learning Goals

ERIC – Education Resources Information Centre

EYFS – Early Years Foundation Stage

ICT – Information Communication Technology

IT – Information Technology

IWB – Interactive Whiteboard

LA – Local Authority

NAEYC – National Association for the Education of Young Children

OECD – Organisation for Economic Co-operation and Development

Ofsted – Office for Standards in Education

RCT – Randomised controlled trial

SALT – Speech and language therapy

SAMR – Substitution, Augmentation, Modification and Redefinition

SCITT – School-Centred Initial Teacher Training

SEN – Special Educational Needs

TAM – Technology Acceptance Model

TPACK - Technological, pedagogical and content knowledge

UTAUT – Unified Theory of Acceptance and Use of Technology

Declaration

This thesis is my own work and no part of the materials contained in it has previously been submitted for a degree in this or any other university.

Statement of Copyright

Acknowledgements

Having worked with practitioners for many years, I always knew that any research I conducted for my doctorate would need to include their voices. I would like to thank everyone that took part in the project.

I would especially like to thank the eight practitioners who worked with me on the action research projects. They committed significant time to this research. I enjoyed having the opportunity to learn from them. I hope they found it as beneficial as I did.

My supervisor, Steve Higgins, has supported me in many ways. I enjoyed our conversations and learned so much from him.

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My partner, Martin Ellis, encouraged me to start the doctoral journey and he has supported me throughout the six years it has taken to complete it. He has helped in too many ways to mention, I am especially grateful for his patience and his graphic design skills.

Chapter 1. Introduction

1.1. Background

I have worked in the education sector for thirty years. During the whole of that time I have had a role in supporting the use of educational technologies, both as a teacher and Information Communication Technology (ICT) coordinator in my own schools and through my work as a consultant supporting other schools. I have been involved in projects designed to procure more hardware or software for schools and know that the impact of these projects was often judged based on the amount of technology available in settings, rather than on the impact the technology was having on staff and children within those settings. Part of my role was to evaluate this impact.

How this impact is judged varies. It depends on the reasons why technology is being implemented in the first place and there are several rationales for using technology. There are some people who continue to argue against the use of technology, especially in the early years. Not all technology use is appropriate or beneficial and it is necessary to remember this. However, an ongoing general debate about the appropriateness of educational technology (EdTech) may not be helpful, especially as many versions of this debate refer to screen time. There are many types of EdTech. Not all of them have screens.

My personal focus has always been on the impact technology can have on teaching and learning. I have taught across all age ranges, from early years to Higher Education and have used technology with all my students. My interest in EdTech is very broad. As a consultant I have visited many schools and talked to a lot of practitioners. I have seen a broad and varied picture of technology use. Some schools have very little equipment, some have almost too much. In some schools technology is stored in cupboards and rarely used, in others it is more integrated into everyday teaching and learning.

I am regularly asked if I know of a setting that is using EdTech to its full potential, one that people can visit and learn from. While I have seen some excellent practice, it tends to be in specific areas. A school may be using technology in a single subject area or be using one tool really well, but not be using EdTech across the whole setting or whole curriculum. I am yet to find a practitioner that believes they are using EdTech to its full potential. They all want to improve, though many are doing more than they realise.

I have established EdTech practitioner networks to share best practice. These included practitioners from the early years, primary and secondary schools. I believe that lessons learned about EdTech are transferable and the issues faced by a primary teacher are often similar to those faced in secondary or even higher education. These networks were formed as a result of my belief that practitioners are the experts in what happens in their classrooms. They are essential participants in the process of sharing practice and reflecting on how it can be improved. They have a vital role in identifying what the priority for change should be and which areas of their practice they want technology to support.

Training should be tailored to practitioners' needs rather than being focused on something that was identified by others and which may be of little importance to the practitioners at that time. This means that when I support the use of technology in schools, I need to recognise that their reason for using it may be different from my own preferred focus on a pedagogical rationale. This is not the only valid reason for using EdTech.

The networks I have established appear to have been effective and feedback has been positive, but this judgement is subjective. I want to know if there is evidence to support the view that this is an appropriate way of providing support to educational practitioners.

This research focuses on early years education. In England, the Early Years Foundation Stage (EYFS) is the period between birth and 5 years old (Standards and Testing Agency, 2017). As much of my research is focused on practice in nurseries, preschools and EYFS classrooms in schools, this means I am defining early years as 2-5-year olds.

The decision to focus on early years was partly because my most recent school experience was in a reception class, partly because of the limited amount of research in this area (Garvis & Lemon, 2015; Livingstone, Marsh, Plowman, Ottovordemgentschenfelde, & Fletcher-Watson, 2014, p. 5; Plowman & Stephen, 2003), and partly because of personal experiences when working with other practitioners. It is not uncommon for colleagues to express a view, mistaken in my opinion, that technology is more appropriate for older children. This is supported by research which suggests that older children tend to have more access to technology than younger children (Twining et al., 2017). Attitudes towards educational technologies in the early years can be a barrier to its use.

There is an ongoing debate in the media, on social networks and in the research literature about whether it is appropriate to use EdTech with early years children at all (Zomer & Robin, 2016). The question of whether young children should use technology is revisited every time a new technology is introduced (Wartella & Jennings, 2000). The introduction of computers was no different and the literature includes many examples of people on both sides of the debate talking about the risks and benefits they bring. Much of the recent literature on the use of educational technologies in the early years comments on the debate. Comments often refer to the fact that it is now commonly accepted that the debate has moved on from ‘is it appropriate to use technology’ to ‘how should technology be used?’. This shift was identified back in 1995 (Clements & Swaminathan) but the fact that it is still seen as necessary to highlight the debate suggests that the issue persists (Aldhafeeri, Palaiologou, & Folorunsho, 2016; Garvis & Lemon, 2015; Konca, Ozel, & Zelyurt, 2016; Palaiologou, 2016a).

Lindahl and Folkesson (2012) state that the literature includes numerous examples of fears about using technology. However, the two citations they provide do not appear to support this claim. Plowman and Stephen (2003, p. 151) when referring to the debate say that ‘there does not appear currently to be any clear evidence on the deleterious effects of exposure to ICT’ and Vernadakis, Avgerinos, Tsitskari, and Zachopoulou (2005, p. 103) review a range of research and conclude ‘results demonstrated a significant contribution of computer use in the classroom as a learning tool’ with the caveat that such use ‘should be developmentally appropriate’. Lindahl and Folkesson (2012) themselves make it clear that research findings do not justify the fears.

While there are still people who believe technology is harmful to young children (Rowan, 2017), more recent references to this debate tend to be comments about the debate continuing, rather than examples of people participating in the debate themselves. It may be time to move on from mentioning it at all. For this thesis I have taken the position that it can be appropriate to use educational technologies in the early years: the question is what does ‘appropriate’ look like?

A final reason for focusing on early years is that there is a perception that there can be more freedom for early years settings to be creative with the use of technology when compared to settings working with older children (Brooker, 2003). If this is the case, lessons learned in these settings could be valuable for practitioners teaching other age groups.

My interest in educational technologies in the early years comes mainly from personal experience. I have supported many schools and practitioners to use EdTech, always with an aim of improving teaching and learning. I want to be able to provide better support, to use this research to help me work more effectively with practitioners and help them to use technology in appropriate ways. I hope that the results will also be of value to others working in this area.

Selwyn (2012) suggests that educational technology is an area that 'tends to attract academics who are absorbed passionately with digital technology throughout their everyday lives'. Given the personal rationale for this research, I have needed to consider how I will avoid biases which may influence my research approach and conclusions. Throughout this thesis, I have tried to be open and transparent about what I have done, how I have analysed my findings and the conclusions I have drawn.

1.2. Research Aims

My research is built on my personal beliefs and assumptions:

- that my research project should be about more than finding things out, it should make a practical difference.
- that expertise resides in different places; it is important to learn from existing literature and from conducting research, but also from practitioners who have real experience and knowledge to draw on.
- that what works in practice will vary depending on people's experience, their beliefs and their environment.

It could be argued that all research is intended to make a practical difference but this is not always the case. Elliott (2006) distinguishes between 'educational research' and 'research on education'. He uses the term 'educational research' to refer to research that has a practical purpose and the term 'research on education' to refer to research that aims to produce objective facts, but which does not aim to change practice.

Pring uses the term ‘educational research’ in a broader sense to refer to any research about education. He mentions a common criticism: it does not help professional practice (2003). He suggests that action research overcomes this problem, as it not only aims to generate knowledge about education but is focused on how practice can be improved in a particular context. Action research is not about finding a single solution, but recognises the need for ongoing reflection, trying things out and adapting practice. The intention is not to validate theories through research and then apply them to practice, theories are validated through the practice (Bell, 2003).

There are many approaches that are defined as action research (Bevins & Price, 2014) and these will be explored in the methodology chapter. For now, it is enough to identify that action research:

- is focused on finding a solution to a real-world problem – in this case how practitioners can use technology more effectively
- involves working with the practitioners who are most directly concerned with the issue being explored – in this case practitioners who want to improve their own practice
- is collaborative – participants benefit from sharing ideas and coming together to evaluate the actions they have put into place.

Action research is being used at different levels within this thesis. The whole project can be regarded as action research and each practitioner who participated in Cycle Three was supported to conduct their own action research project within their setting.

1.3. Research Questions

Research Question 1: *What is the relationship between early years practitioners' use of educational technologies and their pedagogical beliefs?*

- What are the pedagogical beliefs of early years practitioners?
- How are early years practitioners using educational technologies to support teaching and learning?

This question requires the exploration of two key issues:

- What is educational technology?
- What does effective teaching and learning look like in early years education?

Research Question 2: *How can early years practitioners be helped to integrate educational technologies into their practice in a way that supports their pedagogical beliefs?*

- How would early years practitioners like to use educational technologies?
- Is action research an appropriate route to enable early years practitioners to reflect on pedagogy and improve their use of technology?

When exploring how educational technologies are implemented, another issue needs to be explored:

- How does their use and their understanding of technology relate to current theories of educational technology implementation?

My overarching aim is to explore how early years practitioners are using technology in their settings and how I can improve my practice and support them to use it more effectively. I want any change to be a sustained change, for EdTech to be embedded within settings in a way that supports the practitioners' practice and pedagogy. This requires finding out what effective use of educational technologies looks like.

Key issues include:

- What is Educational Technology?
- What does appropriate use of Educational Technology in the early years look like?

These questions will be addressed in Chapter 3, but it is worth considering what appropriate means in this context.

There are lots of appropriate activities practitioners could use with their children but there is always a choice to be made, they cannot do it all. Choosing to do one activity means they cannot do something else. They need to select the one that is the most efficient, effective or appropriate (Higgins, 2018).

How can they decide what is most appropriate? What criteria can they use?

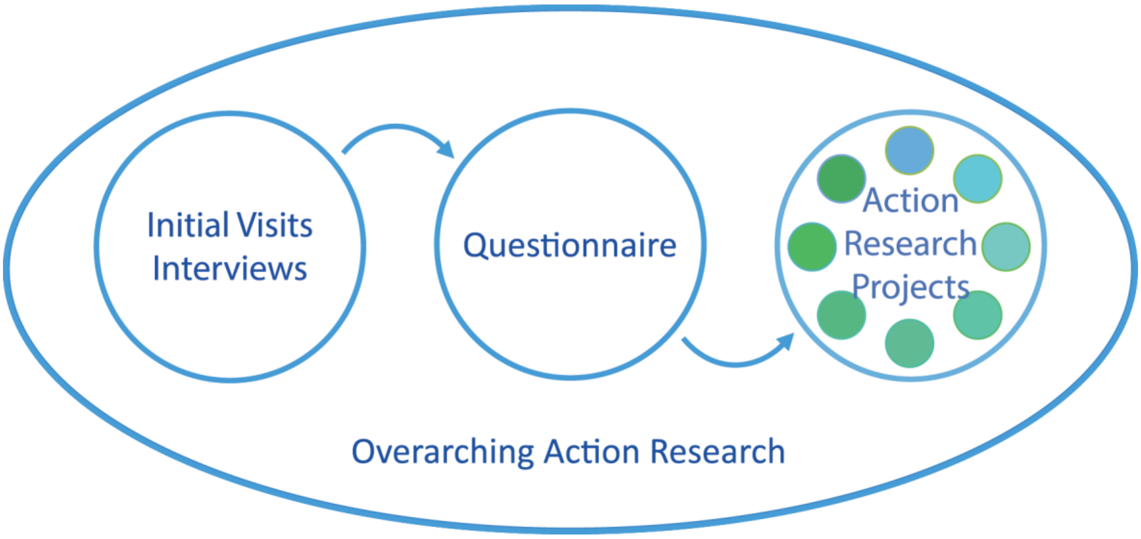
> *To increase the likelihood of it being appropriate I think it needs to meet an identified need or a perceived problem, rather than being picked from the top of a list of effective strategies or plucked at random from successful research findings (Higgins, 2018, p. 156).*

Activities need to be appropriate for the specific context; what is appropriate in one class or setting may not be appropriate in another. Different activities will be appropriate at different times.

Higgins (2018) stressed the importance of considering whether something is appropriate from the perspective of the child and the teacher. Does it meet their needs? For a child, is the activity developmentally appropriate? Does it support their learning? Is it accessible? For a teacher, they need to know that the activity links to their learning objectives and is compatible with their pedagogical beliefs.

Defining ‘appropriate’ may mean going beyond the teacher’s current values and beliefs. At times teachers may need to re-examine their beliefs as new approaches may challenge current practice.

1.4. Research Design



I am using a pragmatic action research approach comprised of three distinct phases:

- Cycle One: interviews with twenty early years practitioners
- Cycle Two: questionnaires with responses from 335 practitioners
- Cycle Three: practitioner action research projects involving eight participants

Each phase can be seen as one cycle of the overarching action research project, and each one is made up of a series of activities:

- A review of relevant literature
- Action planning
- Implementing the activities identified during action planning
- Evaluating the activities
- Identifying next steps as a result of the evaluation

Because of this approach, this thesis is not a linear document with single chapters about methodology, data collection, data analysis and findings. Each cycle includes each of these elements.

Most chapters start with a header image to show how that chapter fits within the overarching design (see the image at the start of this section). When the image is all blue the section refers to the overarching research, orange is used to show if the section relates to a specific cycle.

Figure 6, in section 2.4, gives a breakdown of each cycle and shows how they fit with my methodological approach.

I am using a pragmatic approach. There are many links between pragmatism and action research so this could be seen as an obvious choice, but the literature on both action research and pragmatism is complex, as each can be interpreted in many different ways. The reasons behind my choice are explored in section 2.7, but one of the main reasons is the pragmatist’s focus on making a practical difference.

1.5. Thesis Structure

Reflections

Action research reports need to document some aspects, at least, of the researcher's reflection in order to establish the validity of the research (Somekh, 1995, p. 348).

Action research is a reflective process; text boxes will be used throughout the thesis to identify some of my reflections during the project and how they impacted my decision making about future stages of the research process.

My overarching methodology is action research. Within this methodology, I use a range of methods. Action research is explored in Chapter 2 which also deals with issues of ontology and epistemology. Rather than confining information about research methods and methodology to a single chapter, this subject is discussed in each of the appropriate sections of the thesis. In a similar way, there is not a single literature review or ethics section. Each phase of the research raised new questions, which required a review of additional literature and consideration of ethical issues.

EdTech can be defined in many ways and some of these terms and definitions will be explored in Chapter 3. Throughout the thesis, I will be using the term ‘educational technology’, or EdTech, which is seen as the broadest term. It encompasses many of the other terms used in the literature. Participants, in all stages of the research, were deliberately not given a definition, this was so practitioners’ interpretations of the term could be explored. As well as definitions, this chapter also examines research on how EdTech is being used in early years settings and how this links to practitioners’ pedagogical beliefs. It reviews references to technology in the early years curriculum and barriers practitioners may face when trying to use EdTech.

The first cycle of the research was a pilot project; practitioners from twenty settings in the North East of England were interviewed. This phase is summarised in Chapter 4. Findings suggest that the term ‘educational technology’ is interpreted more broadly by practitioners than the literature suggests. EdTech is being used in a wide range of ways which are compatible with early years practitioners’ pedagogical beliefs. The full findings of this phase were published in the International Journal of Early Years Education (Jack & Higgins, 2018) and a copy of this article is available in Appendix A, section B.

Some of the themes from Cycle One are explored further in the second literature review in Chapter 5. This includes an overview of rationales for using EdTech and literature about practitioners' pedagogical and technological beliefs.

One of the outcomes from the initial interviews was the identification of a need to establish whether the findings would be supported by a larger study. A questionnaire with a larger sample was conducted and is described in Chapter 6. Responses from 335 respondents support the view that practitioners have a broader definition of educational technologies than the literature reviews had revealed, and it appears to be more embedded in EYFS settings now than in the past. It is being used to support the whole EYFS curriculum, but there are still barriers to its use and more training is needed. Additional findings from the questionnaire phase were written up and published in the Research In Learning Technology journal (Jack & Higgins, 2019), this article can be found in Appendix C, section B.

Chapter 7 reviews some of the literature on issues that will be important for my exploration of the second research question: how to support practitioners' effective use of educational technologies. This includes literature on how technology is implemented and on approaches to training.

I return to action research as a methodology in Chapter 8, this time with a focus on how a group of practitioners were supported to use action research. The chapter also includes information about how the group was set up and managed. An overview of each of the action research projects is found in Chapter 9.

Chapter 10 provides an overview of the findings from the action research projects. It explores some of the key questions that have been identified throughout the thesis and also evaluates whether action research was an appropriate approach to use to support these practitioners. Findings from the action research phase were written up and published in the Imagining Better Education conference proceedings (Jack, 2019). This article can be found in Appendix D, section L.

Chapter 11 is a review of the whole research process. It summarises the main conclusions and evaluates the quality of my overarching action research project.

Chapter 12 provides an opportunity to reflect on the research process, I identify some of the lessons I have learned from my work and look at how these may be taken forward into future research projects.

Chapter 2. Methodology

2.1. Educational Research

Educational research encompasses a broad range of topics and methods. It can be difficult to identify a single purpose but Pring (2003, p. 27) suggests that the 'distinctive focus of educational research must be upon the quality of learning and thereby of teaching'. This implies that outputs of research should contribute to an improvement of practice.

The importance of a link between theory and practice is also identified by Dewey:

> *[results] may be scientific in some other field, but not in education until they serve educational purposes, and whether they really serve or not can be found out only in practice (Dewey, 1929, p. 33).*

However, there has been a distinction made between 'doers' and 'knowers' (Bryk, 2015), with 'doers' or practitioners being expected to use the knowledge generated by 'knowers' or researchers. However, research conducted by academic researchers can have little impact in the classroom (Cohen, Manion, & Morrison, 2007). Some practitioners are reluctant to engage with academic research because they believe it has little relevance to them and their own context.

> *Practitioners would be more likely to put professional researchers' findings into practice if these findings were used to inform the solution of work-related problems defined by the practitioners (Wallace, 1987, p. 100).*

Action research fits with the view that research should have clear links with practice and is being used as the overarching approach for the whole of this research project.

In the next section, I will explore some of the different action research approaches and show how my research fits within this range. As action research is also being used for the practitioner projects that are discussed in Chapters 8, 9 and 10, I will revisit action research methodology in Chapter 7.

2.2. Action Research

The term 'action research' is becoming so widely and loosely applied that it is becoming meaningless (Tripp, 2005).

This section will show that there are many different interpretations of action research, but this does not mean that action research is not a useful approach. Action research is about practice, finding solutions to everyday problems rather than looking at the theoretical problems some researchers focus on (Elliott, 1978). Action research, therefore, is closely associated with change. It results in change of practice (action) and change of understanding or knowledge (theory) (Atweh, Kemmis, & Weeks, 1998).

Action research is closely associated with the work of Kurt Lewin who also supported the need for research to impact on practice, writing that 'research that produces nothing but books will not suffice' (Lewin, 1946, p. 45). Lewin recognised that research should make a difference to practice and theory, distinguishing between research that dealt with the theoretical 'if so' situations and research that would help a practitioner to act in a specific context. He believed that both were necessary (Lewin, 1946).

Lewin described the action research process as a 'spiral of steps each of which is composed of a circle of planning, action and fact-finding about the result of the action' (Lewin, 1946, p. 38).

Cyclical approach

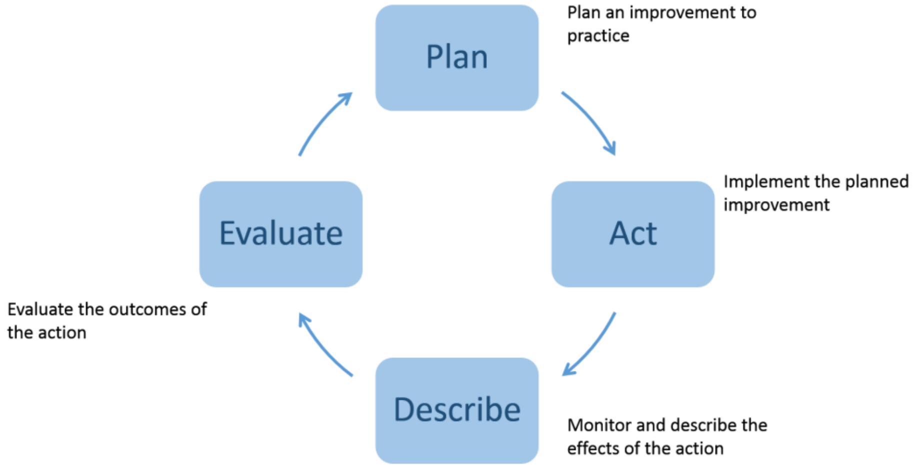


Figure 1: Action Inquiry Cycle adapted from Tripp (2005)

Action Inquiry is a generic term for any process that follows a cycle: where practice is improved by moving between taking action and inquiring into the effectiveness of this action, see Figure 1 (Tripp, 2005).

The different forms of action research are all types of action inquiry and there are many diagrams that illustrate its cyclical nature. These range from simple overviews as shown in Figure 2 (O'Leary, 2004, p. 141), to more complex approaches as shown in the cycle adapted from Kemmis and McTaggart in Figure 3 (Baumfield, Hall, & Wall, 2008, p. 5).

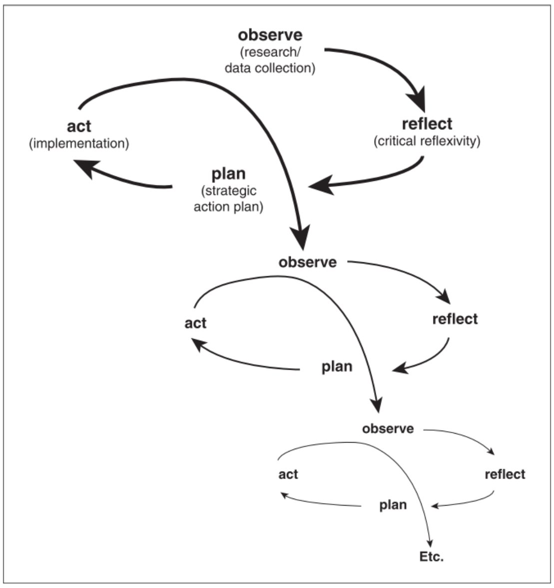


Figure 2: Cycles of Action Research from O'Leary (2004, p. 141)

Most diagrams are like these, they show a neat cycle, but the reality is perhaps better shown in Figure 4 (McNiff & Whitehead, 2002, p. 57).

This ‘messiness’ is not often described in published accounts of action research, however, it is important to be flexible and able to change the focus of the research when necessary, especially when there are several participants’ perspectives to be considered (Cook, 2009).

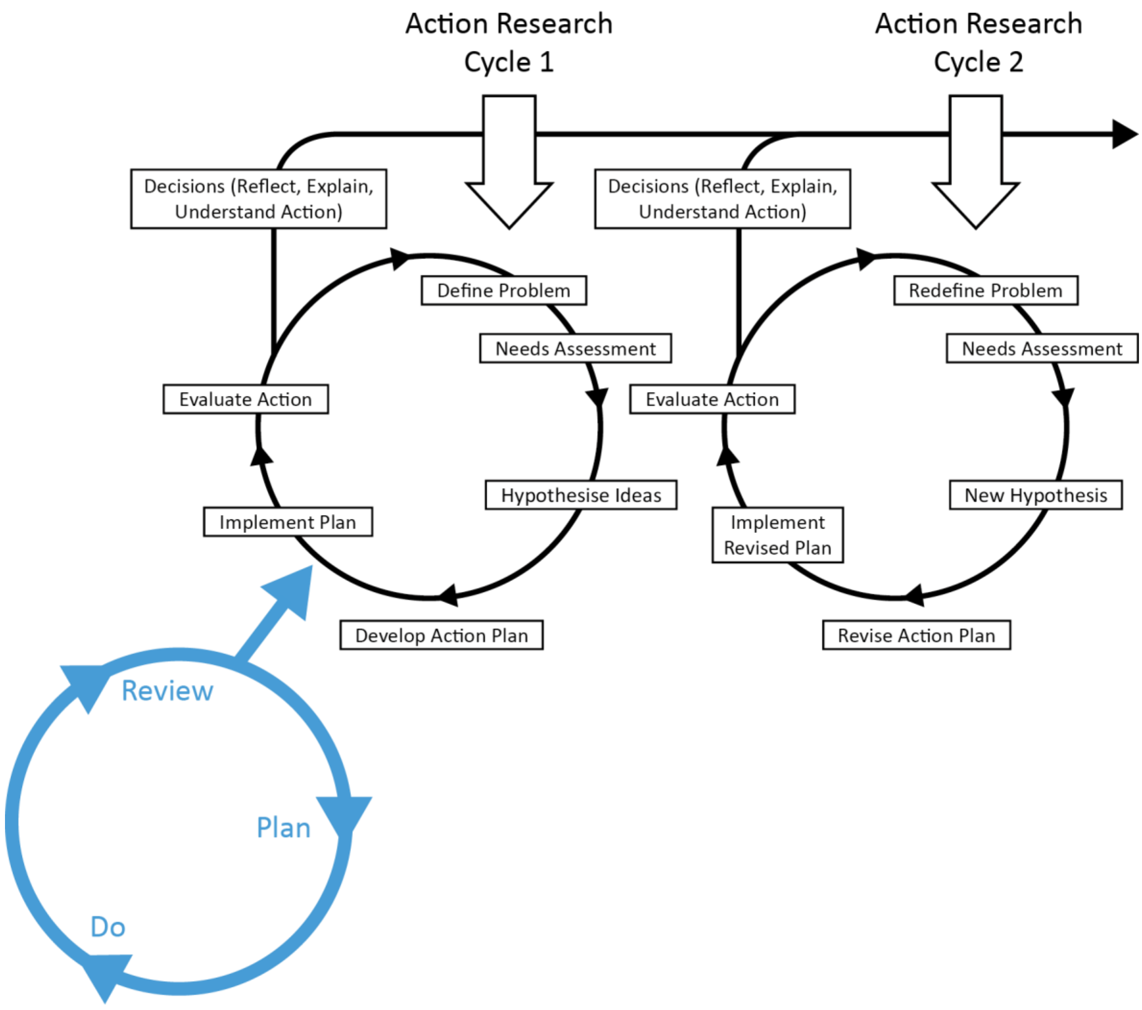


Figure 3: Action Research Cycle adapted from Baumfield, Hall, & Wall, (2008, p. 5)

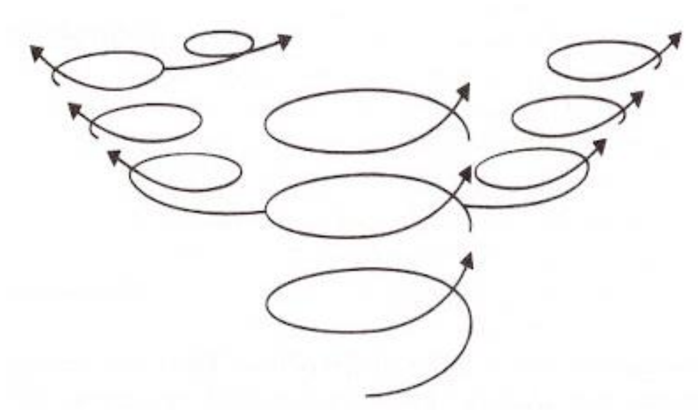


Figure 4: Action Research Spiral from McNiff & Whitehead (2002, p. 57)

While a cyclical approach is common to action research, the different models do not all focus on the same things. For example, Elliott sees action research as being a way of deepening a teacher's understanding of a problem before forming a diagnosis. He does not think actions should be part of the process until this understanding has been achieved (Elliott, 1978). This appears to be in contrast to Oquist (1978) who sees a strong link between the production of knowledge and a change of 'reality', with these happening simultaneously.

Lewin and his colleagues identified four types of action research (Adelman, 1993):

1. Diagnostic action research – external change agents intervene in an existing situation, diagnose the problem, and recommend remedial measures.
2. Participant action research – people from the affected community are involved in the research process from the beginning.
3. Empirical action research – using record keeping and accumulating experiences; conclusions are drawn after working with a number of similar groups.
4. Experimental action research – a controlled study of the relative effectiveness of various techniques in nearly identical social situations.

This shows that even from the early days of action research, the term could be interpreted in different ways.

Multiple models

Cohen et al describe the 'impressive' scope of action research, suggesting it can be used anywhere problems 'involving people, tasks and procedures require a solution, or where some change would result in a more desirable outcome' (2007, p. 297). A review of this area is complicated by the range of different terms used (e.g. action research, reflection, enquiry) and a wide range of definitions (Baumfield, Hall, & Wall, 2013).

Approaches to action research have been categorised in many different ways, Rearick and Feldman (1999) identified three types of categories, see Table 1.

Table 1: Ways of categorising Action Research from Rearick and Feldman (1999)

Type of category	Categories	Defined as
Theoretical orientation	Technical	The action research is grounded in experiences and observations, it often

		involves experimentation and aims to control the environment.
	Practical	The action research aims to understand, it involves deliberation on alternatives and leads to decisions about action.
	Emancipatory	The action research is focused on societal structures that coerce or inhibit freedom, the aim is emancipation or empowerment.
Purpose	Personal	The action research involves becoming more familiar with the development of the participant’s knowledge and educational theories.
	Professional	The action research supports staff development with the outcomes being added to a shared knowledge base.
	Political	The action research is used to critique the workplace and social agendas.
Type of reflection	Autobiographical	In this action research the researcher is the main focus, it involves introspection which aims to understand rather than explain.
	Collaborative	The action research involves asking questions and seeks answers beyond oneself.
	Communal	The action research asks questions about democracy, freedom and social justice.

Some of these words can appear to relate to very high-level ideas, for example, the emancipatory orientation or political purpose can be seen as looking at making major changes to society or social agendas. But these words can be interpreted in different ways. For example, Bridges (2003, p. 187) describes emancipatory action research as research which is ‘designed to free participants by helping them think differently’ and socially critical action research as research where ‘what normally went unquestioned was questioned’. These interpretations seem to be pitched at a much lower level. This suggests that the outcome does not need to be a significant social change.

Elements of Action Research

With so many models and such broad definitions, it is difficult to establish a fixed list of the key elements of action research but some features are common to all approaches. Somekh (2006, pp. 6-8) identifies eight key principles.

1. Action research integrates action and research through a series of cycles.

As discussed, action research is a cyclical process (see section 2.2). Action research is action orientated, it does not just aim to describe the context being researched but to identify a practical, positive change (Munn-Giddings, 2012). This action is specific to the context being researched.

2. Action research is conducted by a collaborative partnership of participants.

Most descriptions of action research refer to the need for it to be led by participants from the contexts being studied, there is usually seen to be a preference for them to work collaboratively. See section 2.2.1 for more details.

3. Action research develops knowledge and understanding of a natural environment

Action research is about a real context and needs to consider all of the usual, every day variables within a classroom, which may not be directly controllable. Researchers are insiders and already familiar with the situation they are investigating. It is important that the context is described so others can judge whether any findings would be applicable to their own context.

4. Action research starts from a vision of social justice and social transformation

Action research follows a principle of positive change, it aims to result in improvements.

5. Action research involves high levels of reflexivity

As a result of the involvement of 'insiders', there is a need for regular reflection on their current practice. See section 2.2.2 for more details.

6. Action research involves engagement with a range of existing knowledge

Action researchers are interested in what is already known, though participants should be critical of this and examine whether it is appropriate in their context.

7. Action research results in powerful learning for participants and develops self-understanding

Learning is not just about the context or the situation being researched, action research is also an opportunity for participants to learn more about themselves, their beliefs, assumptions and practices.

8. Action research sets the research in a broader context than the setting being researched

While action research is focused on the specific environment, there is a recognition that it is important to consider the broader context as well.

2.2.1. Participation and collaboration

Action Research often involves practitioners as both subjects and co-researchers, this is based on the Lewinian suggestion that research findings about people's behaviour are more likely to be valid and able to be implemented if the people in question participate in the research and analysis of findings (Argyris & Schön, 1989). The lessons learned may be more easily shared as practitioners are more likely to try out interventions that have been successful for settings similar to their own.

> *In practice, there seems to be a gathering consensus that small-scale, practitioner-led action research projects often have more impact than more rigorously controlled studies. … such small-*r *studies have as much validity as expensive big-R funded projects. Teachers are much more likely to change what they do if they see someone else doing it differently, or hear or read a short story about a small-scale intervention which they like the sound of (Claxton, 2007, p. 130).*

Action research is based on two key principles: improvement and involvement (Grundy, 1987, p. 142). The aim is to improve the context being studied but it is usually seen to be important that this change is not imposed from the outside. The stakeholders, from the context being studied, should be in control of the process. This focus on 'involvement' is a reason why action research is not simply another 'change theory'.

It is important that this 'involvement' is valued by everyone. It would be easy to pay lip service to participation, but 'involvement' is more than simply thinking that involving people is 'a good thing to do'. Ideally, stakeholders should be involved in all aspects of the project, from planning to analysis to writing up. In reality, of course, this is not always practical.

Collaboration is seen as a key element of action research but there are different opinions about this. Some would say it can only be action research if the process is collaborative (Kemmis & McTaggart, 1992) and where there is a group of participants that can support one another to change.

One of the best vehicles for social change is pressure from the group (Hodgkinson, 1957).

Cohen et al. (2007) disagree about the need for action research to be a group activity. They see this as a restrictive view and make a link between the individual approach and Stenhouse's 'teacher-as-researcher' approach (1975). They suggest that Whitehead also supports the view that action research can be an individual pursuit. However, Whitehead has said 'action research is never solitary. It involves individuals finding ways to improve what they are doing in company with others' (McNiff & Whitehead, 2009, p. 20).

When deciding whether collaboration is essential, it can be important to recognise that collaboration can mean different things. It can mean working with an outside researcher, or with a critical friend, or with a group of colleagues working on the same project. Any of these approaches can be successful.

2.2.2. Reflection

There is a tendency for some action research to become ingrown and 'content-less', so that self-exploration and personal growth seem to become the whole focus and purpose of the research. This may be effective as a form of therapy, but it is difficult to justify calling it research (Somekh, 1995, p. 348).

There is a close link between reflection and action research. While all action research involves reflection, not everyone who reflects on their practice is conducting action research (Somekh & Lewin, 2008a). Action research is more rigorous.

Reflection on practice is seen to be a key element of early years practice and can take many forms (Waller & Davis, 2014). 'Reflection in action' happens in the moment, allowing practitioners to respond to what is happening around them. 'Reflection on action' happens later. It enables practitioners to look back on what happened and think about whether they should have responded differently (Schön, 1983).

As Table 2 shows, action research can be seen as lying between routine reflection and scientific research (Tripp, 2005). Different types of action research will be at different points of this continuum.

Table 2: Action Research compared with routine practice from Tripp (2005)

	Routine Practice	Action Research	Scientific Research
1	Habitual	Innovative	Original Resourced
2	Continuous	Continual	Occasional
3	Responsive Contingency driven	Pro-active Strategically driven	Methodologically driven
4	Individual	Participatory	Collaborative / collegial
5	Naturalistic	Interventionist	Experimental
6	Unexamined	Problematised	Commissioned
7	Experienced	Deliberated	Argued
8	Unarticulated	Documented	Peer reviewed
9	Pragmatic	Understood	Explained/theorised
10	Context specific	-	Generalised
11	Private	Disseminated	Published

Baumfield et al. (2013) see 'practitioner enquiry' as falling between reflection and action research, and this may be where the practitioner projects fit (see Figure 5).

Corey (1954) identified two alternatives to action research when considering methods to improve educational practice. One is to use external researchers to tell practitioners what to do, the other is to use subjective impressions to identify what needs to change. He does not seem convinced that reflective practice will lead to improvements. Having an idea about how to improve practice is not the same as putting it into effect.

> *We find it relatively easy to talk a better type of teaching or supervising or administering as a consequence of reading or hearing what others say that we should do. But there is a vast difference between this modification in our vocabularies and any substantial modification in the way we behave (Corey, 1954, p. 376).*

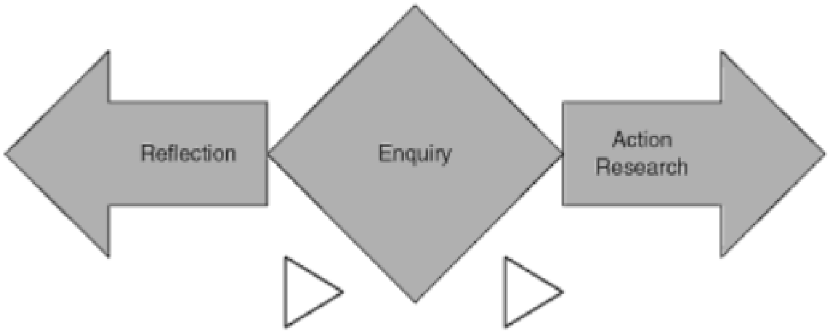


Figure 5: Positioning enquiry between reflection and Action Research from Baumfield et al. (2013)

While not as structured as some forms of action research, ‘practitioner enquiry’ is more rigorous than everyday reflection. There is a need for more consideration of existing knowledge or research than you would usually find in everyday reflection. For it to be described as action research it does need to be more systematic and rigorous than the reflection that occurs in everyday practice (Kemmis & McTaggart, 1992).

> *Action research involves critical reflection on practice but goes further in being a systematic attempt to address a problematic situation, which reflection alone cannot deal with (Foreman‐Peck & Heilbronn, 2018, p. 132).*

2.3. Challenges for Action Research

> *Action research is simply a form of self-reflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of their own practices, their understanding of these practices, and the situations in which the practices are carried out (Carr & Kemmis, 1986, p. 162).*

Even when Action Research was still in the early stages of development, there were those who argued that it was not ‘real’ research. It was even described as being ‘quantified common sense rather than … a form of scientific, empirical research’ (Hodgkinson, 1957, p. 146). Action research is seen to be validated differently to more ‘pure’ research.

Even if early methods of action research can be seen as rigorous, the broad range of approaches means that some are naturally seen as more ‘scientific’, ‘real’ or ‘true’ than others. Much recent action research has been described as a ‘qualitative distortion of the action research model’ described by Lewin. It is suggested that the ‘participatory reflective progressive problem solving approach’ of McNiff and Whitehead is an example of this (Gorard, 2013).

Stringer (1999) has questioned whether action research is scientific. The answer depends on your definition of science. Stringer suggests that the scientific method seeks to generate knowledge that is objective, generalisable, reliable, replicable and valid. He also suggests that scientific knowledge is partial, incomplete and reductionist, of limited practical use. Scientific knowledge is more than a solution of a practical problem, which could just demonstrate common sense, not science. Science involves controlled experimentation and looks for generalisations. The practical solution is ‘merely an intermediate step and not the end of the road for the scientist’ (Hodgkinson, 1957).

Lewin also referred to the distinction between what he called action research and pure science but did not see that action research was any less scientific. He even said ‘I am inclined to hold the opposite is true’ (Lewin, 1946, p. 35).

Action research is often criticised because of a lack of rigour and because it can appear biased towards the researcher’s beliefs and values (Bryman, 2012). However, there are many who see the value of using action research. Somekh (2006) suggests that it should be the ‘methodology of choice for social science researchers focusing on innovation’, because of ‘the quality and reliability of the knowledge it generates’. This knowledge can easily be validated by people in different settings who will be able to recognise its usefulness.

‘Pure’ research produces reliable knowledge through repeatable experiments and publicly shared results. Action research, however, aims to produce an improvement in participants’ practice with no expectation that this knowledge should be public, even if it would be useful for other practitioners (Wallace, 1987).

While Stenhouse describes research as ‘systematic inquiry made public’ and talks about the value of publishing research so that it can benefit from criticism and be of use to other people (Stenhouse, 1981, p. 111), he does not see publication as essential. He talks about ‘publication to the village’ and perhaps an action research group can serve this purpose without the findings being shared more widely.

Practical problems with Action Research

Zuber-Skerrit identifies four practical problems with conducting effective action research (1996). They are:

1. Collecting data may overload an action researcher’s already busy workload,
2. Findings can be simplistic: ‘too minimal to be valid’, or overcomplicated: ‘too elaborate to be feasible’,
3. Practitioners may not have the necessary research skills,
4. Research may require a lot of time and effort which may not be justified by the outcomes.

Time is one of the main problems. When research involves practitioners, who are already working within the context being researched, it necessarily becomes an extra thing for them to do. The research needs to fit in with the professional responsibilities of the practitioner (Hall, 2009). There is a need to balance how much they are expected to do with the limitations of time they can devote to it (Somekh, 1995). Action research takes a long time, it requires a continued commitment and sustaining this commitment over a year or more is not easy (López-Pastor, Monjas, & Manrique, 2011).

Other potential problems include group dynamics (Hodgkinson, 1957), everyone needs to be included and feel that their contributions are valued. It can take time for relationships to develop (Platteel, Hulshof, Ponte, van Driel, & Verloop, 2010) and facilitators can benefit from previous experience of action research in order to manage and support the process effectively (Platteel et al., 2010).

How useful are the results?

Given the close link between action research and the researcher’s values and beliefs, it is likely that projects are not replicable. Even if the same project was repeated by the same researcher it may result in different conclusions. Similarly, there are those who say that there is a danger that the findings from action research would be used after it is appropriate to do so. The action research may have tested an approach and found it appropriate, but what about in a few years' time? Would the same approach still be justifiable (Hodgkinson, 1957)?

I would challenge the relevance of this question. The aim is to find solutions for that specific context, at that particular time. If the practitioner continued to be involved in the process, they would recognise the need to continue to reflect and adapt their practice to changing circumstances.

2.4. Methods

Action research is often seen as a qualitative approach, but it can involve collecting both qualitative and quantitative data (Bryman, 2012). For this research, both quantitative and qualitative approaches were seen to be important, as they allowed appropriate data to be gathered in response to each research question.

Evaluating the use of technology by quantitative means can be problematic, as it can lead to an assumption that each setting or child experiences the technology in the same way, or that aspects of a context need to be controlled in order to measure the impact of the intervention (Blamey & Mackenzie, 2007). In this research, the context is not seen as something to be controlled, but as part of the question. How can EdTech be implemented in a way that supports these settings and these stakeholders? The focus on context can mean that findings cannot be generalised, but this is not the aim of the participants' projects. Given the number of participants, some conclusions may be possible about the types of contexts in which a similar approach is likely to work.

Table 1 showed some of the ways action research has been defined. Given the fact that terms like emancipatory and political can be interpreted broadly, it would be possible for me to make a case for my research fitting within several of these types of action research. However, I believe that these broad definitions are inappropriate. I am interested in getting practitioners, and myself, to think differently and to question what has previously been unquestioned. However, I do not interpret this in terms of political change or individual empowerment, my aim is to impact on professional practice.

The theoretical orientation I see myself as falling within is the ‘practical’ approach. I am interested in getting a better understanding of the context which will lead to better decision making about actions that will help to improve it. This links to a ‘personal’ purpose which aims to develop my knowledge about educational theories, but also to the ‘professional’ purpose. I want what I learn to contribute to a broader, shared knowledge base. I see myself using the ‘collaborative’ type of reflection; I am seeking answers beyond myself.

Chapter 8 will return to these themes and look at how the practitioners I worked with might fall within these categories.

It might be ideal to be able to show exactly how I fit within the existing literature and how I follow the approach of a specific person or group, whether that be McNiff and Whitehead, or Baumfield, Hall and Wall, or any of the others. I do not think this is possible. There are many overlaps between these groups and many subtle differences, so this may be an impossible task. As one of the main features of action research is that it adapts to the specific context, no two researchers will ever conduct research in exactly the same way.

One solution to this problem could be to break down the different types of action research into different categories, no longer under an overarching action research term. But would this be appropriate? Within the quantitative or qualitative paradigms there are multiple approaches, but would anyone suggest that these terms should be removed? A more appropriate solution would be for researchers using action research to be very clear how their approach fits within the broad umbrella term.

A deeper review of the literature on action research may have shown that it is possible to categorise these approaches, but this was beyond the scope of this project and Somekh suggests that the link with action researchers beliefs and values means that it would not be possible to identify specific ‘schools’ (Somekh, 1995, p. 340). Even when more specific ‘types’ are identified, they tend to refer to how action research would work in ideal circumstances and they rarely fit with real-life projects (Hart & Bond, 1996).

An overview of the whole research project is shown in Figure 6; it shows how an initial literature review was conducted before the three main cycles began. Each of the three cycles includes an additional literature review, as new questions and themes emerged.

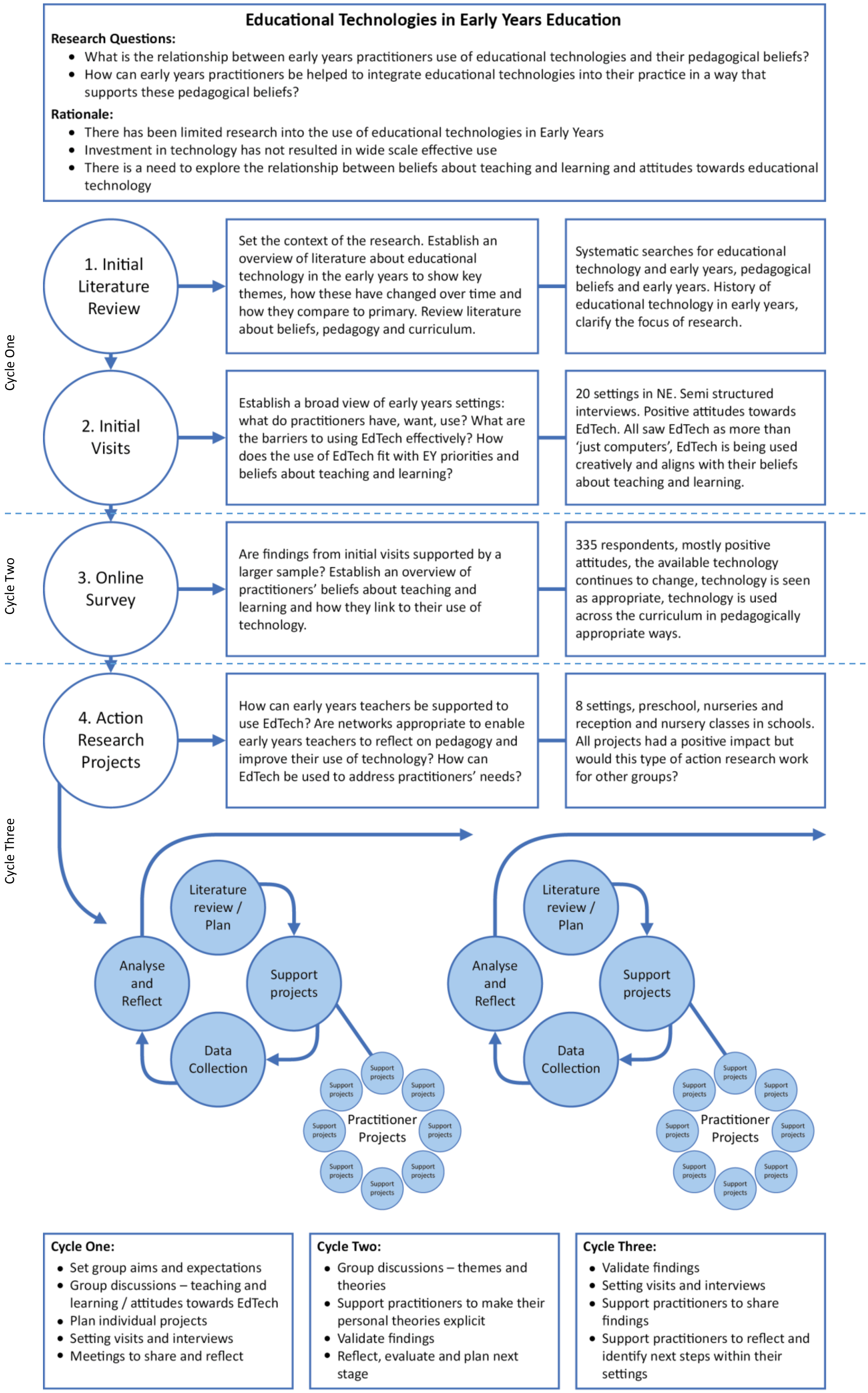


Figure 6: Overview of the project cycles

The diagram shows how the practitioners' action research projects fit within the overarching research project. The three cycles identified at the bottom of the diagram refer to my role in these projects; practitioners conducted their projects at their own pace: some completed a number of cycles, others were still on their initial exploratory phase at the end of the project.

Why action research?

Research Question 1: *What is the relationship between early years practitioners' use of educational technologies and their pedagogical beliefs?*

- What are the pedagogical beliefs of early years practitioners?
- How are early years practitioners using educational technologies to support teaching and learning?

Research Question 2: *How can early years practitioners be helped to integrate educational technologies into their practice in a way that supports their pedagogical beliefs?*

- How would early years practitioners like to use educational technologies?
- Is action research an appropriate route to enable early years practitioners to reflect on pedagogy and improve their use of technology?

I have tried to explain why I have decided that action research is an appropriate approach for addressing these research questions. It is just as important to consider whether other research designs would have been suitable.

Thinking about the first research question, an observational case study design could have been appropriate, but this is only the first step in a larger study and can be seen as the first cycle in an action research approach.

Thinking about the second question, I am interested in educational technology in the broadest sense. I am not testing out a specific device or activity, so a randomised control trial (RCT) to evaluate efficacy would not be appropriate. I am interested in the conditions in which technology may work. An RCT would not be appropriate for this (Wrigley, 2018) nor would a purely quantitative approach as this would not support an in-depth evaluation of impact which can depend so much on the context (Balanskat, Blamire, & Kefala, 2006).

Action research allows me to incorporate a range of methods, to build on initial findings and use them to identify the next stage in the research.

2.5. Evaluating Action Research

There are established criteria for evaluating research.

For quantitative research these include:

- Validity – does the research measure what it set out to measure?
- Reliability – are the results consistent over time?
- Replicability – if the research is repeated, would the results remain the same?
- Generalisability – can the results be applied elsewhere?

These criteria are not seen to be directly transferable to qualitative research and Lincoln and Guba (1985) suggested some alternatives:

- Credibility – are the findings true, credible and believable (from the perspective of the participants)?
- Dependability – would the same results have been obtained if the research was repeated within the same context and group?
- Confirmability – would other researchers have interpreted the results in the same way, are personal biases managed?
- Transferability – could the results be transferred or generalised to other contexts/settings?

There is overlap between these concepts and you could question whether a different name makes much difference, but what can vary is how judgements of these criteria are made. It is important for the action research process to be as transparent as possible, so other people can evaluate the findings (McTaggart, 1998).

Generalisability is often seen as a measure of good research, and action research has been criticised for the difficulties of generalising results. It is not always appropriate to apply lessons learned in one context to another without some modification and action research is very context specific, but this criticism is relevant to many types of research and is especially true of single studies. There is a lot of variation between different settings, teachers and pupils, so it is not possible to be confident that what has worked in one context will work elsewhere (Higgins, 2018).

While the specific findings of an action research project may not be transferable, some of the key themes may be; whether this is the case can be confirmed by further research in the new setting (Argyris & Schön, 1989). Action research can also identify theories or new research questions that may be testable using different research methods.

Action research cannot be validated through replication as every context is different. One way of validating findings is by involving the participants (Wallace, 1987). This is another reason why collaboration is a key element of action research.

Validity is not about the research methods used but whether conclusions are appropriate. Coe identified two types of claims (2012).

- **Interpretation claims** (often referred to as internal validity): whether the conclusions made in research are warranted.
- **Transfer claims** (often referred to as external validity): whether the conclusions of research can be applied to different settings or individuals.

Action research is seen to have high internal validity, for the practitioner and the context within which the research was completed, but its external validity, its reliability and transferability can be questioned. It is often carried out by practitioners who are not experts in conducting research. The role of partnerships in supporting the teacher-researchers can be crucial, with support being provided by external researchers (Baumfield et al., 2013, p. 8). While this may be less of an issue for my own overarching action research, the practitioner researchers would face challenges. They would need support with conducting their projects. The research projects also needed to be realistic and practical. The practitioners were working on the project alongside their normal workload. This had implications for the way the research projects were structured, and these will be explored later.

As well as the criteria identified above, quality research needs to consider the role of the researchers and whether the research is ethical (Baumfield et al., 2013). These aspects will be considered in more detail in section 2.8. I hope that the research is written up in a way which makes the process transparent and allows a reader to make their own judgements about its quality.

The forms of action research can be very different, yet ‘what they have in common far outweighs their differences’(Argyris & Schön, 1989, p. 614). There is a danger that criticising one form of action research could be seen as justification for criticising all action research. It is important to clearly identify the elements of the approach being used.

Tripp (2005) asked ‘how effective is action research?’ He suggests that it is not possible to find a meta-analysis of action research which would help to answer this question, he could only find evaluations of specific action research projects. He suggests a reason for this: action research is based on common sense and ‘it doesn’t make sense to challenge its effectiveness’.

Is Tripp’s question a sensible question to ask? Action research can be seen as a method, methodology or paradigm. If it is seen as a paradigm, a comparable question would be whether there have been meta-analyses conducted of positivism or interpretivism?

It is clearly possible to evaluate action research as a method, and even if action research is not evaluated as a whole it uses methods that have been evaluated, so it is possible to evaluate the process.

Reason (2003) provides an alternative view, he suggests that action research is not a methodology but an orientation to research.

2.6. Ontology and Epistemology

There is a view that decisions about research design need to be underpinned by the researcher’s ontological and epistemological views (Freeman, 2006) and consideration of these views would usually appear at the start of a methodology chapter. Here it has been left to the end. I feel it is important to identify the research questions and use them to identify the methods that will allow them to be addressed more effectively. This does not mean that matters of ontology and epistemology are not relevant. My questions and preferred methods will reveal elements of my underlying beliefs, my bias.

While researchers may not be able to state clearly what their epistemological beliefs are, the research questions and methods they use often reveal their preferences (Freeman, 2006). Research questions need to be established at the start of the process, as they will inform the rest of the research. Deciding on a question can be difficult; Hammersley and Atkinson (1983) suggest that it can be harder to identify the right question than it is to answer it. Creswell (1998) suggests keeping the question broad, in qualitative research it can be revisited; the research process is flexible enough to bring in new areas of interest that may emerge. It should, however, be clearly enough defined to help develop the research method (Boeije, 2009).

Ontology refers to the nature of reality. Epistemology is the nature of the relationship between the researcher and reality, how do they know what reality is (Guba & Lincoln, 1994)? There are two broad epistemological views: positivism, which suggests that there is a reality that can be observed and measured, and constructivism, which suggests that reality is constructed by people based on their own knowledge and experiences (Moriarty, 2011). These two approaches can be subdivided, and it can be a difficult area to understand. This view is supported by the fact that not all qualitative researchers are clear about their epistemological views (Freeman, 2006).

Longstreet (1982) described the two main paradigms and referred to them as the scientific and humanistic paradigms. He suggested that if research does not fall within one of these, it is seen as 'fuzzy' or 'poor' science. He also suggests that there is a need to broaden out this approach and that there is a need for a paradigm for approaches with 'the kind of data that are, in their very nature subjective and liable to continuous change' (p142). An action research paradigm is suggested.

Baumfield et al. (2013) agree that action research is the third dominant paradigm (alongside positivist research and interpretive research). Not everyone agrees. Others would see action research as sitting within the interpretivist paradigm (Parmar, 2014). Given the wide range of action research approaches, it may not be possible to say definitively which paradigm all action research falls within.

In the past, I have found it difficult to identify with a single epistemological tradition. Baumfield et al. (2013) suggest a useful exercise for clarifying a person's view. If I was given two conflicting pieces of evidence about a learner (a standardised test score and a teacher report) which would I be most likely to use to make decisions? This does not help me, as my answer would be 'it depends'. Different data can be useful for answering different questions and your choice can depend on what you want to achieve.

I might never fully identify with a single approach, but my inclination was to start with exploring critical realism. While some see this as a subset of positivism (Alvesson & Skoldberg, 2009), it seems to provide a way of viewing the world that draws on both sides of the debate. It suggests that reality can be seen in three ways:

- Empirical – the experience as seen by the researcher
- Actual – the experience as other people may have seen it
- Real – what actually happened

This suggests that there is an underlying reality, but how it is interpreted depends on the researcher's beliefs and expectations. This may not be the way others would have interpreted it. I believe that some things are more open to interpretation than others. Part of this research is looking at people's beliefs and opinions, so the level of interpretation is high.

Further reading has led me to examine the pragmatic paradigm. Pragmatism does not see arguments about the nature of reality as an essential starting point for discussions about research paradigms. Pragmatism sees knowledge as being warranted assertions which come from 'taking action and experiencing the outcomes' (Morgan, 2014, p. 5).

2.7. Pragmatism

In its broadest sense, pragmatism could be said to be the philosophical orientation of all Action Research (Stark, 2014, p. 89).

Stark's quote encouraged me to find out more about pragmatism, especially as she goes on to say that pragmatism is not looking for a single truth but is interested in finding out what works for a particular situation.

Pragmatism is not a single coherent body of thought (Bridges, 2003).

there are "as many pragmatisms as there are pragmatists", in spite of the many differences among individual philosophers, all pragmatists are united in the belief that human existence inherently involves the active practice of making meaning through interaction with our environment (Stark, 2014, p. 88).

As with ‘action research’, pragmatism is a term that has been interpreted in many ways and some say it has been ‘trivialised’, with those who describe themselves as pragmatists often being focused on methods rather than philosophical assumptions (Hall, 2013). Morgan agrees, saying the advocates of mixed-methods research tend to focus on the practical aspects of pragmatism, not the philosophical (Morgan, 2014).

While there is no single pragmatic approach there are some common themes. For example, beliefs are required to help people interact with the environment and all beliefs are subject to change if new evidence emerges (Almeder, 1986). It is not possible to establish fixed truths. Both pragmatism and action research suggest that it is not possible to identify solutions or best practice that will work anywhere or any time (Hammond, 2013). Dewey’s fallibilism is practical; we cannot be certain that information about what has happened in the past will be relevant in the future (Biesta & Burbules, 2003). Research findings are seen as ‘provisional truths’; future experience can lead to them being amended (Clarke & Visser, 2018).

Pragmatism has its roots in the works of Peirce, James and Dewey. Hammond (2013, p. 3) identified a core principle of these works:

> *knowledge is consequential, generated after action and reflection on action, even if we can use what we know already (antecedent knowledge) to guide our actions.*

Dewey suggests that reality reveals itself through our interactions with it. There is a reality but it can only be known through experience (Biesta & Burbules, 2003). A pragmatist, instead of focusing on ontology and epistemology, will be looking at the research question or problem they are trying to solve (Parvaiz, Mufti, & Wahab, 2016).

Dewey preferred the term ‘warranted assertions’ to ‘belief’ or ‘knowledge’, saying it was less ambiguous (1941). These warranted assertions are established through rigorous discussion and agreement (Hammond, 2013). Answers will only ever be tentative; the best answers available at the current time (Johnson & Onwuegbuzie, 2004).

> *What is to count as warranted or justified belief in contrast to mere opinion, dogma and guesswork is solely determined by a democratic discussion aimed at achieving an unforced consensus (Elliott, 2006, p. 179).*

For the pragmatist, and the action researcher, the best test for the truth or validity of an idea is whether it 'works' in practice, the best way to find out if it does is to try it. This means theory leads to practice. Similarly, they both use practice to develop new ideas and theories (Bridges, 2003). These ideas and theories are seen to be useful only if they will make a difference to peoples' lives or experiences (James, 1922, p. 200). This focus on actions and real world practice means that action research is well suited to the pragmatic perspective, (Clarke & Visser, 2018) as does the 'continual interplay between action and reflection that pragmatism requires' (Goldkuhl, 2011, p. 92).

Some action research approaches are focused on social transformation; a pragmatic approach requires a focus on problem solving, identifying problems and looking at how changing practice can address them (Hammond, 2013).

Pragmatism and action research

Pragmatism, and especially the work of Dewey, can be seen as underpinning action research. Hammond (2013) has identified a number of similarities between the two including:

- Knowledge is consequential and fallible; existing knowledge is not enough, it needs to be considered within a specific context and evaluated through action.
- The development of knowledge comes from interaction with the world and is an ongoing, iterative process.
- The importance of 'intersubjective agreement', working with others is a way of validating new knowledge.

Pragmatists, like action researchers, are interested in focusing on what is useful and practical (Reason, 2003).

Pragmatism is not a 'recipe for educational research' (Biesta & Burbules, 2003, p. 114). Methodological pragmatism means that instead of choosing between methodologies, it is possible to choose from within them, selecting a research method or a combination of methods that fit best with the research questions (Clarke & Visser, 2018). Pragmatism provides a freedom to tailor research to the research questions and context; this freedom can cause problems and pragmatism has been criticised for a potential lack of rigour. To address this criticism Caelli, Ray, and Mill (2003) suggest researchers address:

- the theoretical positioning of the researcher (the researcher's background and motives for conducting the research);
- the congruence between methodology and methods (being able to defend the researcher's methodology and the methods they intend to use);
- the strategies to establish rigor (providing an overview or evaluation of how this was done);
- the analytic lens through which the data are examined (an examination of the researcher's assumptions).

These areas highlight the importance of the researcher's role within the research and a recognition that they influence the process, it is important to identify any potential sources of bias and how these have been addressed.

Of course, pragmatism is not the only approach that needs to be rigorous. Just because other methodologies have a more established set of 'guidelines' does not mean they are always more objective (Clarke & Visser, 2018).

Hammond (2013) shows how a pragmatic approach can be linked to how action research is conducted, see Table 3.

Table 3: Pragmatism and Action Research from Hammond (2013)

A pragmatic stance on knowledge argues:	This explains why action research:
antecedent knowledge has been constructed in particular circumstances and for particular ends	requires practitioners to generate their own knowledge even if existing concepts and evidence can guide their inquiry
intelligent action is stimulated by indeterminate situations	has a 'problem' solving focus
intelligent action can be contrasted to trial and error reasoning, it requires new habits of reflection and analysis	is reflective and systematic
generating knowledge is a dialectical process	is an iterative process which is never complete
warranted assertions are stable, social agreements but they do not offer a correspondence view of reality	is a collaborative and communicative process
knowledge is generated after the event by considering the consequences of action	has quality criteria that consider the impact of action

the generation of knowledge is value laden	is explicit about democratic values

Not all action research is pragmatic

Not all literature on action research references pragmatism. This raises the question of whether all action research is pragmatic. Hammond (2013) suggests that this is not always the case and action research can have a focus on other epistemological traditions. In section 2.2, I described how Lewin identified a number of different action research approaches, including empirical action research. This can clearly be seen as being linked to a positivist approach. Hammond shows how action research can also be linked to other approaches, including critical inquiry and post modernism.

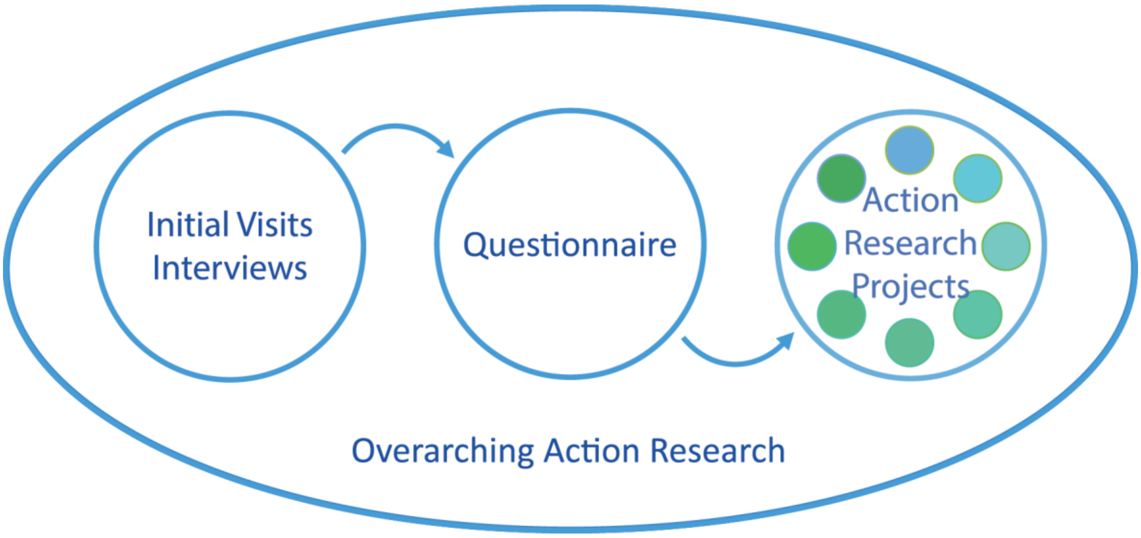
2.8. Ethics

The Academy of Social Sciences has identified five ethical principles of social science research. One of these is that 'social science should aim to maximise benefit and minimise harm' (Academy of Social Sciences [AcSS], 2015). Ethical issues need to be considered at all stages of a research project (Brindley & Bowker, 2013). The design of this project is more complex than many which means that ethical issues were reviewed regularly. Ethical approval was granted by the School of Education, Durham University (Appendix E) and details of the considerations for each phase are identified within the introduction section of each cycle, see Chapters 4, 6 and 8.

Each of these chapters considers principles identified in the BERA Ethical Guidelines (British Educational Research Association, 2018). BERA identify a number of key issues that must be considered: consent, transparency, right to withdraw, incentives, harm arising from participation in research, privacy and data storage and disclosure. Participation in all stages of this research was voluntary and the purpose of the research was made clear to participants. They were provided with information about how their data would be used, assured of confidentiality and were able to withdraw from the process at any stage. Incentives were used as part of the Cycle Two questionnaires and this process is described in section 6.4.

BERA (2018) also highlight the issue of power. All research involves a balance of power between the researcher and the researched, this balance varies depending on the research method and needed to be considered here, especially when considering the interviews and the action research stages of the project. Karnieli-Miller, Strier, and Pessach (2009) described different types of power relations. For example, with a questionnaire or interview there is a ‘hierarchical’ balance of power. The researcher has the power to design the method of data collection and interpret the data, the research subjects have the power to decide whether to participate or not and how much they will share. Action research may be described as an ‘equal partnership’ if participants are actively involved in all phases of the research including analysis of data, or as ‘low-hierarchical’ where they are only involved in some aspects, as is the case in Cycle Three of this research. I was responsible for setting agendas and identifying participants, but the project was designed to ensure they had an active role in identifying the focus for the research, planning the projects, collecting the data and analysing their own data. They were less involved in the analysis of the overarching research project.

Chapter 3. Cycle One: Literature Review



3.1. Research Questions

Research Question 1: *What is the relationship between early years practitioners' use of educational technologies and their pedagogical beliefs?*

- What are the pedagogical beliefs of early years practitioners?
- How are early years practitioners using educational technologies to support teaching and learning?

Before answering these questions, it is important to explore two key issues:

- What is educational technology?
- What does effective teaching and learning look like in early years education?

This section will review some of the literature written about educational technology and early years education. It will explore the key themes that will be referred to throughout the research. It will examine what is meant by EdTech and how early years practitioners are using it. It will also explore how the EYFS curriculum has referred to educational technologies.

3.2. Educational Technology defined

There is no single accepted definition of 'educational technology' (Arnott, 2013), nor is there any consensus about which terms should be used when talking about technology in schools. The literature identifies a number of possibilities: digital artefacts, digital media, digital resources, digital technology, digital tools, ICT, information technology, instructional technology, interactive devices, internet-enabled technology, learning technology and mobile technologies. Sometimes these terms are accompanied by definitions, often they are not. When a definition is given, it is often simply a list of the devices to which the article is referring (Ekici, 2016; McPake, Stephen, Plowman, Sime, & Downey, 2005; Stephen & Plowman, 2013) and while some literature refers to a range of devices, the focus is often restricted to 'just computers' (Plowman & Stephen, 2003).

Definitions of educational technology are important because they can impact on practitioners' practice. A narrow view, which equates educational technology with computers, has been linked to a 'mechanistic approach', a focus on basic operational functions and rigid 'drill and practice' activities. A broader view is seen as providing 'scope for more imaginative, creative and collaborative activities' (Plowman, McPake, & Stephen, 2012). There is evidence that definitions differ between researchers and practitioners (Plowman & Stephen, 2005).

This project uses the term 'Educational Technology' as this is seen as the broadest term (Reiser & Ely, 1997), encompassing the terms listed above. This term has been defined by the Association for Educational Communications and Technology as technology that is used for any aspect of education, not just as part of the teaching or learning process (Ely, 2008). It can refer to any of the devices or applications used to support education, but it is broader than this and can also refer to the teaching and learning process and how this is designed and carried out. Educational technology is not just about the use of devices (Reiser & Ely, 1997). For most of this research, the focus is on resources, whether hardware or software, but the broader definition will be revisited when reviewing discussions about educational technology in the action research projects (see section 10.6.2).

The term ‘Educational Technology’ was deliberately not defined for participants. One of the aims of the research was to establish how practitioners interpret the term. Do they also limit their definition to ‘just computers’?

3.3. A systematic approach

Despite a common view that EdTech in the early years is not as well researched as technology use in older age groups (Livingstone et al., 2014), there is still a wide range of literature to consider. An extensive review was beyond the scope of this project, so a systematic approach was used to review a sample of the literature in order to answer the key questions identified above.

The Education Resources Information Centre (ERIC) was searched using the following Boolean string search: ("computer" OR "technology" OR "digital" OR "ICT") AND ("early years" OR "pre-school" OR "kindergarten" OR "young children"). The search was limited to peer-reviewed journal articles in 1996 and 2016. These dates were chosen as 1996 was when the Desirable Outcomes for Children’s Learning were published in England (School Curriculum and Assessment Authority & Department for Education and Employment, 1996). It also reflects a time before interactive whiteboards (IWBs) became prevalent in schools. 2016 was the last full year of literature before this review started.

The search identified 44 articles from 1996. After reviewing the abstracts, 15 were excluded as they did not meet the criteria for this study. 240 articles were identified for 2016, 156 were excluded after review.

Studies which were excluded:

- did not focus on early years settings
- focused on assistive technology which supported individual students’ needs rather than being educational for all pupils e.g. cochlear implants
- focused on design and technology, science or medicine
- used technology for data collection rather than as the focus of the research

3.4. What does EdTech refer to in the literature?

All but one of the twenty-nine articles from 1996 have a focus on using computers, or on software that was accessed using a computer. The remaining article evaluated the appropriateness of technology and still had computers as its main focus (National Association for the Education of Young Children, 1996a). The articles from 2016 seemed to have a wider focus. Computers, tablets and IWBs were the focus of 62 of the 84 articles. However, on closer examination, it became clear that these articles were referring to the types of software or activities that would previously have been done on a computer. Robots were the focus of seven articles. In five, the focus was on technology or digital play, but it was unclear which technology was being used.

The remaining ten articles seemed to focus on more than computers, but this was not always the case. Even when the term used was ‘digital technologies’ or a longer list of technologies was identified, the analysis often focused on computers or screen-based technologies (Ebbeck, Yim, Chan, & Goh, 2016; Hsu, 2016; Konca et al., 2016; Mangen, 2016; Palaiologou, 2016a; Preradović, Lešin, & Šagud, 2016).

Only four articles explicitly looked at a broader range of technologies. Two focused on practitioner perceptions (Dong & Newman, 2016; Palaiologou, 2016b), one on technology and social interactions (Arnott, 2016a). The last one looked at technology use in settings, how often it was used and which curriculum areas it supported. It did not say what activities the technology was being used for (Aldhafeeri et al., 2016).

The case for moving away from a narrow definition of ‘technology as computers’ has been made many times (Plowman & Stephen, 2005; Siraj-Blatchford & Siraj-Blatchford, 2005). However, this review suggests that this is not reflected in the literature. Even with the addition of tablets and IWBs, the range of devices the articles refer to is very limited when compared to the range of technology available. This research aimed to find out if practitioners’ perceptions of technology are similarly focused. As previously mentioned, a broader focus has been linked to a more creative use of technology.

This was only a snapshot of the literature, it reviewed two specific years. Some examples can be found which have a broader focus, for example Garvis and Lemon (2015) referred to how a range of technologies can be used to support authentic learning experiences. However, there seems to be limited information about what EdTech early years practitioners have access to and how it is being used. Research is limited to small-scale, qualitative studies (Plowman, 2016) and it is difficult to get an accurate picture of what is happening more widely.

3.5. How is EdTech being used?

In the previous section, a systematic review of literature from 1996 and 2016 identified only one article that looked at how a range of EdTech was being used in settings. This finding is similar to that of Burnett (2010). While her search criteria should have enabled her to identify studies using a wide range of technologies, all of the studies in her review were based on computer applications.

Most of the studies identified through this literature review were evaluations of the efficacy of one particular resource or device. It was much less common for articles to consider a range of technologies. Where this did happen, they looked at the type of technology settings have, how often the different devices are used, or the area of the curriculum which is being supported. There is little evidence of how educational technologies are being used to support teaching and learning (Aldhafeeri et al., 2016; Kerckaert, Vanderlinde, & van Braak, 2015).

Other reviews support these findings, suggesting that research looks at what technology settings have access to but not at how this technology is being used. (Kerckaert et al., 2015). They also suggest that research is more likely to look at children’s use of technology, rather than how practitioners are using it (Bolstad, 2004).

Many articles suggest that technology can make a significant positive impact on teaching and learning (Couse & Chen, 2010; Higgins, Xiao, & Katsipataki, 2012; Vaughan & Beers, 2017) but research suggests that many settings rarely use it (Blackwell, Lauricella, & Wartella, 2014). The opposing views highlighting the negative impact of technology are seen in social media, websites, blogs and mainstream media and publications (Hall & Higgins, 2002; Marsh, 2005, p. 181). Given such different opinions, this research was designed to find out what is actually happening in early years settings.

3.6. Why use EdTech?

In the next cycle of the research I will examine rationales for using technology in more detail (see Chapter 5); this emerged as an area of interest from this phase of the research but at this point of the process the literature review about why practitioners used technology was more limited.

Plowman, Stevenson, Stephen and McPake (2012) identified some reasons why technology can be used to support early years education:

- To help children to acquire operational skills,
- To extend children's knowledge and understanding of the world,
- To help children to develop dispositions to learn,
- To help children to understand the role of technology in everyday life.

Operational approaches, which relate to teaching children how to operate devices, are seen as the least important way to work with technology (Plowman, 2016). The literature suggests that EdTech is not always being used for all these reasons, for example, computers appear to have been used much more for free play rather than for teacher directed activities (Wood, Specht, Willoughby, & Mueller, 2008).

3.7. Technology in the Early Years curriculum

In England, early years provision has to follow the Statutory Framework for the Early Years Foundation Stage (Department for Education, 2014). This document identifies three characteristics of effective teaching and learning:

- Playing and exploring
- Active learning
- Creating and thinking critically

There are three prime areas:

- Communication and language
- Physical development
- Personal, social and emotional development

There are also four specific areas:

- Literacy
- Mathematics
- Understanding the world
- Expressive arts and design

Educational technology is only mentioned in the Understanding the World section. The Early Learning Goal (ELG) states that children should:

- recognise that a range of technology is used in places such as homes and schools
- select and use technology for particular purposes

There is no mention of technology supporting teaching and learning across the curriculum, though previous exemplification materials contain an explanatory note: "The child chooses the technological opportunities around him or herself as a tool to enhance and extend his or her learning" (Standards and Testing Agency, 2012).

In previous curriculum documentation, the role of technology to support learning across the curriculum was more explicit. For example, the Desirable Learning Outcomes (School Curriculum and Assessment Authority & Department for Education and Employment, 1996) stated that children should 'use technology, where appropriate, to support their learning'.

Even in 1990 (Rumbold), curriculum documentation in the UK referred to more than just computers, with references to toys and domestic technology. The Desirable Learning Outcomes (School Curriculum and Assessment Authority & Department for Education and Employment, 1996) were less explicit, stating only that children should 'use technology, where appropriate, to support their learning'. There is, however, a reference to the Key Stage 1 curriculum for 5 to 7-year olds, which says that 'many everyday devices respond to signals and commands'. The Curriculum Guidance for the Foundation Stage (Qualifications and Curriculum Authority, 2000) identifies a number of devices, including programmable toys, cameras, tape recorders, talking books, domestic technology and technology in the environment. This range of devices is also referred to in the 2008 and subsequent Statutory Frameworks as well as in Development Matters (Department for Children Schools and Families, 2008b; Department for

Education, 2012, 2014; Early Education, 2012). Curricular frameworks in the UK clearly identify a range of technologies, though this does not appear to be reflected in the contemporary literature.

The Rose Review looked at the Primary Curriculum rather than EYFS but again highlighted that ‘ICT can make the unique contribution of strengthening each of the areas of learning… and should therefore be at the core of the primary curriculum’; it clearly supports a pedagogical rationale. It refers to a vocational rationale, identifying the need for a good grasp of ICT for education and employment. It also refers to the social rationale, mentioning that children will require digital literacy to fully participate in society’ (Rose, 2009). See section 5.2 for more details about rationales.

Recent developments suggest that technology may be about to change its curriculum status. The new pilot documents due to be trialled in 25 schools make no mention of technology at all (Department for Education, 2018a, 2018b).

3.8. Early Years pedagogy

Early years education is different to other phases of education, with a focus on socio-emotional skills alongside academic skills. Good learning is seen as active and independent (Pääjärvi & Mertala, 2015). This is not always seen to be conducive to working with technology. Some people see technology as a possible threat, taking time away from other more important activities and disrupting learning. However, these attitudes are most often held by those who do not work alongside children using technology (Ljung-Djärf, Åberg-Bengtsson, & Ottosson, 2005).

Nearly all early years pedagogies are based on play and student-centred practices which favour exploratory learning (Allen & Whalley, 2010; Mertala, 2017; Roberts-Holmes, 2012). Most would see the need for a balance between child initiated and teacher-led activities (Ofsted, 2015). Non-statutory guidance in England identifies the characteristics of effective early learning as playing and exploring, active learning and creating and thinking critically (Early Education, 2012). Even in 1991, it was possible to find examples of technology being used to support these types of open-ended activities (Fields, 1991), but this did not appear to be typical (Yelland, 2005).

There is a perception by some that early years practitioners may not be under the same academic pressures faced by teachers of older children. Their child-centred approach could provide an opportunity for them to lead the way in more appropriate and effective uses of technology (Brooker, 2003; Mishra & Joseph, 2012). However, even Brooker who is often cited as identifying this perception has said that curriculum guidance could be seen as ‘an instruction to adults to replace children’s own play agenda with adult-designed learning intentions’ (Brooker, 2011). This could be interpreted as the curriculum being more restricted than some people think. Others, who may accept that early years curricula are more flexible, suggest that technology is seen as an add-on to the curriculum and not necessarily integrated with broader learning experiences (Edwards, 2005b). Mertala (2017) found the use of technology was limited to whole class instruction and ‘drill and practice’ exercises. Other evidence suggests technology in preschool settings is usually interpreted as computers, used mainly during free play (Plowman & Stephen, 2007). Perception about the freedom of the early years approach, even if it is accurate, may not be matched by actual practice.

Brooker talked about early years practitioners matching new technologies to traditional early childhood goals and principles, ensuring children’s learning is child initiated, child centred, exploratory and open-ended, supportive of social interactions and positive learning dispositions (2003). Definitions of learning dispositions vary but they include confidence, curiosity, cooperation, perseverance, resilience and reflection (Claxton, 2007; Siraj-Blatchford, Muttock, Sylva, Gilden, & Bell, 2002). Carr and Claxton suggest that ‘learning dispositions can be construed as *default responses* in the presence of uncertain learning opportunities and circumstances’ (2004).

It has been shown that early years education is about much more than ‘academic skills’ and should focus on more than literacy and numeracy. Children also need to be supported to develop broader skills. Some of these are identified in the Primary Guidance for the Early Years Foundation Stage; they include the development of concentration, independence and autonomy, and the ability to cope with situations that challenge their thinking (Department for Children Schools and Families, 2008a).

3.9. Appropriate use of EdTech

Section 1.3 began to identify what ‘appropriate use’ may mean from both the child’s and the practitioner's perspectives. This section will consider this question further.

Is it appropriate to use technology in the early years, does it make a difference? Even when focusing on a narrow range of technology, it is not always possible to clearly identify whether it supports learning. For example, a literature review from 1985 to 2004 looked at the use of computers with pre-schoolers and concluded that it was not possible to categorically state whether computers had a positive or negative effect (McCarrick & Li, 2007). I have always found it strange that anyone would expect to find that 'technology' as a whole would have a positive or negative impact. Considering other categories of learning support can help to make this point. Not all teachers or teaching assistants can be said to have the same impact, not all learning interventions are positive. Just as some teachers are exceptional and others not so good, different examples of technology use are likely to have different effects. Any researcher in education is aware that there are many complex variables that affect how things work in practice. Practices that work for one practitioner, or in one setting, or for one particular group of children, may well not work for others. Simply putting a device into a setting will not automatically mean practice improves. It is important to consider how technology is used and what it is used for.

> *Good teaching remains good teaching with or without the technology; the technology might enhance the pedagogy only if the teachers and pupils engaged with it and understood its potential in such a way that the technology is not seen as an end in itself but as another pedagogical means to achieve teaching and learning goals (Higgins, Beauchamp, & Miller, 2007, p. 217).*

Practice is influenced by the practitioners' beliefs (Ertmer, Gopalakrishnan, & Ross, 2001). Marcon found that children perform better in classrooms where there is a single pedagogical approach (1999). If there is a mismatch between teachers' pedagogical beliefs and how they believe technology can be used, teachers may use technology ineffectively, or not at all. It will be important, therefore, to consider practitioners' beliefs about teaching and learning and to identify their needs before any technology is introduced.

Technology can support developing learning dispositions such as independence, confidence and willingness to persist in the face of initial challenge (Stephen &

Plowman, 2013). It can do this by encouraging affective, social and cognitive development. Despite the possibilities for using technology to support this wide range of learning objectives it has often been used in a limited way, for example to support turn taking (Plowman, McPake, et al., 2012).

Technology can be used in developmentally appropriate ways with very young children (Haughland, 1999) but, of course, the technology does not need to be used by the children themselves. Similarly, pedagogy is more than what happens with the children. It can be seen as everything a teacher does that makes a difference to children’s learning (Plowman, McPake, & Stephen, 2010). Moyles, Adams, and Musgrove (2002) divide pedagogy into three areas:

- Practice – including planning, assessment, parental engagement
- Principles – knowledge about teaching and learning theories
- Professional – reflecting on practice and striving to improve

There are lots of ways that technology can be used by practitioners. However, there is a wide variation in teachers’ skills and the introduction of technology to schools and preschools has not been matched by training, meaning that some staff lack confidence and are reluctant to use it (Higgins, 2003; Higgins & Moseley, 2001; Laffey, 2004; Plowman & Stephen, 2005). Even when practitioners are able to access training, it often focuses on how to use ICT technically, forgetting about pedagogy. This is unfortunate, as a focus on pedagogy can convince reluctant staff of the value of technology. If they can see how it can be used to support their own teaching philosophy, they will be more likely to use it (Shields & Behrman, 2000). Training and networking can increase the confidence of staff (National Association for the Education of Young Children, 1996b) and help them to feel comfortable learning alongside the children (Jordan, 2004).

3.10. The role of adults

Research suggests that technology is more likely to have a positive effect when children use it alongside adults or more experienced peers (McCarrick & Li, 2007). If children are left on their own with technology, they may not use it in the most efficient way (Preradović, Lešin, & Boras, 2017). There is a need for adults to scaffold and model appropriate use (Neumann & Neumann, 2014), they need to work alongside children and take a similar approach to sustained shared thinking (Sylva, Melhuish, Sammons, Siraj-Blatchford, & Taggart, 2004). However, there is limited evidence of this happening in practice when using technology (Aubrey & Dahl, 2008).

Research focusing on parents also suggests that adults interact with children differently when using technologies. The amount of talking can be affected by the use of electronic devices (Kucirkova, Messer, Sheehy, & Flewitt, 2013; Sosa, 2016), adults can engage with children less when technology is involved, maybe because they see the technology as providing the interaction instead.

Of course, the need for adult support is not restricted to technology. Claxton and Carr (2004, p. 92) recommend a potentiating environment, with ‘frequent participation in shared activity’ which will support the development of learning dispositions. It is not enough to make resources available, adults need to play an active role by explaining and modelling learning. Arnott suggests that technology can be a way of providing this potentiating environment (Arnott, 2016b), but technology does not always support interaction and it can prevent practitioners from taking this role. While practitioners are familiar with supporting young children’s learning, this does not always happen when using technology. Plowman and Stephen suggest this may be because other activities take priority over technology and that practitioners have limited confidence with ICT (2007).

3.11. Barriers to the effective use of EdTech

When evaluating the impact of educational technology, it is important to clearly establish how this impact will be judged. The success of EdTech has often been judged on how often it is used, rather than on whether it is being used in appropriate ways to support teaching and learning (Prestridge, 2017). This reflects the findings in section 3.5 which showed that most of the literature in the systematic review focused on how often technology was being used, rather than what it was being used for.

The potential of technology to support learning has long been recognised (Zevenbergen & Logan, 2008) but this potential has not been realised. The literature highlights a range of barriers that can limit the use of technology in schools. These have been categorised in different ways by different people. Khalid and Buus (2014) produced a framework showing the different approaches and their place in the literature, some of these are shown in Table 4.

Table 4: Barriers in the integration of ICT from Khalid and Buus (2014)

Categorizations of Barriers
Micro-level, meso-level and macro-level
Extrinsic or first-order and intrinsic or second-order
Teacher-level barriers (confidence, competence, and resistance to change & negative attitude) and school-level barriers (time, training, accessibility, technical support)
Resources, knowledge and skills, institution, attitudes and beliefs, assessment and subject culture

The division into macro, meso, and micro level barriers has been proposed by many authors. Barriers occur at different levels, they can affect individual teachers or classrooms, or they can have an impact at the setting level, or at the regional or national level. While this can provide a useful framework, it is not always easy to assign a barrier to a single level as they can be context dependent.

Ertmer (1999) divided barriers into extrinsic (lack of equipment, training and technical support) and intrinsic barriers (attitudes and beliefs). Research suggests that most extrinsic barriers have been tackled in schools (Ertmer, 2005). However, technology use is still not as widespread as some would like and intrinsic beliefs are described by Ertmer as the "final frontier" (2005).

Even when practitioners have access to technology this does not mean it is being used, and even when it is used, it may not be used effectively (British Education Suppliers Association, 2015). In one study, practitioners did not see the value of using digital technology to support learning. Teachers can be sceptical and hesitant about its use (Aldhafeeri et al., 2016). However, this is not always the case; Mertala (2017, p. 1) found that the 'vast majority of early childhood educators have a positive attitude towards using ICT with children'.

Barriers are seen differently by different practitioners; some settings with very limited access to resources are using them effectively (Mama & Hennessy, 2013).

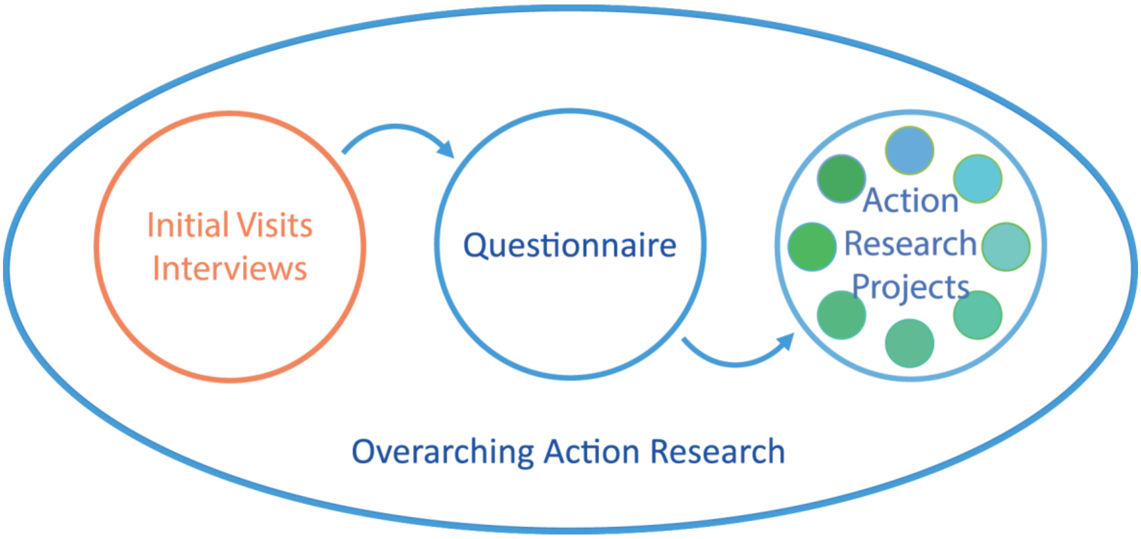
3.12. Summary

The literature includes three main types of research (Balanskat et al., 2006):

- Reviews of access and infrastructure which focus on how many devices and what type of technologies practitioners have access to
- Explorations of how often EdTech is being used
- A measure of the impact EdTech makes

This review has shown that most literature refers to the first two types and evaluations of how technology is being used and the impact it has made are much less common. This cycle aims to focus on these questions.

Chapter 4. Cycle One: Interviews



4.1. Research Questions

Research Question 1: *What is the relationship between early years practitioners' use of educational technologies and their pedagogical beliefs?*

- What are the pedagogical beliefs of early years practitioners?
- How are early years practitioners using educational technologies to support teaching and learning?

This question requires the exploration of two key issues:

- What is educational technology?
- What does effective teaching and learning look like in early years education?

This section provides an overview of the interviews that were conducted as part of the initial exploratory phase of the research. It outlines some of the key findings. Other findings have been published in the International Journal of Early Years Education and this article can be found in Appendix A, section B. Interviewees were asked what technology they had access to, and how it was being used. This provided an opportunity to explore their definition of educational technology and whether their use of technology was aligned with their beliefs about teaching and learning.

4.2. Methodology

Early years settings in six local authorities (LAs) in the North East were visited between January and May 2015 (see Table 5). Most interviews were conducted with a single practitioner, but one focus group was conducted with twelve managers from Children's Centres.

The interviews were semi-structured and focused on practitioners' teaching and learning philosophies, their beliefs about technology and how technology is being used in their settings. This provided an opportunity to explore whether their use of technology aligned with their beliefs about teaching and learning. They were asked about educational technology, but the term was deliberately not defined. The aim was to find out what they thought it meant. The discussion guide is in Appendix A, section A.

Interviews lasted between 30-60 minutes and were recorded, transcribed and analysed using the qualitative data analysis software NVivo; this is produced by QSR International and designed to analyse rich, text-based and/or multimedia information, where deep levels of analysis on small or large volumes of data are required.

Analysis of the data was both inductive and deductive using an approach similar to that described by Fereday and Muir-Cochrane (2006). Initial a priori codes (Bazeley & Jackson, 2013) were created based on the research questions and the themes addressed through the discussion guide, but it was seen to be important that these initial codes should not restrict the analysis (Schreier, 2014). During the initial coding, additional nodes emerged from the data. These allowed the themes to be examined in more detail and ensured the final nodes were closely related to the data. The analysis was undertaken following the principles in Schreier (2014), the analysis was systematic and iterative. As codes were added or modified, all the data was re-examined. This usually occurred after enough time had elapsed to allow the data to be viewed with fresh eyes. The final codes related to different technologies and how they were used, practitioners' pedagogical practice and practitioners' beliefs about technology, early years education and pedagogy. The themes that emerged through this analysis formed the structure of section 4.5 where the findings are presented. These findings then fed into the planning for the next cycle of the overarching research and became the initial nodes for the analysis of the new data.

4.3. Sample

Some of the settings involved in Cycle One were already known to me, but I had not met the early years practitioners before. Other settings were identified by LA contacts.

Table 5: Participants in Cycle One interviews

Setting	Age range (years)	Key Stage(s)	Role	Number of children (in setting)	Catchment area (as described by interviewee)
Children's centres (LA) x 12	0-5 years	EYFS	Managers	12 – 85	Deprived
Nursery (Private)	0-5	EYFS	Room leader	100	Mixed
Nursery (LA)	2-4	EYFS	Key worker	80	Mixed
Nursery (LA)	2-4	EYFS	Head teacher	80	Affluent
Primary School (Free)	4-7	EYFS KS1	Reception teacher	90	Mixed
Primary School (LA)	3-11	EYFS KS1/KS2	Early years coordinator	400	Deprived
Primary School (LA)	2-11	EYFS KS1/KS2	Early years teacher	450	Deprived
Primary School (LA)	3-11	EYFS KS1/KS2	Early years leader	450	Mixed
Primary School (LA)	3-11	EYFS KS1/KS2	Reception teacher /computing coordinator	500	Mixed

4.4. Ethics

Participation in the research was voluntary and the purpose of the research was made clear to the practitioners. Interviews followed the discussion guide in Appendix A, section A, which included information about ethical considerations.

Participants were informed of how the data would be used and assured of confidentiality and anonymity. They were able to withdraw from the process at any stage. I asked participants for permission to record the interviews. All recordings were stored securely.

As described in section 2.8 there is a power relationship ‘inherent in researcher-researched interaction’ (O'Leary, 2004, p. 50), it was important to build a rapport to encourage the interviewees to share. It was also important to ensure that their voices were clear in the analysis and findings. I was careful to listen carefully and check my understanding through follow up questions, in order to ensure that I checked my interpretations and did not make assumptions (Mears, 2012).

While it was not possible to revisit the interviewees to check my analysis, I did discuss my findings at meetings and conferences with other early years practitioners. This provided opportunities to have my interpretations challenged. In some research, participants do not benefit as much as the researcher (Tripp, 2005), in this case, all of the interviewees were offered the opportunity to participate in later stages of the research and to receive copies of the findings once they had been written up.

4.5. Findings

4.5.1. How do practitioners interpret the term ‘Educational Technology’?

The term Educational Technology was deliberately not defined, the aim was to find out what they thought it meant. The range of technology they talked about was much broader than that described in the literature. Table 6 shows responses to the question ‘what educational technology do you have?’ This question was open-ended. No prompts were given, so answers reflected the resources that interviewees most closely associate with the term ‘educational technology’. Other resources may have been available and even if an interviewee did not mention a technology it does not necessarily mean they did not have it. The table does not show how often resources were used or what they were used for. It did not include information about the age or quality of the resources.

All settings had at least five items of educational technology. All had a digital camera and a computer. The table shows technology that was present in more than one setting. Other technologies that were mentioned were: Apple TV, calculators, an immersive room, light box, overhead projector, Smart Table, stop watches, torches, digital toys with lights and buzzers.

4.5.2. What EdTech is available in EYFS settings and how is it being used?

The curriculum handbook does not mention the use of technology to support learning. Respondents indicated that technologies are being used regularly to support all three characteristics of effective teaching and learning and to support all areas of learning and development as identified in the EYFS curriculum (see section 3.7).

All of the practitioners, including one who described herself as a technophobe, had very positive attitudes toward EdTech and were able to describe the difference it made to their practice.

> *I am a technophobe, I will run away [from it]….[but] they gave me an iPad a year ago, I can't live without it, I cannot live without it...it has opened new ways of working that I have never seen before*

Interviewees were asked to describe how they were using technology. Again, this was an open question and responses may have been different if they had been given a list of activities to choose from. While research in the past has focused on the use of technology by children (Bolstad, 2004), all of the interviewees talked about how it was being used by both children and staff. Findings supported the view that early years practitioners have a child-centred approach to teaching and learning and that developing learning dispositions is a key goal. These goals were reflected in the activities the interviewees described when asked how they were using EdTech (see Table 7).

Table 6: What technology do settings have?

Setting Description (EYFS Age Range)	LA School 1 2-5	LA School 2 3-5	LA School 3 3-5	LA School 4 3-5	Free School 4-5	LA Nursery 1 2-4	LA Nursery 2 2-4	Private Nursery 0-5	Children's Centres 0-5
Cameras video or still	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Computer	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IWB	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
iPads	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No
Recording Device	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes
Programmable Toys	Yes	No	No	Yes	Yes	Yes	No	No	Yes
Audio Players	Yes	Yes	No	Yes	No	No	No	Yes	Yes
Remote Control Toys	Yes	Yes	No	No	No	No	No	No	Yes
Role Play	Yes	No	No	No	No	No	No	Yes	Yes
iPods	No	No	No	Yes	Yes	No	No	No	No
Metal Detectors	No	No	Yes	No	No	No	Yes	No	No
Musical	No	No	No	No	No	No	Yes	Yes	No
Phones	No	No	No	No	No	No	No	Yes	Yes
Visualiser	No	No	Yes	Yes	No	No	No	No	No
Walkie-talkies	No	No	No	No	No	No	No	Yes	Yes

Table 7: How are children using EdTech?

Activities	Areas of Learning	Kind of Learning	Learning Dispositions	Adult Involvement
Home/school projects: e.g. sending Teddy home with a **camera**	C&L UW	Operational Dispositions	Cooperation	Ongoing Support / Move to Independence
Searching the **Internet** for information to support their play	PSE C&L UW	Operational Dispositions Curriculum	Curiosity	Ongoing Support
Using **YouTube** to access songs and other stimulus materials	C&L UW	Dispositions Curriculum	Curiosity Reflection	Ongoing Support
Exploring cause and effect with **toys with buttons to press** and using this as a stimulus for language development	C&L UW	Operational Dispositions Curriculum	Cooperation Curiosity Perseverance	Ongoing Support / Move to Independence
Working on open ended language and number activities – **computer software**	C&L L M	Dispositions Curriculum	Perseverance Curiosity	Ongoing Support
Free play with **Bee Bots** e.g. creating mats for them to explore.	C&L UW EAD	Operational Dispositions Curriculum	Cooperation Curiosity	Ongoing Support /Move to Independence
Whole class or group role play including using **large screens and projectors** to support pretend play e.g. flying to the moon	C&L UW EAD	Dispositions Curriculum	Cooperation Curiosity	Ongoing Support / Move to Independence
Making movies and animations using **iPads**	C&L L UW EAD	Operational Dispositions Curriculum	Cooperation Perseverance	Ongoing Support
Drawing and printing pictures on **computers and iPads**	C&L EAD	Operational Dispositions Curriculum	Perseverance	Move to Independence
Copying dances, which children had found on **YouTube**	P C&L UW	Dispositions	Confidence	Ongoing Support

Using **iPads** to take photos when outside, using them as a tally instead of children writing numbers	PSE C&L M UW EAD	Operational Dispositions Curriculum	Independence	Move to Independence
Taking photos and videos to help children reflect and identify good learning, using **cameras** and **iPads**	C&L UW	Operational Dispositions	Reflection	Ongoing Support / Move to Independence
Recording messages using '**easispeak' microphones**	PSE C&L UW	Operational Dispositions	Cooperation Confidence Reflection	Ongoing Support / Move to Independence
Using **QR barcodes** to access appropriate websites independently	PSE C&L UW	Operational Dispositions	Independence	Move to Independence
Supporting children with Special Needs e.g. using music to calm down an autistic child, using an **audio player** or a **whiteboard** to enlarge books for a visually impaired child	PSE C&L	Dispositions Curriculum	Cooperation Independence Resilience	Ongoing Support / Move to Independence
Playing games / using **iPad apps** to support literacy or numeracy	C&L L M UW	Dispositions Curriculum	Independence	Move to Independence
Using **metal detectors** to support maths activities	C&L M UW	Dispositions Curriculum	Curiosity	Move to Independence
Listening to stories / songs using **storyphones / easi-ears headphones**	C&L UW	Operational Dispositions Curriculum	Cooperation	Move to Independence
Programming with **iPads**	C&L UW	Operational Dispositions Curriculum	Perseverance	Ongoing Support
Reading stories on **iPads**	C&L L UW	Dispositions Curriculum	Independence	Move to Independence

Key: PSE = Personal Social Emotional, P = Physical, C&L = Communication and Language, L = Literacy, M = Mathematics, UW = Understanding the World, EAD = Expressive Arts and Design

Interviewees talked explicitly about three of the areas of learning with technology identified by Plowman, Stevenson, et al. (2012): acquiring operational skills, extending knowledge and understanding of the world, and developing disposition to learn. The fourth area, understanding the role of technology in everyday life, was not mentioned explicitly but it is possible that it could be an element of all of the different uses of technology the respondents mentioned.

This is different to findings from previous research which suggested a more restricted use of technology. These earlier findings suggested that the use of technology was often limited to using computers during free play time, or to focus on operational skills or turn taking (Plowman & McPake, 2013; Plowman & Stephen, 2005; Plowman & Stephen, 2013; Plowman, Stephen, & McPake, 2008; Stephen, 2014).

4.5.3. What are the barriers and enablers to using EdTech?

As previously mentioned (section 3.11), there are different types of barriers and these have been categorised in different ways (Bingimlas, 2009). One approach is to divide them into intrinsic (beliefs, attitudes, confidence) and extrinsic (access, time, training, support) barriers (Blackwell et al., 2014). Ertmer believed that in schools the extrinsic, or second order barriers had been successfully addressed and intrinsic, or first order barriers were now the ‘final frontier’(2005, p. 25).

Another way of thinking about barriers is to divide them into ‘teacher-level’ barriers and ‘school-level’ barriers (Bingimlas, 2009) or micro-level (teacher level), meso-level (school level) or macro-level (system level) barriers (Balanskat et al., 2006). If Ertmer is right I would expect to find that the practitioners were faced with intrinsic, micro / teacher-level barriers rather than meso or macro, extrinsic barriers. In the early years settings visited for this study, this did not seem to be the case.

Most of the barriers the interviewees identified could be categorised as second order / extrinsic barriers:

- Finance: there is a significant cost associated with purchasing and replacing technology. Most practitioners had limited budgets to spend on resources to meet their, and their children’s, needs. The high costs meant that some practitioners worried resources might get damaged and were reluctant to make them available for children to use themselves.

- Access: several settings had resources which were old or in poor condition and it was difficult to buy additional resources. Within school settings, resources often had to be shared with other classes.
- Technical support**:** this was usually provided by internal staff, often the teachers themselves. Two LA schools did have formal technical support but only for a limited time each week; this meant that damaged resources were not fixed quickly.
- Staff confidence and skills: some staff lacked the confidence and knowledge to use technology and were worried they might press the wrong thing and break the equipment. Few early years practitioners received training in the use of technology, other training was seen to be more important e.g. literacy or numeracy.
- Time: staff found it difficult to find time to learn to use resources and to keep up to date with new developments. Pupil/staff ratios meant that it could be hard to find time for staff to work alongside children and support their use of technology. For staff with limited ICT skills, it could take them longer to do things with technology and it could be quicker to do things the way they were used to. Staff with more confidence regarding EdTech did comment on the time they saved by using technology.

When talking about barriers to using EdTech in their setting, with their children, only one person identified an intrinsic/first order barrier. This practitioner, from a school setting, believed that using technology meant that children were less able to sit and listen e.g. at story time. Despite this, she, like all of the other interviewees, saw the value of using technology with her children. They all recognised the impact it could have on children's learning.

[It helps] ... without a shadow of a doubt, [we] couldn't do the reflection without it

When talking about barriers, comments usually referred to the staff or the setting, few barriers related to the children. However, when asked about any concerns they had about using technology with early years children more generally, a number of potential issues were mentioned. Most related to eSafety concerns. Interviewees talked about children accessing inappropriate content or the dangers of publishing videos and photos online. Most felt that eSafety was not a significant concern in their setting where access to technology and the Internet was monitored. They were more concerned about children's use of technology outside of the setting, as parents often did not know about the dangers or have the knowledge needed to put safeguards in place.

Other concerns were the possible impact of technology on children's personal and social skills, though again this was not seen as a problem for their children. It was seen as more of a risk for older children. One interviewee thought that technology could replace existing resources, for example, children would go to technology first rather than looking for information in books.

The interviews suggest that, for these twenty practitioners at least, attitudes are not a barrier to technology use. Lack of training was a barrier, as was a lack of knowledge. One question asked about what resources they would like in an ideal world, some interviewees talked about the need for expertise.

> *My knowledge of technology isn't good, I think technology could make my job so much easier, but my barrier is that I don't know it exists.*

> *[I would like] a technician… who's savvy and knowledgeable about the curriculum ...a very important person… someone to give guidance… who has got the time to research and source the better technology.*

4.5.4. How does the use of EdTech align with pedagogical beliefs?

Blackwell et al. (2013) suggest that beliefs can have a positive effect on the use of technology. Practitioners with positive attitudes towards educational technology, who believe that it will have a positive impact on children's learning, are more likely to use it. The interviewees talked about using technology to support the curriculum but also learning dispositions. Answers to questions about pedagogy within the interviews suggested that these practitioners' beliefs matched those of typical early years practitioners, as described in section 3.8. The activities described in section 4.5.2 show that the use of technology supports this pedagogical approach.

4.6. Limitations

This study involved a small sample and investigated practitioners' beliefs and perceptions. It is not clear how generalisable this snapshot is. The interview questions were deliberately open ended; a large-scale survey approach may have produced a different result.

Details of how the technology was used were self-reported. When possible, I toured the settings which provided some additional evidence. However, it is possible that some interviewees may have been describing what they would like to happen, rather than current practice.

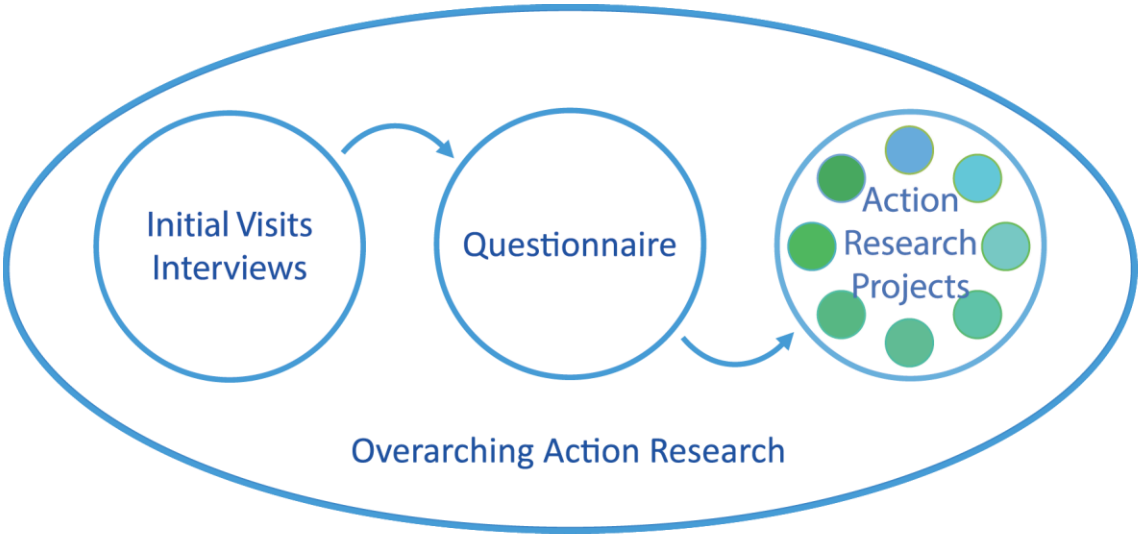
4.7. Summary

This research indicated that technology may be more embedded in early years practice than recent literature suggests. All of the practitioners described a wide range of technologies that they either already had or would like to acquire in the future. Their definition of education technologies was clearly broader than ‘just computers’. While all of the interviewees talked about a wide range of ways they could use technology, it is less clear how much of this is happening in practice. Practice does not always match practitioners reports which can be ‘overstated’ (Mama & Hennessy, 2013) and there were limited opportunities for observation which could have clarified the accuracy of the reports.

Some settings regularly planned interesting uses of technology, but it is possible that the activities practitioners plan may not match the children’s experiences. While practitioners were not concerned about any risks involved when using technology with young children, there are still challenges that need to be addressed to ensure effective integration. These include a lack of funds, time and confidence. Limited access to adequate training and support also remains a challenge.

Cycle One suggests that educational technology is being defined in a much broader way than the literature suggests. Settings have a range of technology. Practitioners had positive attitudes towards EdTech and were able to describe a range of activities that matched their descriptions of their pedagogical beliefs. Cycle Two will examine whether these findings are reflected on a larger scale. It also explores some of the themes which emerged from Cycle One. It started with a literature review focused on rationales for using technology, and practitioner beliefs.

Chapter 5. Cycle Two: Literature Review



Reflections

The visits to the settings in Cycle One indicated that Educational Technology was being used across the curriculum and in line with the interviewee's pedagogical beliefs.

One of the changes from previous research findings is that technology is being used for more than just learning operational skills and developing simple turn taking; it is being used to support a range of learning dispositions and for learning across the curriculum. All of the interviewees had positive attitudes towards technology, but I was interested in exploring further why they thought it was important.

In Cycle Two it would be useful to explore why practitioners believe they should use technology and also their technological and pedagogical beliefs.

5.1. Research Questions

Research Question 1: *What is the relationship between early years practitioners' use of educational technologies and their pedagogical beliefs?*

- What are the pedagogical beliefs of early years practitioners?
- How are early years practitioners using educational technologies to support teaching and learning?

5.2. Rationales

Simply having EdTech available in the EYFS is not enough; if it is to be used effectively, practitioners need to know why it is important (Bolstad, 2004). The Cycle One interviews did not specifically include questions about the interviewees reasons for using EdTech in the EYFS, but this was a theme that emerged from the Cycle One literature review. This second literature review allowed this theme to be explored in more detail.

As previously mentioned, there are some authors who suggest that technology is not appropriate for young children and that they should not be using computers at all (Cordes & Miller, 2000). However, the consensus seems to be that technology is an inherently good thing (Hammond, 2014; Selwyn, Potter, & Cranmer, 2010) and there have been calls for ICT to be introduced 'as early as possible' (BECTA, 2001).

There has been a significant investment in technology in schools, this has been accompanied by strong incentives for schools to use more ICT (BECTA, 2003). While there has not been such a strong drive for the use of technology within the early years (Lindahl & Folkesson, 2012), there is support for the view that ICT has a role in preparing children for school and that children need to be prepared for a future where technology has a central role (Eagle, Manches, O'Malley, Plowman, & Sutherland, 2008; Saçkes, Trundle, & Bell, 2011).

Selwyn, Potter and Cranmer (2010) suggest that the reason technology has not been successfully introduced into education is due to the range of agendas driving its implementation. They identify a number of reasons that have been given for why ICT should be used in primary education:

- There is a need to keep up with the rest of society (p6).
- Children expect to have access to technology in school (p8).

- The public expects schools to use technology. Adults use technology in their daily lives and think children should be able to do this too. Employers expect children to be prepared for their future roles in the workforce (p10).
- The use of technology is required by national policy (p11).

The potential for technology to impact on teaching and learning was not one of the main reasons identified by Selwyn et al (2010), though there are some almost incidental references to teaching and learning within their accounts of the different rationales.

With the exception of teaching and learning, these reasons are closely linked to some of the rationales identified by Hawkridge (1990):

- **Social rationale:** computers pervade societies and schools need to prepare children for life in these societies.
- **Vocational rationale**: children need to learn to use computers as they will need them for their future career.
- **Catalytic rationale**: technology can transform education, either the education system itself, or methods of teaching and learning.
- **Pedagogical rationale**: technology can have a positive impact on teaching and learning.

Hawkridge's social and vocational rationales seem to be very straightforward but the others deserve closer examination.

Catalytic rationale

> *[The] application [of EdTech] has often been mundane; being merely used to reinforce existing educational practices rather than as a catalyst for educational innovation." (Masters & Yelland, 2002, p. 313)*

EdTech is regularly referred to as a 'game changer' (Selwyn, 2016). But there is little evidence that the use of ICT results in a radically different approach to teaching and learning (Hammond, 2014).

Somekh (2003, p. 149) suggests that, given the changes technology has brought to everyday life in the home and workplace, technology provides 'unparalleled opportunities for radical changes in schools and the education system' but that schools have 'proved resistant to reform'. She does recognise that not all changes are radical; they can be evolutionary.

The Organisation for Economic Co-operation and Development only include three rationales in their report (OECD/CERI, 2001); they make no mention of the catalytic rationale. This could suggest that there is little evidence of Somekh's radical change. Evolutionary change seems more likely with technology as a catalyst in the sense of enabling or amplifying changes (Balanskat et al., 2006).

It may be useful to think about what catalytic change would look like. It may relate to teaching and learning and pedagogy but there are other types of change and other issues within education. This is beyond the scope of this research.

Higgins & Moseley (2001, p. 204) describe two possible pedagogical uses of ICT: the first, "retrospective", accommodates an existing curriculum, and the second, "prospective", is forward looking and leads to radical changes in teaching and learning. The latter has tended to capture the imagination of teacher educators supporting the introduction of ICT into education. However, they suggest that teachers implementing the use of computers do so because they believe it fits with their existing pedagogy.

Pedagogical rationale

As this section has shown, the reasons given for using ICT in schools are often not directly related to learning (Selwyn et al., 2010) though some believe this should be the prime focus. The Teaching and Learning Toolkit (Higgins, Kokotsaki, & Coe, 2012) says that educational technology can make a difference, but it is not enough to simply provide access to technology. Practitioners need to explicitly consider how it will support children's learning (Higgins, Kokotsaki, et al., 2012).

The pedagogical rationale refers to the fact that computers can be used to support teaching and learning.

> *The issue is not, however, whether technology should be considered and used in education settings but how and whether it makes a difference in children's learning and development (Parette, Quesenberry, & Blum, 2010, p. 336).*

Early years practitioners work with two to five-year olds in nurseries, schools or preschools. They are committed to providing the best possible education for their pupils and are keen to identify ways to enhance teaching and learning. Educational technologies are one way of doing this (Livingstone, 2012).

Even if, as previously mentioned, technology is seen to have potential for positive impact on learning in the early years (Vaughan & Beers, 2017), simply having technology is not enough. The fact that much of the literature focuses on the amount of technology settings have, or how often it is used is worrying. If this reflects why EdTech is being used it is unlikely that the focus will move on from the social rationale where the technology is in a setting because children are used to seeing it elsewhere.

> *Without an education component, technology cannot reach its full potential for supporting children's learning and development (McManis & Gunnewig, 2012, p. 14).*

Not every use of technology is appropriate or beneficial (Clements & Sarama, 2002), practitioners need to consider how the technology is used (Higgins, Xiao, et al., 2012). A practitioner who has a social rationale will have a reason to have technology in their setting, but a pedagogical rationale may be needed in order for the technology to have value for teaching and learning.

Computers can be seen as catalysts enabling change in education. One example of this would be how technology can support a change from rote learning and teacher centred lessons towards a more open ended, child centred approach. The previous section showed that other interpretations of technology as catalyst are more dramatic.

Rationales for using EdTech in the EYFS

So far, the literature in this section has referred to schools generally. It is possible that the situation is different in the early years. Edwards (2005b) wrote about interviews with twelve early years practitioners who were asked why they used computers in their classrooms. They identified three reasons:

- the children needed to remain up to date with technology,
- the management had decided it was necessary to use a computer,

- the computer would provide an extra experience, not linked to pedagogy or skills but just another thing to do.

She contrasts her findings with a survey conducted by Wood, Willoughby, and Specht (1998). They also identified three reasons for using technology:

- to prepare children for later school experiences,
- to facilitate learning,
- to enhance physical, hand-eye coordination.

While most reasons given for using technology mean it is not being integrated into learning experiences, this research shows that in 1998 some teachers did identify the pedagogical rationale as a reason for using technology. It is worth noting that this was a survey of 75 early childhood directors, only half of whom had a computer on the premises. It is not possible to judge how much technology was being used in these settings and if it was being used to support learning.

This review does not support the claim made by Lindahl and Folkesson (2012, p. 1729) that ‘the main motive for introducing ICT into preschool has been an expectation that it would improve learning and instruction’.

Why are rationales important?

While the evidence examined above is limited, it is perhaps no surprise that references to pedagogical uses of EdTech are limited. Unless practitioners can see why EdTech can support their approach to teaching and learning, technology is likely to remain an add on, something to do as part of free play time (Plowman & McPake, 2013; Plowman & Stephen, 2005; Plowman & Stephen, 2013; Plowman et al., 2008; Stephen, 2014). It is encouraging that the interviewees in Cycle One appear to be moving towards a pedagogical rationale for their use of EdTech.

Tondeur, Van Braak, and Valcke (2007) reviewed national strategies from a range of countries and reported that most reflect the economic or social rationale. These documents refer to why technology is important for the countries involved, not just for educational establishments. An emphasis on technical skills in the curriculum would support these two rationales. They suggest that national curricula in England stresses the pedagogical rationale, though this was before the removal of ICT, which was replaced with Computing in 2014.

Research by Tondeur et al. (2007) showed that the pedagogical rationale was a low priority. Respondents to their survey focused mainly on a skills-based, technical use of technology. They do refer to a comment in the OECD/CERI report which states that there is a ‘growing convergence between the economic, social and educational rationale’ (OECD/CERI, 2001).

Having rationales that practitioners can relate to will be important. A focus on the pedagogical rationale could persuade practitioners to use technology (Watson, 2001). It is, of course, possible to have more than one reason for using technology, but it would be useful to make the pedagogical rationale more explicit.

5.3. Beliefs

Rationales which provide reasons for using technology at the regional or local level are often supported by national policy. Once a rationale has been adopted for using educational technology, the change needs to be implemented by individuals. Practitioners’ personal beliefs have been clearly shown to influence their practice in the classroom (Prestridge, 2017). It is beyond the scope of this thesis to do a comprehensive overview of the complex literature about teacher beliefs (Ertmer, 2005). However, in order to understand how and why teachers use EdTech, it is essential to take their underlying beliefs into consideration (Tondeur, van Braak, Ertmer, & Ottenbreit-Leftwich, 2016).

Ertmer identified a need for research that examined:

> *“the similarities and differences between teachers' pedagogical beliefs and their beliefs about technology” (Ertmer, 2005, p. 36).*

Pedagogical beliefs refer to practitioners’ beliefs about teaching and learning, while technological beliefs should ideally refer to beliefs about how technology enables them to translate those pedagogical beliefs into classroom practice. Technological beliefs relate to if, when and how to use a technological tool (Ertmer, 2005).

Pedagogical beliefs

Early years practitioners tend to have a student-centred, exploratory, open ended approach to teaching and learning (see section 3.8). This can be contrasted with a more teacher-centred, rote learning, behaviourist approach, though categorisation of beliefs is not as simple as this 'bi-polar distinction' suggests (Tondeur et al., 2016). Finding out about practitioners' beliefs can be difficult, as beliefs are not observable. They do not always match actual practice (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Tondeur et al., 2016).

It is important to recognise that computers and other technology can be used in many different ways. They are not associated with a single pedagogical approach, though how they are used does change depending on pedagogy (Tondeur, Hermans, van Braak, & Valcke, 2008).

Technological beliefs

> *unless a teacher holds a positive attitude toward technology, it is not likely that he or she will use it in teaching (Zhao & Frank, 2003, p. 809).*

Until recently, there has been a perception that technology in schools has been used for 'drill and practice' activities, or to broadcast information using audio or video (Goodwin, 2012; Murray & Olcese, 2011; Wang, Kinzie, McGuire, & Pan, 2010). Even now the majority of educational apps are based on 'drill and practice' principles (Papadakis & Kalogiannakis, 2017).

> *There is been an explosive increase in the number of self-proclaimed education apps which are available… in the two most popular online stores (Google Play and App Store)… aim[ed] at the age group below 10 years (Papadakis, Kalogiannakis, & Zaranis, 2018, p. 140).*

The App Store and Google Play have a significant number of educational apps which are classified as suitable for pre-school/early years. However, a recent review of these found that most are designed in line with a 'drill and practice' approach to learning, which is described as 'inappropriate' and not recommended for educational usage (Papadakis et al., 2018). This view is supported by Yelland (2016, p. 125).

Teachers tend to adopt innovations that support their own teaching and learning beliefs (Tondeur et al., 2008). If early years practitioners prefer a flexible, active, exploratory approach to learning, they are likely to consider these ‘drill and practice’ apps to be inappropriate (O'Hara, 2008).

If there is a mismatch between teachers’ pedagogical beliefs and how they believe technology can be used, this could result in teachers either not using technology at all or using it in ineffective ways. However, devices do not dictate pedagogical beliefs. A device can be used in different ways to support a range of approaches to teaching and learning and there are many applications that support the more open, exploratory learning that early years practitioners tend to favour. By including pedagogy in training sessions, practitioners will be more likely to build the knowledge necessary to select appropriate software and activities (Ntuli & Kyei-Blankson, 2011).

Links between pedagogical and technological beliefs

Marcon (1999) found that children perform better in classrooms where there is a single and consistent pedagogical approach; technology use should match practitioners’ beliefs. Practitioners are more likely to see the value of EdTech if they can see how it would support their pedagogical beliefs (Tondeur et al., 2016) and how it can be integrated within appropriate practices (Plowman & Stephen, 2005). Even if practitioners are using technology in ways that fit with their pedagogical beliefs (Lim & Chai, 2008) it is often being used simply to do what the practitioner has always done, without recognising the opportunities the technology offers.

> *Teachers using technology therefore tend to domesticate the application in such a way that it becomes congruent with their prevalent teaching practices while ignoring the affordances the technology offers (Voogt & McKenney, 2016, p. 1).*

The term ‘affordances’ refers to ‘the perceived and actual properties of an object or artefact, those properties that determine just how it could *possibly* be used and how the technology can facilitate or hinder learning of various kinds’ (Carr, 2000, p. 62). It is possible that when practitioners first use a device they may spend more time exploring these affordances and only later start thinking about how the technology can be used to support pedagogy (Higgins et al., 2007).

It seems that the affordances of educational technologies may not have been incorporated into early years settings in a way that supports early years pedagogies. Some technologies are being used in limited ways e.g. for a display or to act as a 'babysitter' (Masoumi, 2015). The research by Masoumi is mainly focused on IWBs, computers and tablets, meaning the affordances of other types of technologies were not even considered.

Does technology change beliefs?

> *"Effectively integrating technology into the curriculum demands effort, time, commitment and sometimes even a change in one's beliefs" (Clements & Swaminathan, 1995).*

Technology has often been linked to the constructivist approach to learning (Burke, Schuck, Aubusson, Kearney, & Frischknecht, 2018; Hammond, 2014). Bonawitz et al. (2011) link constructivism to active exploration and discovery learning which is part of the early years pedagogy I described in section 3.8. Some literature suggests that technology can lead to a certain approach, usually suggesting it results in a move towards a constructivist approach (Hammond, 2014; Ifenthaler & Schweinbenz, 2013).

Some literature suggest that practitioners with a constructivist approach would be more likely to use technology than those with a transmissive, teacher centred-approach (Burke et al., 2018). However, other literature suggests the opposite, that technology can result in a move from more child centred approaches to a more controlled approach (Vincent, 2007) and the Burke study found that IWBs were more likely to be used for transmissive approaches. Some claim that 'traditional beliefs have a negative impact on the classroom use of computers' (Hermans, Tondeur, van Braak, & Valcke, 2008). Yet many traditional uses of technology support a transmissive or 'drill and practice' approach.

This could be the result of a need to be in control in an unfamiliar situation or because EdTech is being used as a substitute for older, more restrictive technologies, rather than in a situation where the practitioner is aware of all of its affordances and can use it in innovative ways.

The available evidence does not convince me that technology will always change practitioners' beliefs towards a constructivist approach. It is possible that introducing a new technology can, however, be a reason to try something new (Matzen & Edmunds, 2007). Technology could be a catalyst for reviewing existing practice. Prestridge describes how a change of practice can lead to a change of beliefs as a result of reflection on the change (2017).

> *... it does not necessarily affect (or even allow) the fundamental change in their pedagogy which is needed to incorporate the integration of new technologies (Beauchamp, 2004, p. 331).*

The above quote from Beauchamp (2004) suggests that for technology to be integrated effectively requires a change in the practitioner's pedagogy. Matzen and Edmunds (2007) suggest that this change does not in fact happen and that teachers use technology in line with their existing pedagogical beliefs; if a practice does not match these beliefs, they will not use the technology. Other people support the view that teachers use technology in ways that support their own beliefs (Niederhauser & Stoddart, 2001) with some suggesting that this is because pedagogical beliefs are more important than how technology is used. Pedagogical beliefs and teaching practices can be seen to be on a higher level of a hierarchy than technology use (Zhao & Cziko, 2001).

Does technology really change beliefs? It is not clear how many of the research projects mentioned above evaluate beliefs rather than practice. It is possible that technology offered opportunities to support beliefs that were already there. Most of the literature that mentions change suggests that technology results in a move to constructivism. This is often presented in a way that suggests that constructivism is the better pedagogy.

I have assumed that technology can support any pedagogical beliefs. What is clear is that technology does not change practice or beliefs on its own, though it can be a catalyst for change. It is possible that participating in research encourages more reflection on practice and provides a supportive environment to change.

Why is it important to consider beliefs?

> *What distinguished highly effective teachers from other teachers was a particular set of coherent beliefs and understandings which underpinned their teaching… (Askew, Brown, Rhodes, Wiliam, & Johnson, 1997, p. 3)*

It is thought that training in the use of Educational Technology is more likely to be effective if it shows how using technology can support pedagogical beliefs (Tondeur et al., 2016). My concern with this is that it implies the technology should come first. Once you identify a useful technology, you look for ways that it can support a practitioner's pedagogy. I believe it is more important to start with what practitioners want to achieve and why, identify an activity that fits with these beliefs and then find an appropriate technology to support this activity.

This is based on my interpretation of 'appropriate use' of EdTech as discussed in section 1.3. Appropriate use refers to whether it meets the needs of the practitioners, as well as the developmental needs of the child.

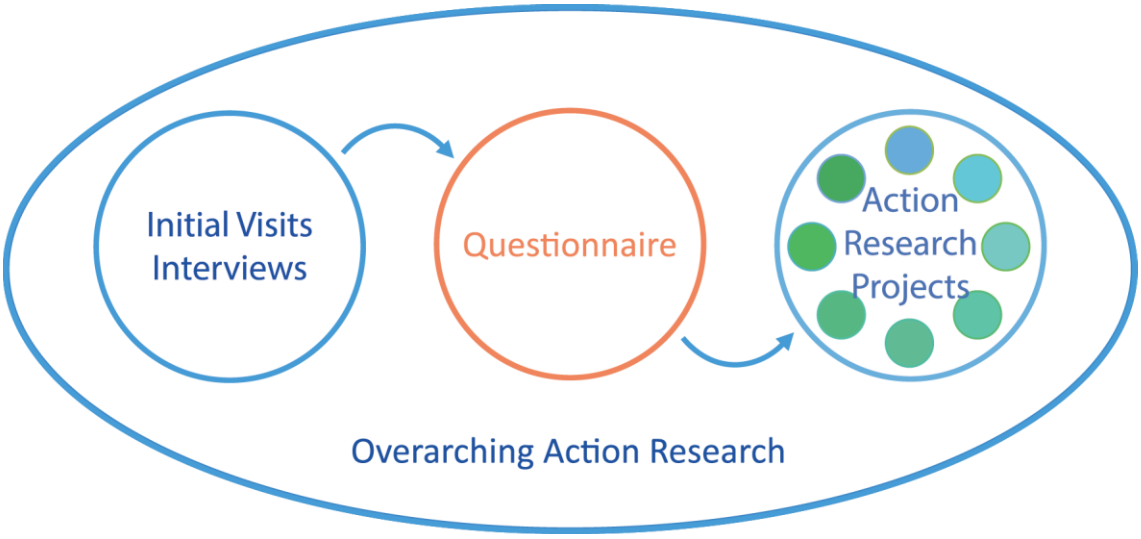
The literature on implementing new technologies will be examined in Chapter 7.

5.4. Summary

This section has considered the different rationales for using EdTech and then looked at personal beliefs. It is likely that there is going to be some crossover between the two. If the national policy favours a particular rationale, this may influence how practitioners think about technology and how it is then used in practice.

There are people who suggest that before making any decisions about EdTech, it is important to ask the "is it worth it?" question. In other words, "does technology enable you to do something you could not do before?" Or "does technology enable you to do something you could do before but better?" (Dawson, 2007, p. 6). In Chapter 7 I will discuss the process of implementing EdTech within educational settings and consider these questions.

Chapter 6. Cycle Two: Questionnaire



Reflections

Much of the literature reports on how much technology is being used and how often, very little appears to report on what the technology is being used for. The interviews in Cycle One went some way towards addressing this but only with a limited sample. There is a need for a larger scale study to address some of the emerging issues in more detail. This would include how technology is being used across the curriculum. Questions are also needed that will help identify EYFS practitioners' pedagogical and technological beliefs.

This section provides an overview of some of the key findings arising from the questionnaire. Other findings were written up and submitted for publication (Jack & Higgins, 2019); a copy of this article is in Appendix C, section B.

6.1. Research Questions

Research Question 1: *What is the relationship between early years practitioners' use of educational technologies and their pedagogical beliefs?*

- What are the pedagogical beliefs of early years practitioners?

- How are early years practitioners using educational technologies to support teaching and learning?

6.2. Methodology

Two questionnaires were adapted for this study. The first focused on technology (Blackwell et al., 2013) and has been discussed in a number of articles and reports (Blackwell et al., 2014; Blackwell, Wartella, Lauricella, & Robb, 2015; Wartella, Blackwell, Lauricella, & Robb, 2013; Wartella, Schomburg, Lauricella, Robb, & Flynn, 2010). The second questionnaire (Kim, 2005) focused on pedagogical beliefs and practices.

Given the rapidly changing technological landscape, changes were made to ensure my questionnaire included questions about up-to-date devices and questions were added to ask how technologies were used. My questionnaire was shared with seven experts from local authorities and schools who provided feedback on the items and functionality.

Blackwell et al. (2013) identified a number of limitations with their research. Some, such as the use of self-reports, are shared by this study. One, the need to consider how the technology is being used, is addressed here. As well as finding out what technology is available, this research looks at how practitioners are using the technology they have. Rather than simply asking which areas of the curriculum are being supported, respondents were also asked about the types of activities children were experiencing and whether adults were working with them to extend their experience beyond basic exploration.

The questionnaire was made available online through Bristol Online Surveys (BOS) (now Online Surveys). The majority of respondents (302) accessed this version and the data was exported into IBM SPSS Statistics 22. Thirty-three respondents returned paper copies. Data from the paper versions were transferred into SPSS, which was used for the analysis of the quantitative questions. Qualitative responses were exported into NVivo 10 for thematic analysis.

6.3. Sample

A convenience sampling method was used to identify participants. Information about the questionnaire was sent to existing contacts, educational technology advisors and early years advisors, who were asked to share it with their contacts. I also contacted some professional groups via email or social media and some were able to share information about my research with members of their networks. I also did internet searches to find early years settings listed on publicly available school directories and contacted these settings directly. Most communication was through email or social media. As the survey was available online, there may have been a bias in the sample, with responses coming from people who are comfortable using technology (Tymms, 2012). Paper versions were available on request and posted to a number of settings.

Full details about the respondents and their responses can be found in Appendix C, section A. 50.7% of the 335 responses came from early years settings within schools, 27.2% from private nurseries, 10.4% were from childminders. The rest were from preschools or playgroups (4.2%), Local Authority (LA) nursery schools (3.6%), other nurseries (1.8%) and children's centres (0.9%). 1.2% did not say where they came from.

75.6% of the respondents who worked in schools, worked in Local Authority (LA) schools, 18.5% worked in academies, which are publicly funded independent schools, 5.4% in independent schools, which charge fees and 0.6% in free schools which are funded by the government but are not run by the local council, giving them more control than LA schools (Gov.uk, 2018). This is representative of the types of schools in the UK.

The vast majority of respondents, 96.4%, came from England. 1.8% from Scotland, 0.9% Northern Ireland, 0.3% Wales and 2 respondents, 0.6%, came from outside of the UK. Most respondents were teachers (48.3%) or head teachers/managers (37.2%).

6.4. Ethics

This was an opt in study, the questionnaire was available online and people could choose whether to complete it or not; they could also stop at any time. Information about the research was provided at the start of the questionnaire (Appendix B).

As I discussed in section 6.3, initial invitations were sent to existing contacts who were asked to share them with their networks. A small minority of contacts responded to say this would not fit with their communications policy. Other contacts were identified by online searches of public databases, which yielded organisational emails. Invitations asking people to participate were only sent once.

As completion required a significant time commitment, an incentive was offered, respondents were able to choose to be entered into a draw for a £30 voucher. This was the only time personal details were collected and these were stored separately from the data, which was exported from the online service provider (Bristol Online Surveys) for analysis. The winner of the prize draw was selected at random once the data collection phase had ended. The BERA guidelines for the use of incentives were followed (British Educational Research Association, 2018).

A number of respondents asked for paper versions of the questionnaire. These were completed anonymously, and the data added to the spreadsheet produced by BOS.

6.5. Findings

This section provides an overview of the findings that are most relevant for this thesis. The questionnaire provided additional data, some of which was written up and submitted for publication (Jack & Higgins, 2019). A copy of the article is in Appendix C, section B. An overview of the findings for each of the questions are in Appendix C, section A.

6.5.1. What are practitioners' pedagogical beliefs?

The questionnaire asked the respondents about their beliefs and their practices. Factor analysis of the responses to the questions about beliefs (Appendix C, Question 24) showed that these could be allocated to two main groups. Some questions identified practitioners with a child-centred pedagogy, others identified a more 'traditional', teacher centred, approach to teaching and learning.

Items that were related to the child-centred pedagogy included:

- Establish a collaborative partnership/relationship with parents
- Provide opportunities for developing social skills

- Activities are responsive to individual differences in children's levels of development

Items that were related to a more teacher-centred pedagogy included:

- Children spend extended time working individually at desks
- Workbooks and/or worksheets are common
- A focus on teaching children isolated skills by using repetition or recitation

For the questions on practice, three factors were identified (see Appendix C, Question 26): I categorised these as formal, exploratory and purposeful.

Items that were related to the formal category included:

- Use flashcards
- Practice handwriting on lines
- Participate in whole-class teacher-directed instruction

Items that were related to the exploratory category included:

- Play with games, puzzles, and construction materials
- Select from a variety of learning areas and projects
- Experiment with writing by drawing, copying, and using their own invented spelling

Items that were related to the purposeful category included:

- Reflect on work they did earlier in the day/ week/term
- Plan their own activities
- Solve real maths problems using real objects in the classroom environment

The responses suggest that the practitioners were more likely to have child centred beliefs and to provide more exploratory activities than formal activities, but there were practitioners who fell into each category.

6.5.2. What EdTech do practitioners have access to?

Question five asked respondents to indicate what educational technology they had access to. While in the interviews this question had been open ended, in the questionnaire the respondents were given a list of types of educational technology. They also the option to identify devices that were not on the list.

All respondents had access to at least one device, with some having twenty or more, see Figure 7. As in Cycle One, educational technology is more than just computers, IWBs and tablets, though this time the definition was suggested by the questionnaire rather than the respondents.

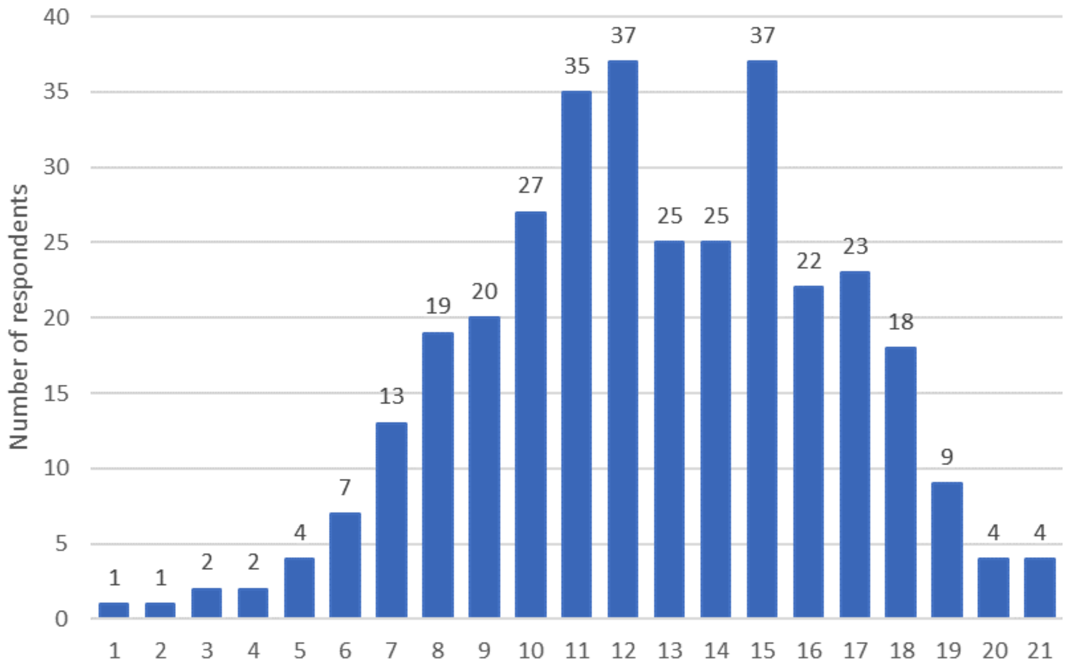


Figure 7: Number of devices available in the interviewees' settings

Blackwell et al. (2013), described technology as universal if 75% of respondents could access it and non-universal if fewer than 30% had access to it. This definition was used to analyse the responses to this questionnaire, as shown in Table 8. Some comparisons can be made with the original findings.

Eight technologies can be classified as universal: Internet access, Role play, Digital cameras, Audio players, Laptops, Programmable toys, Tablets and Desktops.

The availability of desktops, laptops, and digital cameras is similar to the Blackwell study, but the number of televisions is very different, 79% in 2013 and only 37% in this study. Similarly, there is a significant difference when it comes to tablets. In the 2013 study, only 28% had access; in this study, there is universal access, with 79.3% having access.

Having a technology does not necessarily mean it is being used. There are still some technologies, particularly non-universal technologies, where nearly a third of practitioners (over 30%) did not use them even when they had access. This was the case with visualisers, metal detectors and eReaders. However, this does not necessarily mean that they were not considered valuable. For example, 46.1% of settings that did not have metal detectors said that they would like to have them; for eReaders it was 30% and visualisers 29.4%.

Table 8: Universal and Non-Universal Technology

		All	*Blackwell (2013)*
Universal - over 75%	Internet access	96.3	-
	Role play	92.5	-
	Digital camera	91.0	*92*
	Audio player	82.9	*21 (iPods / MP3)*
	Laptops	82.3	*See desktops*
	Programmable toys	81.5	-
	Tablets	79.3	*28*
	Desktops	78.0	*83 (laptop / desktop)*
	Remote control cars	64.6	-
	Audio recorder	62.6	-
	IWB	62.4	-
	Music	61.1	-
	Video camera	60.1	-
	Radio	50.6	-
	Mobile Phone	45.9	-
	Walkie talkie	39.3	-
	Video player	37.9	*79 (TV/DVD)*
	TV	37.0	*See video player*
	Microscope	33.0	-
	Gaming devices	30.6	*15 (iPod Touch)*
Non- universal - less than 30%	Visualiser	24.7	-
	Metal detector	18.5	-
	eReader	13.1	*15*

Respondents who did not have access to a particular resource were able to indicate if they thought it was 'not appropriate' for their children. Not everyone agreed about the appropriateness of some devices. For example, nearly three-quarters (71%) of respondents who did not have a TV in their setting thought it would not be appropriate to have one, however, a small number (5%) indicated they wanted a TV. For gaming devices, 74% of respondents without them thought they were inappropriate, but 9% wanted one. For microscopes, 38% thought they were not appropriate but 48% wanted them, for metal detectors it was 39% and 44% respectively. Of those respondents who did have these devices, some were using them every day. These differences may indicate different understandings of how these devices can support learning.

Having a device does not necessarily mean it is usable. Respondents were able to say whether a particular device was broken and whether they wanted it to be repaired or had decided they did not need it. The percentage of devices that were broken was low, less than 5% for most types of devices. Those that were over 5% are shown in Table 9. The most common broken devices were metal detectors (14.29%) and walkie talkies (18.40%). In most cases respondents wanted broken devices to be fixed.

Table 9: What percentage of each type of device was broken?

Devices	Broken - needs fixing	Broken - not needed	Total broken
Visualiser	2.70%	2.70%	5.41%
Music	4.59%	1.53%	6.12%
Audio Recorder	5.98%	0.54%	6.52%
TV	2.56%	5.13%	7.69%
Remote Controlled Car	7.77%	0.97%	8.74%
Video Player	3.64%	5.45%	9.09%
Metal Detector	7.14%	7.14%	14.29%
Walkie Talkie	16.00%	2.40%	18.40%

6.5.3. Why is EdTech being used?

Rationales were not explicitly mentioned in the questionnaire; however, it was possible to gain an indication of respondents' views through the analysis of their qualitative responses. NVivo was used to analyse these responses using the process which was described in section 4.2.

Respondents were asked about their attitudes towards educational technology and for an explanation of these attitudes. Many respondents gave explanations corresponding to one of Hawkridge's (1990) rationales (see section 5.2).

Most of the respondents with a rationale had a social rationale (see Table 10). They use technology because it is everywhere in society and they thought their setting should reflect this.

Table 10: Rationales for using EdTech

Rationale	N	%
Social	110	56.70%
Vocational	4	2.06%
Pedagogical	80	41.24%
Catalytic	0	0.00%
	194	100.00%

The next most common rationale was the pedagogical rationale. The pedagogical rationale is not explicit in the current Statutory Framework handbook in England (Department for Education, 2014). Without a curriculum which emphasises the use of EdTech to support teaching and learning, practitioners may have little reason to use the technology they have to support their pedagogy. For educational technologies to have more of an impact on teaching and learning, curriculum documentation may need to be reviewed.

The greater focus on a social rationale may have resulted in a change of culture and embedding of technologies in settings, leading to a sector which is now ready to focus on the pedagogical rationale in both policy and practice. This could result in the embedded technology enhancing teaching and learning.

6.5.4. What is EdTech being used for?

Table 11: How EdTech is being used by children

Activity	N	Mean	Mode
Listen to stories / music	319	2.06	1
Practice literacy or numeracy	283	2.17	1
Stimulus material	287	2.29	1
Open ended programs	274	2.56	1
Celebrate achievements	245	2.67	1
Taking Photos	301	2.85	5
Search for information	243	3.04	5

Support SEN	229	3.05	5
Supporting Reflection	225	3.12	5
Show how to use	251	3.58	5
Take videos	207	3.77	5

1= daily, 2= 2-4 x a week, 3= weekly, 4 = monthly, 5 = occasionally

Table 11 shows how often children are using technology for different types of activities. The Modes indicate that one group of activities happened much more often than the other. Listen to stories/music, Practice literacy or numeracy, Stimulus material, Open ended programs, Celebrate achievements all have a mode of 1. This suggests that they are being used daily. The other activities all have a mode of 5, suggesting that they are used only occasionally. However, the means suggest that there may be less of a difference with all activities happening regularly.

Table 12: Characteristics of effective teaching and learning supported by EdTech

Characteristics of effective teaching and learning	N	Mean	Mode
Active Learning	325	2.2	2
Playing and Exploring	328	2.3	2
Creating and Thinking Creatively	322	2.3	2

1 = extensively, 2 = regularly, 3 = occasionally, 4 = not used

Table 13: Areas of learning and development supported by EdTech

Areas of learning and development	N	Mean	Mode
Literacy	328	2.1	2
Mathematics	329	2.1	2
Understanding the World	330	2.2	2
Communication and Language	325	2.2	2
Expressive Arts and Design	326	2.6	3
Personal, Social, Emotional	325	2.6	3
Physical Development	323	2.8	3

(black=prime area, red=specific area)

Table 14: Adult role in the use of EdTech

Adult role	N	Mean	Mode	SD	Range
Adult initiated – large groups / whole class	323	2.3	2	1.02	3
Child initiated – no adult support	330	2.3	2	0.87	3
Child initiated – with adult support	323	2.3	2	0.76	3
Adult initiated – 1 or 2 children	330	2.4	3	0.73	3
Adult initiated – small groups	331	2.5	3	0.74	3

Table 12 and Table 13 show that technology is regularly being used to support all aspects of effective teaching and learning, and across most of the areas of learning and development see section 3.7.

Table 14 shows that adults regularly give the children help with technology. The findings suggest that adults regularly provide support to children who are using technology, but it is not possible to say what this support consists of. It appears that adults are more likely to support child-initiated activities than those they have initiated themselves.

Technology is being used across the curriculum and responses suggest that children are using it in open and exploratory ways, supporting the usual pedagogical approach found in early years. This indicates that there has been a move away from using technology in free play, or to teach children how to operate devices.

6.5.5. Barriers and enablers

Practitioners were asked which factors affected their use of EdTech. This enabled me to identify barriers and enablers.

Table 15: Influencers of use

Influencers	N	Mean	Mode
Curriculum requirements	331	1.53	1.00
Children's ability to use educational technologies	329	1.55	1.00
Personal ability to use educational technologies	330	1.61	1.00
Personal confidence	331	1.63	1.00
Attitudes of senior leaders	330	1.67	2.00
The amount of equipment available	331	1.71	1.00

Personal teaching and learning philosophies	330	1.71	2.00
Attitudes of colleagues	330	1.75	2.00
The amount of time available	332	1.83	2.00
Parental attitudes to technology	329	1.86	2.00
Children's age(s)	330	1.86	2.00
eSafety Issues	331	1.88	2.00
Training and support available	331	1.88	2.00
Technical support	330	2.03	2.00
Finance available	330	2.16	3.00

1 = encourages, 2 = no difference, 3 = discourages

Only finance is seen as a barrier to using technology. Enablers are curriculum requirements, the children's ability to use technology, practitioner confidence and the amount of equipment available, see Table 15.

Curriculum

The findings suggest that one of the key drivers for the use of EdTech was the curriculum. Development Matters currently includes examples of how EdTech can be used across the whole curriculum in a range of different ways. The early years curriculum currently refers to the need for children to "recognise that a range of technology is used in places such as homes and schools" which could be interpreted as a focus on the social rationale. References to teaching and learning, the pedagogical rationale, are not included in the Statutory Framework handbook (Department for Education, 2014). It is possible that for educational technologies to have more of an impact on teaching and learning, the documentation should be reviewed. If curriculum requirements are one of the main reasons for practitioners to use technology, it is concerning that changes appear to include the removal of technology from any aspect of the curriculum (see section 3.7).

Training

Practitioners in settings were more likely than childminders to feel they had received enough training, see Table 16.

Table 16: Access to training

Training	Childminder	Setting	All
Enough	25.71%	46.28%	44.11%
Some	20.00%	27.03%	26.28%
None	54.29%	26.69%	29.61%

However, almost 66% of all respondents felt that they had not had enough training and 73.6% of respondents wanted to access more training in future.

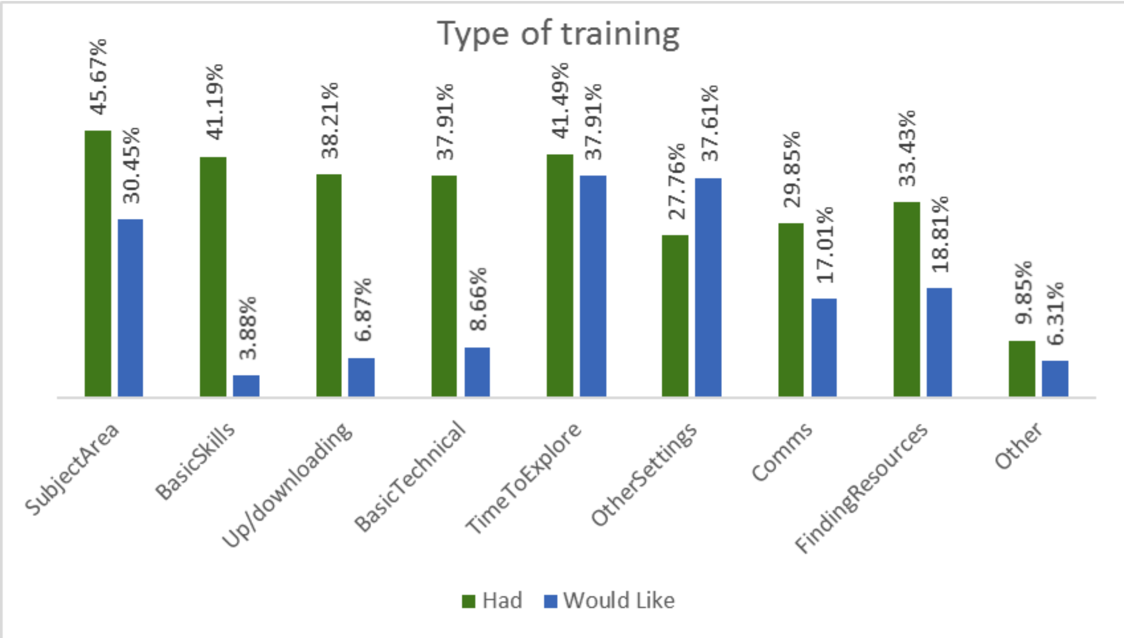


Figure 8: Type of training accessed/wanted by interviewees

Figure 8 shows the type of training respondents had previously had access to, and what they would like to have in the future.

The training that they would find most useful was:

- Time to explore new and different technologies
- Access to information about how other settings were using technology successfully
- Support with using technology in specific areas of the curriculum

Training in basic skills and technical skills appears to be less desirable than other types of training. It is worth noting that while a significant proportion of respondents had received training on how to operate devices in the past, few wanted such training in future. Plowman (2016) suggests that operational approaches are the least appropriate way to use technology; this research indicates that there appears to be a shift away from this approach for both children and practitioners.

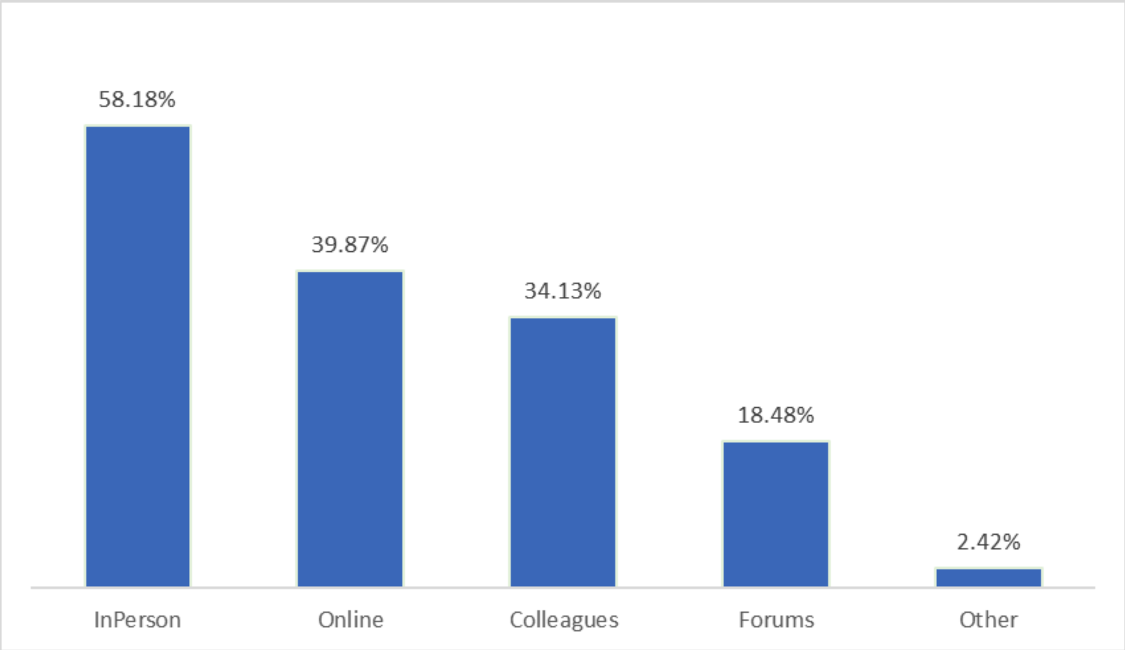


Figure 9: Respondents' preferred training delivery method

Most people who wanted more training wanted face to face training (Figure 9). Online training and support from colleagues within their own setting were also popular. Almost 20% thought support through online forums would also be useful.

Attitudes towards EdTech

Practitioner confidence was high. Nearly all practitioners were confident about using technology for personal use (97.9%), to support their role as a practitioner (96.4%) and to support children's learning (94.5%).

Respondents were asked about their attitude towards technology in the early years. As Figure 10 shows 52% thought it was essential, 28.7% that it was necessary to support the curriculum, 15.4% that it was nice to have and 1.2% that it was not appropriate

It might have been expected that respondents who describe technology in the early years as 'not appropriate' would use technology less often than other groups. However, for most devices, it was the group that describes technology as 'nice to have' that use it least often. Examples of this are shown in Figure 11.

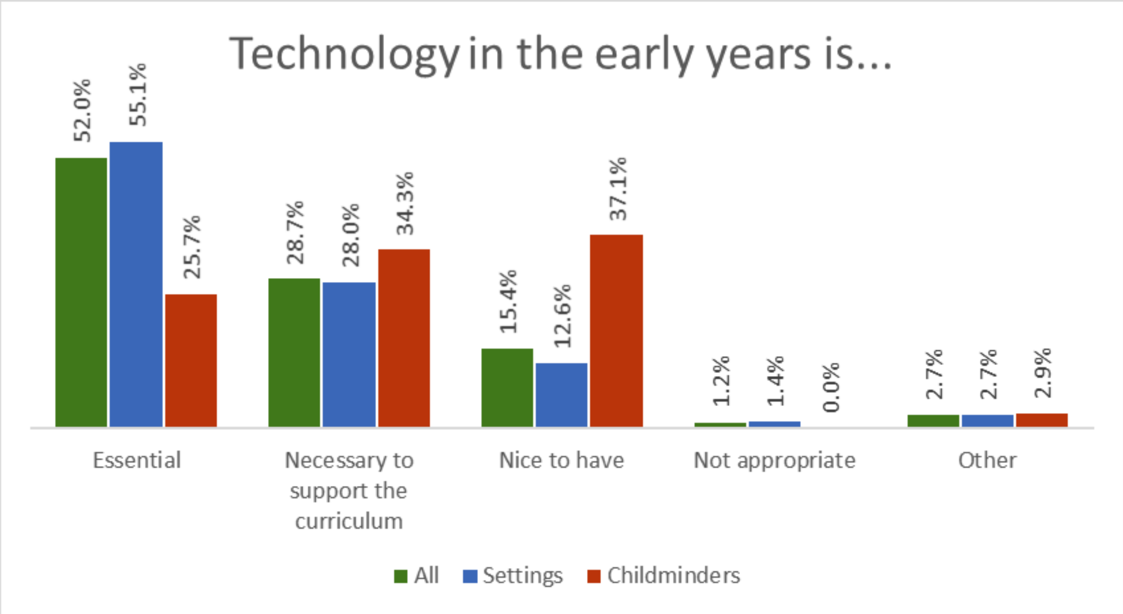


Figure 10: Interviewee's attitudes towards EdTech

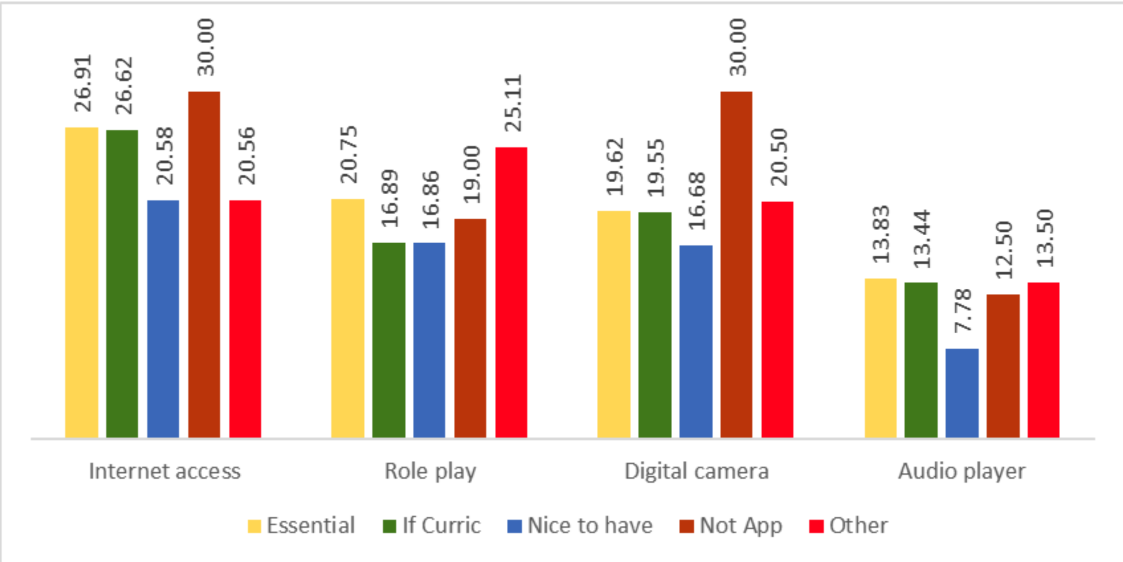


Figure 11: How often is a device used by an interviewee (depending on attitude)?

When asked to explain their attitudes a number of key themes emerged, these are shown in Table 17 (see Question 16 in Appendix C for more details).

Table 17: Common themes in practitioner attitudes towards EdTech

Themes emerging from practitioners' attitudes towards EdTech	N = 401
Technology is everywhere	72
Technology has a positive impact on learning	50
There is a need for balance	40
It depends on the activity or device	37
Children need technological knowledge for the future	36
Technology can have a negative impact	35
Other things are more important than technology	33
Home access	31
Need to focus on the purpose	18
Technology is needed to support the curriculum	11
Reference to their personal feeling	10
Children need to learn how to be safe	10
Technology is not necessary	7
Rate of change	4
Focus on the child	4
Children can learn to use technology later	3

We live in a world where technology underpins many aspects of life. Children need to feel confident to use technology, and learn how it can enhance life skills, from an early age.

The most common answers referred to the fact that children are surrounded by technology, so they should be using it from an early age (the social rationale).

Many technological items encourage huge amounts of problem solving for children and provide opportunities to develop speech and language skills.

The next most common theme related to the fact that technology can enhance children's learning (the pedagogical rationale). Answers referred to a range of areas technology could help with, including speech and language development, deeper learning, fine motor skills, problem solving, joy of learning, curiosity and social skills.

Children should use all different resources to learn, technology has its place as does a child's imagination and use of everyday objects.

Children should learn about technology, but also need old school play and interaction too.

Many answers indicated that, while technology was important and necessary in early years settings, it was just one approach that needed to be part of a balanced curriculum.

The children behave better without technology in the setting

They don't know how to play or socialise! They suffer from too much screen use and lack of imaginative play.

Not all attitudes were positive; a significant number of people said that technology was less important than other activities or that it could have a negative impact on other important areas of development.

Some of the answers could be used to support either more use of technology or less use. For example, respondents' answers referred to how much technology children had at home. This could be a reason not to have technology in the setting, because it could not compete with home or because children have too much technology at home. Alternatively, it could be a reason to use technology more, because the setting should reflect the home or because children had little access at home and the setting needed to make up for this.

It appears that attitudes are positive and educational technologies are being used in more educationally appropriate ways. However, this does not necessarily mean they are having a positive impact on learning. The majority of respondents indicated that they believed it was important to use technology, because children were surrounded by it in society. Fewer suggested it was because of its pedagogical value. Future research could address this issue more explicitly and explore whether the embedding of educational technologies in the early years results in a move towards a more pedagogical rationale.

6.6. Limitations

Given the self-reporting nature of questionnaires, it is not possible to know if practitioners are reporting what is actually happening in practice. They may be describing what they believe is an ideal way of using technology. Even if this is the case, the findings suggest that practitioners are more aware of a range of possible uses for technology than they were in the past and these uses can support teaching and learning.

I asked local respondents if they would be willing to invite me to visit their setting. This was an opportunity for me to see what was happening in practice. They were all using technology in pedagogically appropriate ways, but it was only possible to visit three practitioners. This group was self-selecting so there may have been a bias toward practitioners who were using EdTech more appropriately.

Respondents came from different types of settings and some worked as childminders. It was possible to identify some differences between these groups, but this is an area that would benefit from future research. It is important to consider the reasons for these differences. As well as differences in funding and resources, it may be due to the level of resistance found in different settings; there may be differences in how much their curricula/policies allow for flexibility in the use of technology. Access to devices is not the only issue when considering resources; some settings will have more time and funding available for staff to access training.

6.7. Summary

While attitudes appear to be more positive and educational technologies are being used in more educationally appropriate ways, this does not necessarily mean they are having a positive impact on learning. Most respondents indicated that they believed it was important to use technology because children were surrounded by it in society. Fewer suggested it was because was of its pedagogical value.

Of the 194 respondents who mentioned rationales, the majority, 56.7% gave answers that suggested the social rationale, indicating that they believed it was important to use technology because children were surrounded by it in society. Fewer, 41.2% referred to the pedagogical rationale and 2.1% to the vocational rationale. No one referred to the catalytic rationale.

Future research could address this issue more explicitly and explore whether the embedding of educational technologies in the early years results in a move towards a more pedagogical rationale.

The pedagogical rationale is not explicit in the Statutory Framework handbook in England (Department for Education, 2014). It is possible that for educational technologies to have more of an impact on teaching and learning curriculum documentation should address this.

Vaughan and Beers (2017) suggest that attitudes towards technology, for example beliefs that technology is beneficial, are causing technology to be seen more often in early years settings. This raises interesting questions. Which comes first, the technology or the belief? Has the physical presence of the technology resulted in practitioners' beliefs, and the ways that they use the technology, becoming more positive? Or are these beliefs being influenced by increased cultural embedding of educational technologies?

Other findings suggest that educational technologies are being used in more educationally appropriate ways than they were in the past. Rather than 'drill and practice' types of activities, children were using technology in much more creative ways. It is not clear if this change is a result of technology changing beliefs or technology allowing practitioners to put existing beliefs into practice.

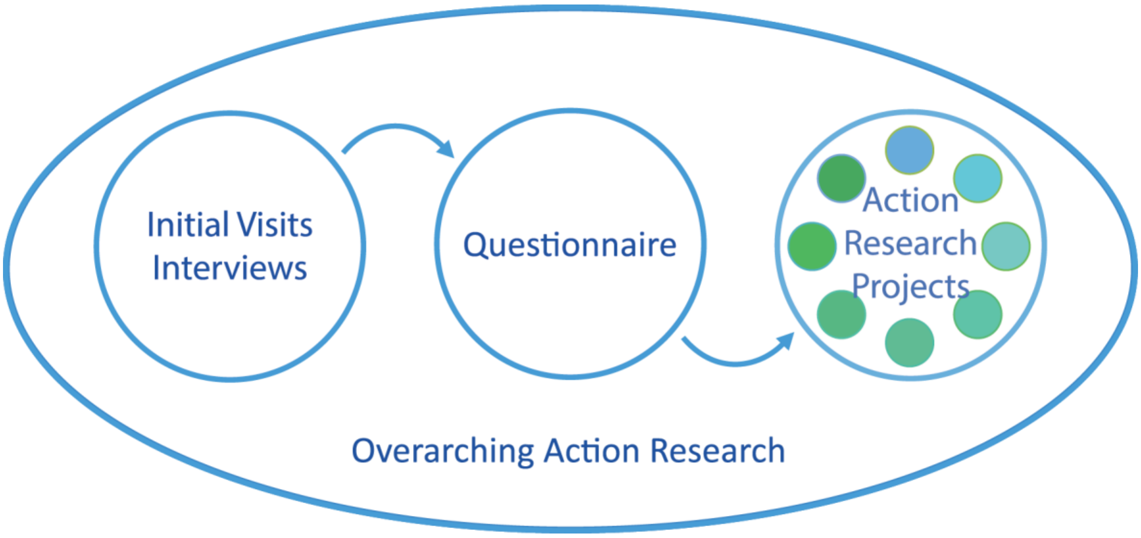
The findings suggest that technology is now physically embedded in early years education and that it is being used in what are considered more pedagogically appropriate ways. Attitudes towards technology are generally positive and it is being used even when practitioners' own beliefs about it may be more negative. This could indicate a change in culture. It seems that educational technologies are physically embedded across the respondents' settings. There are indications that such technologies are becoming culturally embedded too.

The ways technology is being used are self-reported, so it is possible that practice may be different; however, the fact that there is a better understanding of the possibilities is a positive first step. Future research could address these issues further and explore whether the embedding of educational technologies in the early years results in a move towards a more pedagogical rationale.

Hatzigianni (2017) suggests that Brooker's opinion (2003), that early years settings were using technology in exciting and appropriate ways, meant that they could lead the way in using technology. They could show other educators how technology can be used to positively impact on teaching and learning. If technology is starting to be culturally embedded in the early years, it will be interesting to see how this, in turn, influences what is happening in other educational settings.

It is important to recognise that comparisons are being made with research conducted in the US. The international picture is diverse. Research conducted in Kuwait, for example, found that digital cameras were not being used (Aldhafeeri et al., 2016). By contrast in this research, with most respondents coming from England, they are one of the most common devices. Comparisons should be treated with caution and it would be useful to repeat the study across the UK to see if the findings are replicated. While this is a larger scale project than the initial interviews, it is still a relatively small sample. Follow up research with a larger sample and supported by observations would be valuable.

Chapter 7. Cycle Three: Literature Review



Reflections

Simply adding technology to a setting does not automatically result in enhanced learning, so what does make the difference? What does the literature say about the effective implementation of technology?

In the review of rationales, one of the common themes in the literature was that technology can be a catalyst resulting in significant change in the educational system itself. Is transformation an appropriate goal?

There are many theories that describe how technology can be implemented. What can we learn from these?

7.1. Research Questions

Research Question 2: *How can early years practitioners be helped to integrate educational technologies into their practice in a way that supports their pedagogical beliefs?*

- How would early years practitioners like to use educational technologies?

- Is action research an appropriate route to enable early years practitioners to reflect on pedagogy and improve their use of technology?

When exploring how educational technologies are implemented, another question needs to be answered:

- How does the practitioners' use and understanding of technology relate to current theories of educational technology implementation?

7.2. Implementing Technology

Change is a key element of action research. Alongside his work on action research, Lewin is also seen as 'the founding father of change management' (Cummings, Bridgman, & Brown, 2016). It has been suggested that the three steps of change he identified, as shown in Figure 12, underpin all theories of change.

Figure 12: Lewin's three steps of change

However, there are doubts about whether Lewin actually presented such a simplistic, linear model. He would be more likely to see the world as changing and dynamic and to have preferred the cyclical nature of action research (Cummings et al., 2016).

One possible reason for a lack of effective implementation of educational technologies is the lack of a theoretical framework (Tzavara, Komis, & Karsenti, 2018). This section provides an overview of some of the frameworks that have been proposed. It questions whether the problem is a lack of a framework or the fact that there are number of frameworks that cover different elements, but which do not add up to a coherent whole. The aim is to evaluate whether these frameworks can be successful, with the key criterion of success being whether it leads to sustained change. I will consider whether training can result in increased knowledge and a change in practice, or if an action research approach is more likely to result in support of practitioners' pedagogical approaches and to see technology used consistently over time.

This is not an exhaustive review of all models of technology implementation, but a look at the ones that are regularly referred to in literature and commonly used in training. They all have strengths and weaknesses and there is limited research about connections between the different models (Chen & Jang, 2014). In Chapter 11 these frameworks are reviewed, and a simplified framework is proposed for implementing educational technology in the early years.

These frameworks refer to different levels of implementation. In section 4.5.3, I described how barriers can be divided into teacher-level and school-level barriers (Bingimlas, 2009) or micro-level (teacher level), meso-level (school level) or macro-level (system level) barriers (Balanskat et al., 2006). These distinctions can also be applied to theoretical frameworks about technology implementation. Some frameworks relate to a strategic approach of changing the infrastructure or rolling out new hardware or software. While this is often led at the meso/school level, the macro/national policy level can also have a significant impact here. Once the technology is in place and the focus is on how it is used to support teaching and learning, the focus often shifts to the micro level of how practitioners use it, though again there can be a significant meso / school level influence here.

The following section explores my interpretation of how the different models fit within these different levels. This is likely to be simpler than the reality would be; some models could be seen to fit within more than one level.

7.2.1. Macro Level

Diffusion of Innovations

In Diffusion of Innovations Rogers (1995) considers how innovations move through a population, how a new device or approach can spread. He is not looking at how individuals adopt technology but at the way they are taken up by society (Ifenthaler & Schweinbenz, 2013). Rogers identifies five types of people who adopt innovations (Figure 13):

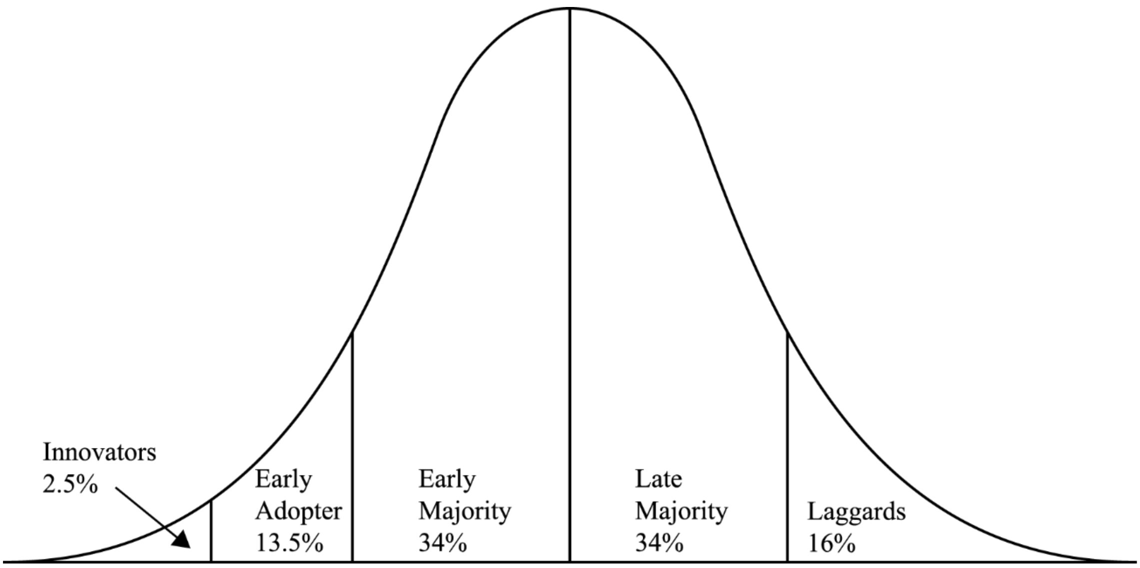


Figure 13: Adopter Categorisation from Rogers (1995)

- **Innovators** have the resources and knowledge to be the first to adopt a new innovation, even if they are not sure about what the benefits will be.
- **Early adopters** are the ones other people look to, they evaluate new innovations and can act as role models.
- The **early majority** deliberate for some time before deciding to implement a new technology. They want to use new technology but do not want to be the first to do so.
- The **late majority** are more sceptical as they may not have many resources, they want to know what the benefits will be before they start to use a new technology.
- **Laggards** tend to make their decisions based on what has worked in the past. They adopt new innovations only when their environment drives them to and when they are sure it will not fail.

These categories are not hierarchical and there is no recommendation that all people should become innovators. The term Laggard should not necessarily be seen as a negative. There may be reasons for being a laggard which can be compared to the barriers identified earlier: lack of time, lack of skills or knowledge, financial costs, lack of resources, reliability of the technology (Compton & Almpanis, 2018). The benefit of this approach is that it highlights the type of support that people may need when technology is being introduced into educational settings.

Having people that fit into the different categories can be important. Without early adopters and innovators, the likelihood of technology being adopted by other teachers will be low (Aldunate & Nussbaum, 2013). This could have consequences for early years settings where staff often have less experience and confidence and where new innovations are not easily adopted due to resourcing problems. Innovators and early adopters may need to come from outside the setting which raises issues of how their practice can be shared. The roles of early adopters and innovators will be taken by different people at different times. An early adopter of one innovation may not be an early adopter of another depending on their goals (Phillips, 2015).

Rogers (1995) identified five attributes that will impact on whether new ideas are adopted:

- **Relative advantage**: is the innovation better than what came before?
- **Compatibility**: will my existing values, knowledge and experience help me to implement the new idea?
- **Complexity**: is it easy to understand and use the new idea?
- **Trialability**: is it easy to try it out?
- **Observability**: will success be visible to others?

Again, these questions may be best answered by looking outside of the immediate setting. At the very least there is a need for opportunities to share ideas and experiences between colleagues within a setting.

Edwards (2013) suggests that the reason technology is not being integrated into early years settings is that practitioners do not understand how to use it. There is a need for more professional development about using technologies, and for support to provide opportunities to use the technology. She suggests that the most effective way of practitioners implementing new technology is for it to be seen as building on existing practice.

Rogers (1995) identifies five stages in implementing innovations (Figure 14).

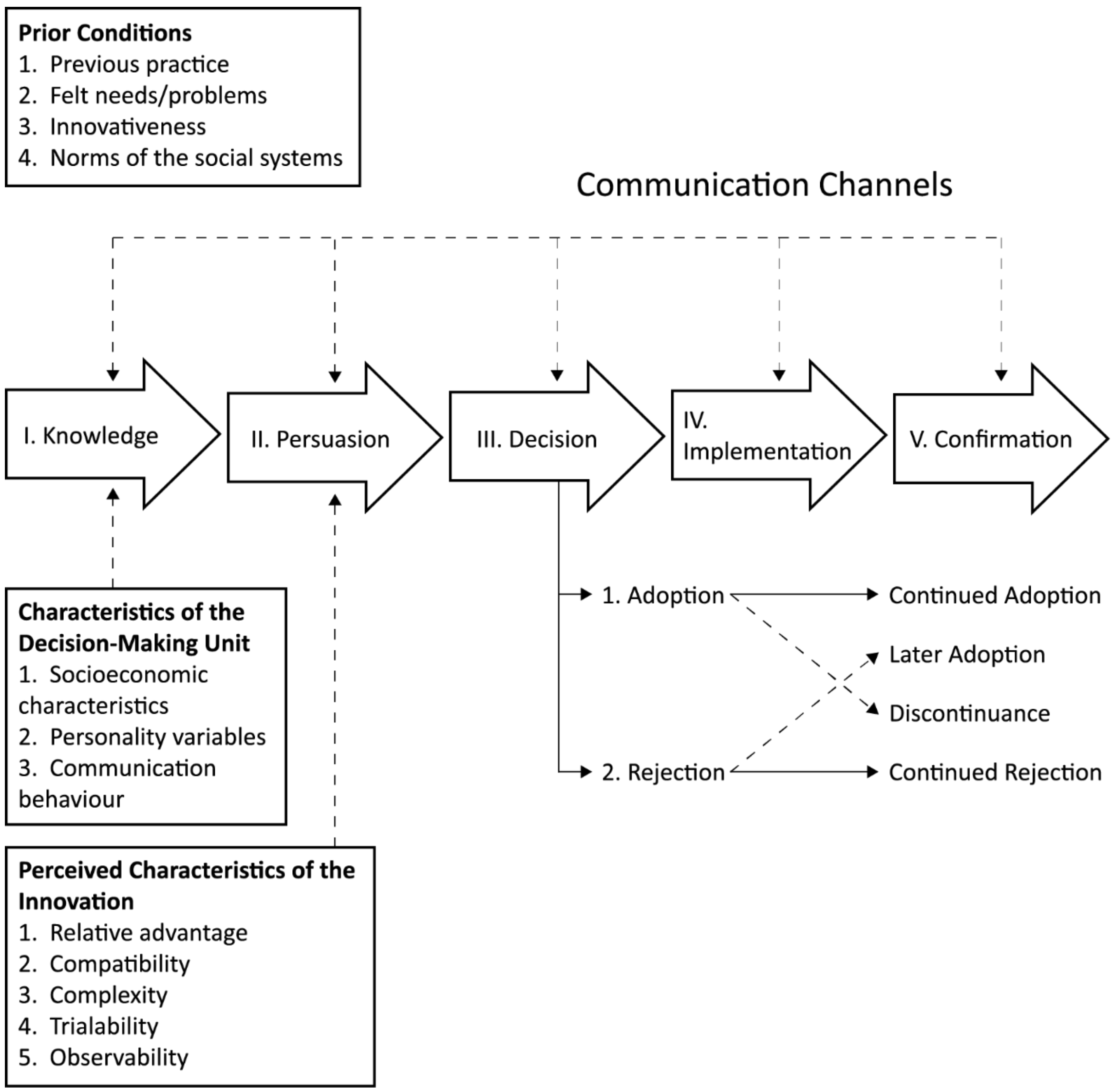


Figure 14: Five stages in the innovation process from Rogers (1995, p163)

- **Knowledge:** practitioners learn about the innovation
- **Persuasion:** practitioners form a favourable or unfavourable impression of the innovation
- **Decision:** practitioners engage in activities before deciding whether to adopt the innovation
- **Implementation:** the innovation is adopted
- **Confirmation:** practitioners review the original decision to adopt the innovation and decide whether to continue to use it.

For this process, the aim is to implement the innovation in the same way as others have used it.

One way of interpreting the process described above is to see the technological innovation as the most important element. This suggests that any new technology can be beneficial (Kämpfen & Maurer, 2018). However, an alternative description highlights the fact that the reason for adopting an innovation is more closely linked to the problem the innovation may solve, see Table 18 (Rogers, 1995).

Table 18: Stages in the innovation process from Rogers (1995)

Initiation	Agenda setting	An organisation identifies a particular problem that may be solved by implementing new technology. The most important problems are prioritised, and possible innovations identified.
	Matching	Once a potential innovation is identified the feasibility of implementation is considered.
Implementation	Redefining / restructuring	The innovation and organisation are reviewed, modifications are made to ensure there is a good fit between the two.
	Clarifying	The innovation is adopted throughout the organisation, corrective action is taken if there are any problems.
	Routinising	The innovation is incorporated into the everyday activities of the organisation.

7.2.2. Meso Level

CBAM – Concerns Based Adoption Model

The Concerns Based Adoption Model (CBAM) theory is useful for describing and explaining the process of educational change (Pareja Roblin et al., 2018). The theory shows that there are ‘affective and behavioural dimensions of change’ and is seen as applying equally to teacher led change and change that is imposed by others (Anderson, 1997). Given this focus on the teachers it could be interpreted as a micro level approach, however, I see the benefits of this approach as identifying how a setting can manage change.

The CBAM theory is underpinned by a number of assumptions including (Anderson, 1997):

- Change is a process, not an event, it takes time to institute change;
- Individuals are the focus, settings will not change until their members change;

- The change process is an extremely personal experience and how it is perceived by the individuals will strongly influence the outcome;
- Individuals progress through various stages according to their emotions and capabilities;
- While the settings are the main focus for change, it is individuals that implement the change;
- People responsible for the change process must work in an adaptive and systematic way and progress needs to be constantly monitored.

Loucks-Horsley (1996) provide diagrams showing two of the key elements of CBAM, the Stages of Concern and Levels of Use.

Table 19: Stages of Concern from Loucks-Horsley (1996)

Typical Expression of Concern about an Innovation	
Stage of Concern	**Expression of Concern**
6. Refocusing	I have some ideas about something that would work even better than this innovation
5. Collaboration	How can I relate what I am doing to what others are doing?
4. Consequence	How is my use of the innovation affecting learners? How can I refine the innovation, so it has more impact?
3. Management	I seem to be spending all my time getting materials ready
2. Personal	How will using the innovation affect me?
1. Informational	I would like to know more about the innovation
0. Awareness	I am not concerned about the innovation

The Stages of Concern (Table 19) relate to how practitioners perceive an innovation, it is not expected that a teacher moves linearly from stage 0 to 6, they may experience more than one stage at a time and concerns may increase or decrease during different phases of the change. The higher stages of collaboration and refocusing may never be reached.

Levels of Use (Table 20) relate to the practitioner's behaviour. Again, they indicate one possible route, this is not necessarily what will happen. Practitioners may investigate a range of initiatives, some of which may not be implemented in full. They may not get to the highest levels.

Table 20: Levels of Use from Loucks-Horsley (1996)

Levels of Use of the Innovation: Typical Behaviours	
Levels of Use	**Behavioural Indicators of Level**
VI. Renewal	The user is seeking more effective alternatives to the established use of the innovation.
V. Integration	The user is making deliberate efforts to coordinate with others in using the innovation.
IVB. Refinement	The user is making changes to increase outcomes.
IVA. Routine	The user is making few or no changes and has an established pattern of use.
III. Mechanical	The user is making changes to better organise use of the innovation.
II. Preparation	The user has definite plans to begin using the innovation
OI. Orientation	The user is taking the initiative to learn more about the innovation
I. Non-Use	The user has no interest in the innovation and is taking no action.

A third element of the CBAM is Innovation Configuration which recognises that not everyone will implement an innovation in the same way, even if they undergo the same training, or experience the same environment or context.

When implementing a change, practitioners will go through three phases. The first is concerned with 'I', how the practitioner perceives the change and how it will affect them. The next is concerned with the task or intervention itself; how can it be used; how can it be implemented effectively? The final phase relates to the impact of the innovation; is it making a difference in terms of the impact on the children? Is there something that would work even better? The concerns of practitioners are likely to shift over time from themselves to their pupils (Stewart, 2015).

TAM - Technology Acceptance Model

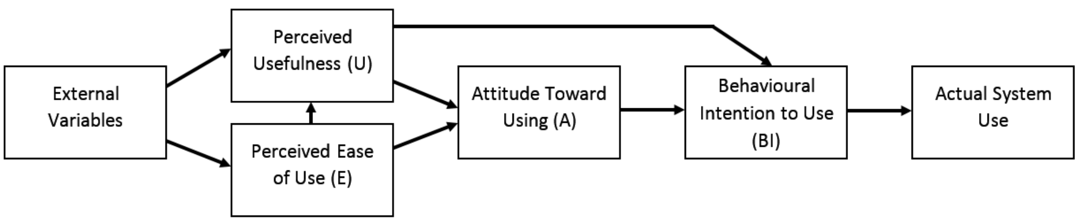


Figure 15: Technology Acceptance Model from Davis, Bagozzi, & Warshaw (1989)

Figure 15 provides an overview of the Technology Acceptance Model (TAM) (Davis, Bagozzi, & Warshaw, 1989). This describes how a users' acceptance of a new technology is determined by two key dimensions: 'ease of use' and 'perceived usefulness' (Venkatesh & Bala, 2008).

This theory can be misinterpreted. For example it has been suggested that 'the easier a technology is to use, the more useful it will be' (Sutton & DeSantis, 2017). In this case the authors were citing Davis, but what Davis actually said was:

> *All else being equal, we claim, an application perceived to be easier to use than another is more likely to be accepted by users (Davis, 1989, p. 320)*

Ease of use is not the only, or necessarily the most important, consideration.

As with many of these models, there is no systematic review of TAM (Scherer, Siddiq, & Teo, 2015) and it is important to realise that the terms 'ease of use' and 'perceived usefulness' are both subjective terms (Davis, 1989).

UTAUT – Unified Theory of Acceptance and Use of Technology

The UTAUT builds on the TAM and tries to bring together a number of models. The theory 'identifies performance expectancy, effort expectancy, social influence and facilitating conditions as key determinants of usage behaviours'. One criticism is that these approaches do not consider the relationships between students and teachers and how they may be affected by the use of technology (Pareja Roblin et al., 2018, p. 166) or the knowledge teachers need in order to use educational technology effectively (Scherer et al., 2015).

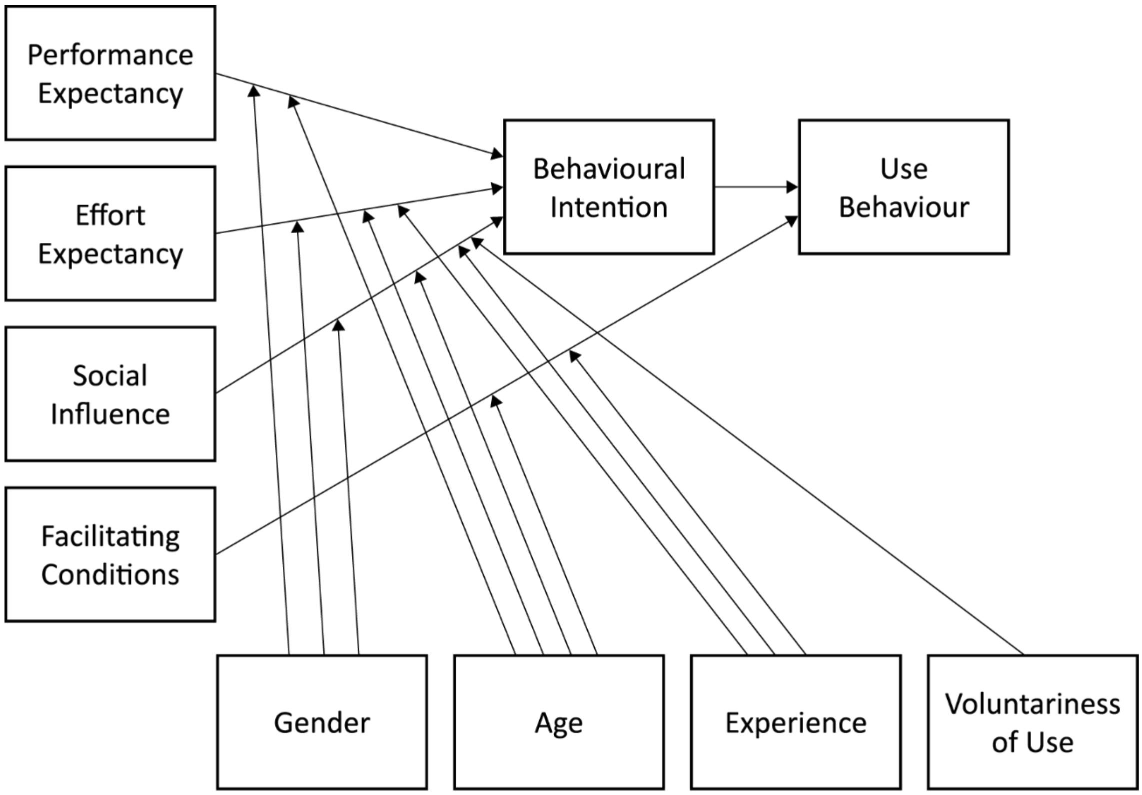


Figure 16: Unified Theory of Acceptance and Use from Venkatesh et al (2003)

UTAUT identifies four key constructs (Figure 16) (Venkatesh, Morris, Davis, & Davis, 2003):

- **Performance expectancy:** will using the new technology lead to improved performance?
- **Effort expectancy**: how easy is it to use the new technology?
- **Social influence:** do (important) people want you to use the new technology?
- **Facilitating conditions:** does the environment support the use of the new technology?

7.2.3. Micro Level

Apple Classrooms of Tomorrow

The Apple Classrooms of Tomorrow (ACOT) project refers to the stages teachers go through when they start teaching (Sandholtz, Ringstaff, & Dwyer, 1990):

- **Survival**: teachers find it difficult to anticipate problems, they focus on themselves and how they react to issues like controlling pupil behaviour

- **Mastery:** teachers start to anticipate problems and develop strategies for solving them

- **Impact:** rather than troubleshooting, teachers start to look at the impact their teaching has on the students' achievement and attitudes.

ACOT also looks at how teachers' approach to instruction changes over time, especially when new technology is introduced. Five stages were identified (Sandholtz , Ringstaff, & Dwyer, 1997):

- **Entry:** this stage is similar to the survival stage identified above; the focus is on how to manage resources and how the pupils behave when using them; this is often linked to a lack of enthusiasm about using the technology.

- **Adoption:** the focus is mainly on teaching pupils to use the technology, the teacher is trying to find resources that match exactly what they want to achieve, technology is used to support existing practice.

- **Adaptation:** technology is now integrated and used more often; it is still often used to do similar activities to those that had been done without technology, but these can be done more efficiently.

- **Appropriation:** attitudes have shifted and the benefits of technology are accepted; practitioners are now ready to start using technology in more innovative ways.

- **Invention:** teachers experiment with the technology and different approaches to teaching and learning.

SAMR - Substitution, Augmentation, Modification, Redefinition

SAMR is an increasingly popular model (Phillips, 2015) but it is not well represented in the literature (Hamilton, Rosenberg, & Akcaoglu, 2016). Developed by Puentedura (2006), it has four stages (Figure 17). The stages can be compared with the ACOT view of entry, adoption, adaptation, appropriation and invention; however, the focus is on the activity rather than the teacher.

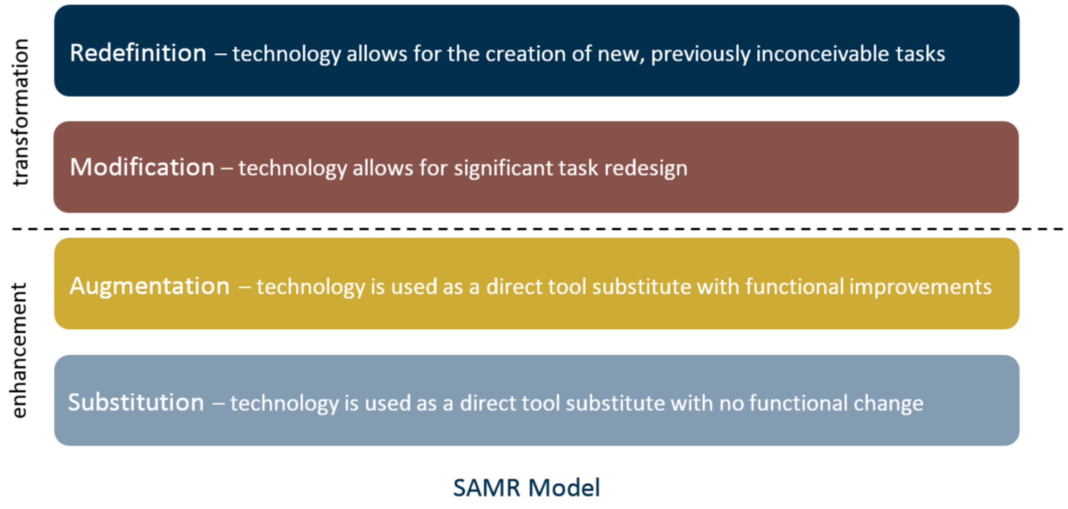


Figure 17: SAMR Model from Puentedura (2006)

Staying at the substitution level for too long can be seen as detrimental (Loong & Herbert, 2018) and there is a view that the higher levels of the SAMR model are more desirable than the lower ones.

The examples provided for each of the levels are not always useful and can make it difficult to see its value. For example, a suggested modification level task is to use a computer simulation rather than a diagram. An example of redefinition was to present information using videos rather than an essay. (Hamilton et al., 2016). Are these really examples of transformational approaches? Perhaps the focus should be on what the practitioner wants students to learn, rather than what they use the technology for. In the second example, students may learn more about how to create a video, than about the topic they are studying.

Following the SAMR model can mean that any technology is seen as beneficial and that the aim is always to use more technology. Many people would not accept this.

Variations of SAMR

There are other similar models to SAMR including the 3Ts model shown in Figure 18 (Magaña, 2017). Again, the problem with these hierarchies is that they put the emphasis on the technology and how it changes the original task. I am not convinced that the primary aim of using technology should be transformation. Nor am I convinced that transformation is a realistic expectation. As Somekh and Davies (1991, p. 154) say this does not mean that transformation is not appropriate in some circumstances, but transformation should have more to do with pedagogical objectives than the use of devices.

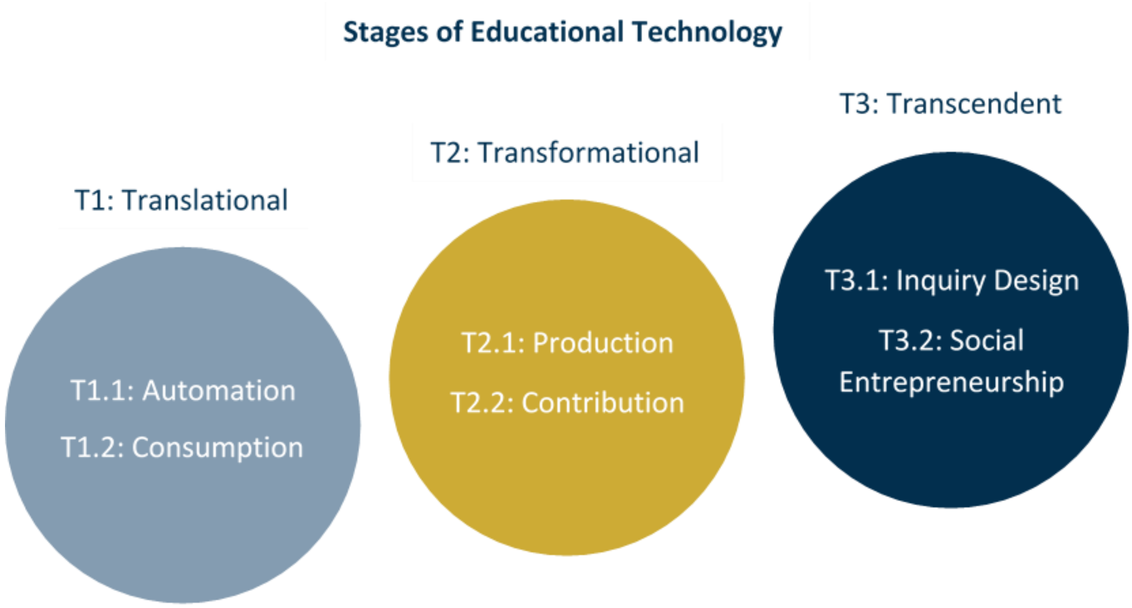


Figure 18: Stages of EdTech use from Magaña (2017, p21)

I believe that it is important to start from the pedagogical objectives: what do you want the children to do? Once this is established, it is then possible to think about how technology could make it easier for these objectives to be achieved.

Technological, pedagogical and content knowledge - TPACK

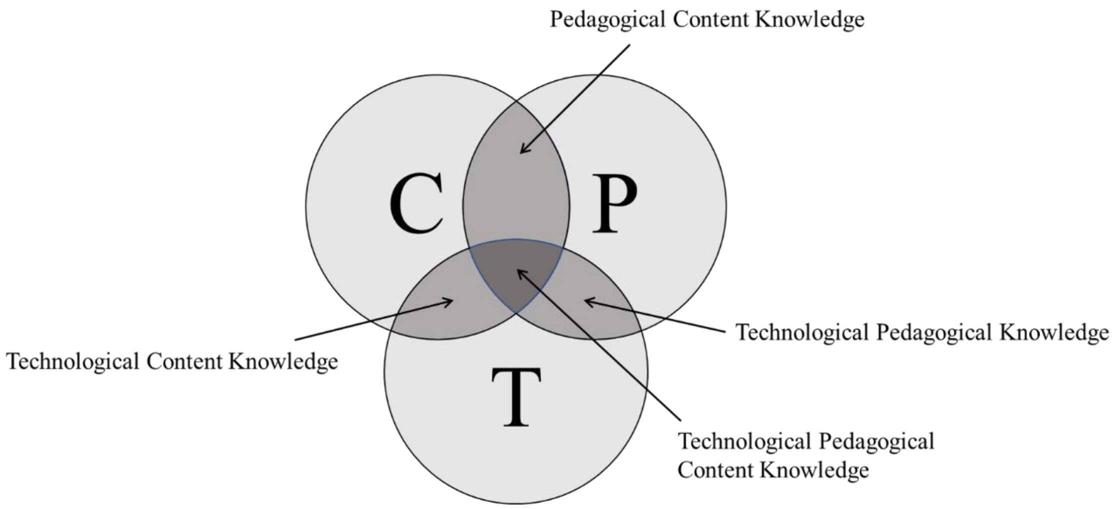


Figure 19: TPACK model from Mishra and Koehler (2006)

A focus on how technology should be used is reflected in the TPACK model (Figure

19) proposed by Mishra and Koehler (2006). This builds on the PCK model (Shulman, 1986) which says that successful teachers need to consider both pedagogy and content. This was originally suggested when classroom technologies were simpler and included overhead projectors and textbooks. Their use was transparent. Newer technologies, however, are:

- **Protean**: they have multiple purposes
- **Unstable**: they change frequently
- **Opaque**: users often do not know how they work

It is now more difficult to integrate technologies into teaching and learning; teachers need to understand how technological tools can be used, as well as having an understanding of pedagogical approaches to teaching content. TPACK shows what is needed to teach effectively with technology (Redmond & Peled, 2018).

This links back to considering how ‘educational technology’ is defined. iPads and computers may well fit into this description of technology, but other equipment might not. Even a complex technology can be so ‘every-day’ that it has become transparent to many of us e.g. digital cameras, remote controlled toys. It may be no surprise, therefore, that digital cameras are the most common technology used in the settings that participated in this research.

TPACK focuses on what knowledge a practitioner needs to implement technology and suggests there are three types that need to be considered together: pedagogical knowledge, technological knowledge and content knowledge. It does not support the view that technology should always be used and TPACK can be used to support practitioners to decide when it is appropriate to use it, and when it is not. This variability has been described as a weakness, saying that the use of technology is more dependent on the students’ needs than their beliefs about technology (Phillips, 2015) but this seems to me to be the point of incorporating the three elements; it allows for flexibility.

Niess (2011) described a developmental progression in TPACK developed by Niess, Sadri, and Lee (2007):

1. **Recognising (knowledge):** being able to use technology, but not knowing how it can be integrated with teaching and learning

2. **Accepting (persuasion):** practitioners are able to form an opinion about the use of technology for teaching and learning
3. **Adapting (decision):** activities practitioners engage in lead to a decision about whether to use technology for teaching and learning
4. **Exploring (implementation):** practitioners actively integrate technology into teaching and learning
5. **Advancing (confirmation):** practitioners redesign the curriculum and evaluate results of integrating technology into teaching and learning

These are directly aligned with the stages identified by Rogers (1995) outlined in section 7.2.1.

7.3. Training

Reflections

I have provided training to many practitioners and I am not convinced that simple, one off training courses are the best way to support the implementation of technology; there are a number of reasons for this:

The focus of courses is usually generic; it is not directly targeted to the specific needs of individual practitioners

Practitioners, even when they have found a course interesting and relevant, often do not follow up what they have learnt; once they get back to their setting they have other priorities and a limited amount of time.

A significant amount of money has been spent on technology in schools. Training has not been so well funded. This means resources are not always used effectively (British Education Suppliers Association, 2015). Decisions about what devices and support were needed have sometimes been made nationally (Gillen, Staarman, Littleton, Mercer, & Twiner, 2007) which is perhaps a less effective approach than allowing schools and practitioners to work out what resources and support they need (British Education

Suppliers Association, 2015).

7.3.1. What is training?

There are many types of training or professional development; it can include any activities that help to improve the quality of education. It is not just about what the practitioner does, but also how this will impact on their students (Day, 1999).

> *The literature suggests that practitioners need guidance, and opportunities to become capable, competent, and informed about the educational role and potential of ICT, and support to make the most of the opportunities that ICT presents for strengthening all aspects of early childhood education practice (Bolstad, 2004, p. 7).*

Kennedy (2005) identified a number of types of Continuing Professional Development (CPD) including training and action research. Training is usually delivered by an expert who sets the agenda and practitioners are often passive participants. This type of training presents participants with preselected information and activities even though no single activity will be applicable for all settings or practitioners (Niess, 2011). This type of top down training has not been shown to have a sustained impact (Wall & Hall, 2017).

There is a view that good professional development respects teachers' knowledge and expertise rather than being delivered by an 'external expert' (Baumfield & Butterworth, 2007). In the UK action research has frequently been used for professional development (Somekh & Lewin, 2008a). Is a teacher led, project-based, approach likely to be more effective? Is action research appropriate?

Kennedy contrasts a transmission model of training with action research, which she describes as transformative (Kennedy, 2005). Not everyone sees such a clear distinction. Others have seen action research as being synonymous with in-service training (Hodgkinson, 1957) though it is not clear how this type of action research would fit with the different models outlined in section 2.2. Would it have rigour and a focus on the development of new knowledge, or would it be a way of exploring new approaches to teaching and learning that have been identified by others?

Professional development should have a positive impact on practitioners, but quality is variable (Borko, 2004). Not all professional development or training is effective. Training has often focused on specific skills rather than the broader picture, and there is a need to recognise that introducing technology may require changes in the classroom (Brand, 1998).

Training about EdTech can be linked to the implementation theories I described earlier in this chapter and can be aimed at moving practitioners through the different stages.

> *The goal of all professional development programs should be to help people reach the collaboration level of practice, such as illustrated on the Stages of Concern (Loucks-Horsley, 1996, p. 8).*

The best training would result in sustained change but this rarely happens. More often what is learned in training is forgotten or not implemented well (Hruskocy, Cennamo, Ertmer, & Johnson, 2000), or is only implemented once, or a few times.

Brooker (2003) suggests that unless new skills are put into practice at once, training will have a limited impact on practice.

7.3.2. What EdTech training do practitioners want?

Many early years practitioners are not using EdTech effectively in their practice (Nikolopoulou & Gialamas, 2015) and want access to professional development that is targeted at their own level of knowledge and experience (Fenty & Anderson, 2014). The results from the questionnaire (see section 6.5.5) show this and identified a need for more support and training. Respondents indicated that this training needs to be about more than basic skills.

> *Most of the current efforts take a very narrow view of what teachers need to use technology - some technical skills and a good attitude. (Zhao, Pugh, Sheldon, & Byers, 2002, p. 511)*

Training about educational technology is often limited in its scope, with little focus on pedagogy or how to use technologies to support teaching and learning (Hruskocy et al., 2000; Zhao et al., 2002). The focus is often limited to how to operate the device (Dong, 2018). Most teachers want access to practical ideas that will have a direct impact on their practice (Guskey, 2002).

When training is limited to the mechanistic, practitioners tend to use technology in ways that match their existing practice, as they have not been shown how it can be used differently (Matzen & Edmunds, 2007).

Again, this can be seen as relating to one of the frameworks reviewed earlier in this section. Training needs to focus on more than technological knowledge; the whole of the TPACK model is important (Koehler & Mishra, 2009). Training which only looks at the technology would therefore not be effective; knowing how to use technology is not the same as knowing how to teach with it (Mishra & Koehler, 2006). Mishra and Koehler (2006) recommend working with teachers on ‘real educational problems’ that technology can help to solve. The best way to use ICT is for practitioners to start by focusing on the learning and identifying what good early years education looks like. It is important to consider the practitioners’ needs and experiences. Once this has been established, it is possible to identify the ways that ICT can help.

> *I have long believed that questions which explore educational technologies from the lived experiences of those using (and those not using) them should be at the forefront of any education technologist’s mind (Selwyn, 2008, p. 83).*

This view, that training and support should link pedagogical and technological beliefs and that the pedagogical rationale should drive the use of technology, is not always supported. Edwards (2005a) investigated the factors practitioners felt were important when implementing technology in their early years settings. She identified nine factors including practitioners knowing how different devices were used, access to technology and supporting collaboration. One referred to the educational purpose of the technology; this was ranked as the 7th most important factor, which suggests there are other more important considerations for practitioners. However, this research was investigating factors to consider when implementing technology. These may not be directly comparable to rationales for deciding whether to implement it.

7.3.3. Links to needs and context

It is important to be realistic about what can be achieved. Training often looks at how to implement an ideal. The classroom does not often fit with this and practitioners may need to cope with many extra variables: the technology may not work as intended, children may be distracted. Rather than thinking about the ideal, it may be more relevant to consider what Selwyn refers to as the ‘state of the actual’ (Selwyn, 2008).

This ‘state of the actual’ will be context dependent, different practitioners and different settings will be at different stages. Support and training need to consider the real contexts practitioners work in. This does not mean sharing best, or ideal, practice is not appropriate. It is important to share what is possible elsewhere, to raise expectations and set longer term goals and to avoid the potential for low expectations.

The most effective training is matched to the practitioner’s own context (Ruggiero & Mong, 2015). It responds to the needs of participants, who come with varying experience and abilities.

> *research has shown that early childhood teachers are most effective at implementing change to their practice when new tools relate to or build on existing tools (Edwards, 2013).*

While introducing technology may require changes in the classroom (Brand, 1998) it is often useful to link training to what practitioners already know and their existing practice. They are more likely to use technology if they can see that its use fits with their existing views of effective teaching practices (Higgins & Moseley, 2001). Linking training to the practitioners context also means that the use of technology can be tailored to the resources and staffing they have available, this means the implementation of EdTech is more likely to be successful (Zhao et al., 2002).

When learning about new approaches, practitioners will benefit from building on their existing knowledge and making links with existing practice, otherwise any new information is likely to be forgotten or reinterpreted to fit with existing practice (Cordingley, 2008). It is important to ensure that practitioners understand what the new approach actually means and avoid situations where it is immediately rejected because it does not match existing beliefs. It is also important to avoid the alternative situation, where practitioners believe their existing practice is already consistent with the new approach and implement it superficially without the necessary depth of understanding (Timperley, Parr, & Bertanees, 2009).

Reflections

Thinking about training has made me consider the implications of a study conducted by Bonawitz et al. (2011). Children were introduced to a new toy which had several different functions. The study compared the impact of four conditions:

- showing a child a single function then leaving them to explore the device,
- showing the child the function after which the investigator interrupted her own explanation (by pretending to remember something she needed to do) and left,
- the investigator pretended to accidentally operate one of the functions,
- the investigator looked at the toy then left.

In all cases, the child was then left to explore the toy.
Children who were shown specific functions spent less time exploring the toy, they spend longer focusing on the functions they had been shown.
This suggests that teaching aspects of a device’s function can limit how it is used later. I wonder whether the findings would be similar for adults. Can training which shows specific ways of using technology be limiting. Would training which offered more time to explore and reflect on how devices are used be more effective?

7.3.4. Networks and collaboration

There appears to be a growing consensus concerning the value of practitioner research as a means of CPD for educational professionals within the United Kingdom but often this is not reflected in the CPD that is available for practitioners to access (Clayton et al., 2008).

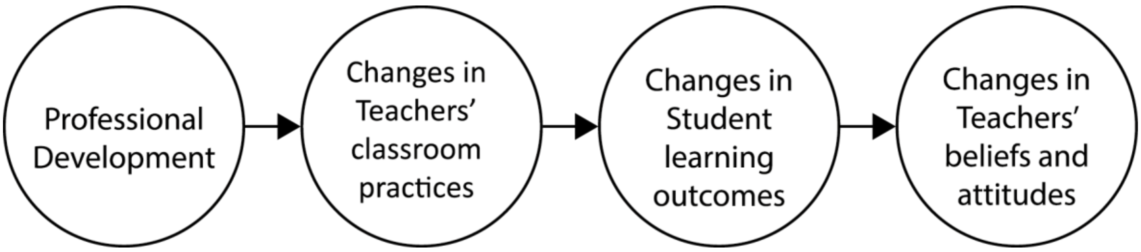


Figure 20: A model of teacher change from Guskey (2002)

Guskey suggests that a primary motivation for changing a teacher's practice is enhancing students' learning. He suggests that professional development often starts with trying to change teachers' beliefs and attitudes, with providers thinking this will lead to a change in practice. He argues that this is the wrong way round and that the approach should be more like that in Figure 20, with teachers only changing their beliefs once they see a new idea implemented and working in their own context and having an impact on student outcomes. However, he goes onto say that the process of teacher change is more likely to be cyclical than linear and, if change is to be sustained, feedback on the outcome of the changes is important. (Guskey, 2002). Parette et al. (2010) agree that teachers' attitudes will only change if they can see that something works in practice.

Peer support can be useful for introducing practitioners to new approaches to practice and can provide practical and emotional support. It can lead to discussions where tacit knowledge is made explicit (Cordingley, 2013).

Reflection can allow deeper consideration of this tacit knowledge, allowing it to be examined and criticised (Schön, 1983).

> *Often we cannot say what it is that we know. When we try to describe it, we find ourselves at a loss, … Our knowing is ordinarily tacit*
> *(Schön, 1983, p. 49)*

Hodgkinson (1957, p. 139) writes that 'it is difficult to change behaviour without changing attitudes or values as well'. Is this really the case? Can it be more a case of making these attitudes or values more explicit and examining whether current practice supports them as well as the teachers think? The SAMR model (see section.7.2.3) suggests that change in practice does not necessarily mean a change of belief. It could be a case of doing something that is more effective at meeting those beliefs.

It has been suggested that developing networks and collaborating with colleagues is one of the best ways of identifying how technology can be successfully integrated into the curriculum, but teachers often find it difficult to find time to do this (Shields & Behrman, 2000). Technology like Twitter and Blogs can provide a source of information that can be tapped into at any time. It can provide ways of developing Personal Learning Networks as a source of CPD (Kirkland, 2010; National Association for the Education of Young Children, 1996b). There is support for the idea that practitioners who work more collaboratively with their own peers are more likely to use computers and will support their pupils in using technology in a constructivist way (Sang, Valcke, Braak, & Tondeur, 2010).

When collaboration takes place in a network or group, having participants at different levels of knowledge and experience can be beneficial (Alghamdi, 2018). These levels can be described in different ways, as the examination of the change and technology implementation models has shown. Section 7.2.1 provides support for the argument that having people at different stages can be beneficial.

This review of the literature about training has identified a number of characteristics of effective training. These are similar to the features of action research described in Chapter 2. The development of action research and research networks has been recommended many times (Aubrey & Dahl, 2008; Marsh et al., 2005). These can provide opportunities for practitioners to share their experiences of using EdTech and to learn about existing good practice.

7.3.5. Action Research

In 2008 Aubrey and Dahl produced a review of the evidence on the use of ICT in the Early Years Foundation Stage (Aubrey & Dahl, 2008) and suggested that there was a need for the development of action research networks. As well as sharing examples of best practice these networks would encourage practitioners to reflect on their own practice. Claxton seems to support this approach when he claims that small scale practitioner led projects often have more impact than larger, more controlled, studies (Claxton, 2007).

Tondeur et al. (2016) identify the value of a long-term, iterative, inquiry approach to CPD that builds on practitioners' beliefs and practices, this approach could be interpreted as action research. There are many terms used to describe action research. In some views it is an alternative to ineffective in-service training (Hine, 2013). When discussing action research with practitioners it is important to be clear about what the term means.

Dewey linked action and beliefs, suggesting that experiences need to be interpreted to generate beliefs and beliefs need to be interpreted to identify actions. He believed that most of this was unquestioned and semi-automated and could be described as habit (Morgan, 2014). For it to be regarded as more formal inquiry it needs to become a more conscious process. Section 2.2.2 explored the difference between reflection and action research; for a process to be described as research it needs to be rigorous and systematic.

According to Leitch and Day (2000) technical action research refers to external agents coming in, identifying solutions and supporting practitioners to implement them. The reflection is done by the external agent. For practical action research, the reflection is done by the practitioners themselves. One criticism is that the focus of the action research can be more on the reflection than the outcome.

Action research needs a clear focus and it is important to know what the researcher is trying to achieve.

> *There is a tendency for some action research to become ingrown and 'content-less', so that self-exploration and personal growth seem to become the whole focus and purpose of the research. This may be effective as a form of therapy, but it is difficult to justify calling it research (Somekh, 1995, p. 348)*

Having time to try new things and to reflect is seen as an important way of influencing practice and beliefs (Prestridge, 2017). Technology can be a catalyst for change; it can provide a focus for reflecting on current practice and what a practitioner wants to do in future. The action research model also supports reflection on practice and beliefs; over time it can lead to a change in practice. It is important for all practitioners to reflect on their own setting. Experiences always happen in a context; previous knowledge will not always predict the outcome of an action in a new context.

> *When teachers engage with others in ongoing reflection about what they have learned about the instructional use of technology, they are more likely to critically evaluate their own pedagogical practice and redesign their instruction (Brand, 1998).*

This view reinforces the value of working with others on action research. This collaboration can lead to new understanding about a practitioner’s own practice.

7.3.6. The Action Research network

Collaboration and reflexive processes, as described above, are two of the three key principles of action research identified by Grundy (1994). She highlights action research's aim to improve understanding, not just practice. The third of her principles is participatory decision making. I believe this principle is less important here; the action research group is made up of practitioners from different settings, all working on their own projects with their own aims. The approach to the projects is described in Chapter 8 and, while there are some common themes between the projects, each one is focused on a particular setting. It would not be appropriate for the group to make decisions on behalf of all of the settings. The aim of the project is not to achieve a consensus, a single approach that all settings will try. Given the differences between settings and practitioners it is unlikely that this would be achievable (Solvason, Cliffe, & Snowden, 2017).

Participatory decision making would seem to be more appropriate for projects that are conducted within a single setting.

Wall and Hall (2017) identified three underlying principles of teacher practitioner research:

- **Autonomy:** teachers know what questions to ask; they may need help with research methods but they direct the focus of the inquiry and they decide when the question is answered.
- **Disturbance:** identifying good questions leads to thinking; success and failure during the cycles of the research lead to further inquiry. Any challenges the practitioners face can be useful as they can stimulate further reflection.
- **Dialogue:** practitioners need to communicate with each other; this is especially true when thinking about what did not work.

Practitioners need to have ownership of the project; they know what questions need to be addressed. They decide on the evidence needed and this will vary depending on the question they are trying to answer. It may include formal assessment data and anecdotal data. Ensuring these principles are addressed will mean there needs to be a balance between the time spent on action research and the practitioners' existing workload (Wall & Hall, 2017).

The aim for the action research projects in Cycle Three of this project is to produce a sustained change and to implement technology in a way that has a lasting positive impact in the practitioners' settings.

Research can make a valuable contribution to CPD; it can motivate teachers and sustain their engagement. However research publications are often inaccessible to practitioners, meaning that research can be seen as irrelevant to the real world (Carter, 1998). Action research is seen as much more relevant, especially as it involves the real driver of change in the classroom, the practitioner.

Action research is seen by some to be a powerful tool for professional development (Ampartzaki, Kypriotaki, Voreadou, Dardioti, & Stathi, 2013).

> *In practice, there seems to be a gathering consensus that small-scale, practitioner-led action research projects often have more impact than more rigorously controlled studies. ... such small-r studies have as much validity as expensive big-R funded projects. Teachers are much more likely to change what they do if they see someone else doing it differently, or hear or read a short story about a small-scale intervention which they like the sound of (Claxton, 2007, p. 130).*

Section 2.3 identified some of the challenges with action research, one of which is finding the time to conduct research alongside an existing work load. The work by Clayton et al. (2008) is just one of many which describes the link between action research and CPD; they highlight the problem of finding time for practitioners to do this in a meaningful way. They suggest it is often done by senior staff as part of MAs or other courses.

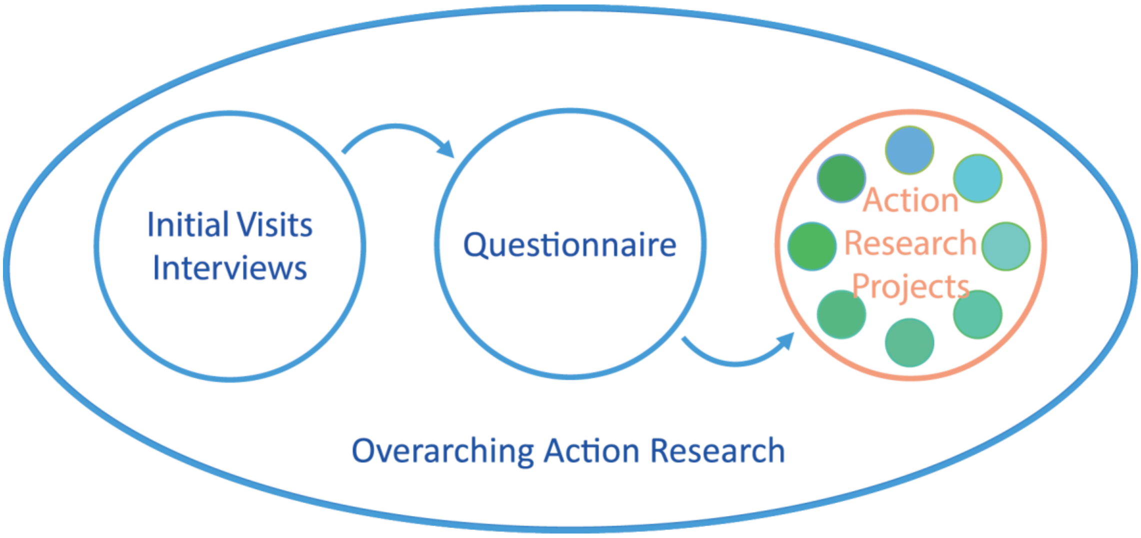
7.4. Summary

> *...teachers are best placed to make professional judgements about evaluating and improving their own work (McNiff & Whitehead, 2005, p. 3).*

In the past the views of teachers have often been ignored (Ponte, Matos, Guimarães, Leal, & Canavarro, 1994). However, teachers can be seen as an essential part of the change process (Connelly, 1980). They are central to the implementation of the curriculum in individual classrooms. They need to be fully engaged in the development process and be encouraged to look at alternative approaches to delivering the curriculum, even if this requires some limited experimentation and risk-taking to try new things (Brundrett, Duncan, & John, 2010).

This research is not emancipatory in terms of improving the education system as a whole (see section 2.2) but is a way of supporting the participants to examine their own values and look at their own practice; can their practice be improved to reflect their values more? It can also affect the wider community as participants share their findings for validation.

Chapter 8. Cycle Three: Action Research Network



Reflections

Action research may be more appropriate than traditional training when supporting practitioners to use EdTech. However, there are practical challenges and criticisms of action research that would need to be overcome.

How would the action research approach work in practice?

8.1. Research Questions

Research Question 2: *How can early years practitioners be helped to integrate educational technologies into their practice in a way that supports their pedagogical beliefs?*

- How would early years practitioners like to use educational technologies?
- Is action research an appropriate route to enable early years practitioners to reflect on pedagogy and improve their use of technology?

Chapter 2 provided an overview of action research but, as has previously been stated, these projects can be seen as a different type of action research.

8.2. Methodology

The action research approach is not a checklist or a list of actions that must be taken; not all action research projects will look the same. As the participants were working on their project alongside their already busy teaching workload, they had less time to devote to some of the more formal elements I was able to include in my overarching project.

Chapter 2 described some of the models of action research; these can be placed along a continuum between reflection and research. The practitioners projects were situated closer to the reflection end than my overarching project. This phase of the research can be described as rigorous self-reflection, similar to the approach described by Baumfield et al. (2013). This does not mean the practitioner projects are less valid than my research. The group meetings and my visits were able to provide more challenge than everyday practice may have afforded. This dialogue with others moved the process from reflection to enquiry (Baumfield et al., 2013) and allowed the participants to make their tacit knowledge explicit. They were able to examine their practice and their underlying beliefs (Wallace, 1987). They could consider whether their practice was appropriate given the aims of their projects. In this way, the projects could be seen as enriching the routine, day to day work of the practitioners (Somekh, 1995).

The practitioners' aim to transform their practice means they were going beyond 'describing, analysing and theorising'; this means their activities can accurately be described as action research (Somekh, 2006).

Their projects fit within the practical, personal and professional approach to action research described by Rearick and Feldman (1999)(See Table 1, section 2.2). They describe a cyclical process which evaluates practice, plans and implements changes and then evaluates these changes before moving on to another cycle (see section 2.2).

8.3. Participants

Action research can help practitioners gain a sense of professional autonomy (Baumfield, 2006); they are the recognised experts in what happens in their settings.

> *real classrooms have to be our laboratories… and they are in the command of teachers, not of researchers (Stenhouse, 1979, p. 20).*

Eight EYFS practitioners were identified to participate in this stage of the project. Some had been involved in previous stages of the research, others were identified by Local Authority ICT and Early Years Advisors. They came from a range of early years settings and included a preschool manager, a teaching assistant and nursery teachers from stand-alone nurseries, and teachers from nursery classes and reception classes in local authority schools; see Table 48 in Appendix D, section F, for more details.

In their own words, see Table 21, participants ranged from ‘technophobes’ and people who had very little knowledge of technology to ICT coordinators who already had a good knowledge of what technology was available and how it could be used. They all wanted to learn more and improve their practice.

Table 21: Comments from Action Research participants at initial meetings

Setting 1: … just here to learn more really… [I’m at] a really basic level… I’m still a blank at the minute, just listening
Setting 2: … just starting to use it in the two-year old provision… I want ideas for new equipment and to learn from other professionals
Setting 3: … [I’m] one of the technophobes, very much wary of technology … confidence is a major factor… I have anxieties [and] want to dispel them
Setting 4: …[I’ve] just taken over as ICT coordinator... the main thing… is to get our iPads in the classroom… a lot of the staff are nervous … [I want to] get [the iPads] being used cross curricular not just in ICT lessons... a focus on technology in early years is part of performance management… trying to expand the use of it
Setting 5: [My] focus is on reflection as it’s on the school development plan… [I want to] get a higher percentage of children exceeding expected progress

Setting 6: We heavily rely on parent involvement because of the lack of equipment… [I] want to move on from the use of iPads to pacify… [I] have identified gaps in resources and want to identify how resources can be used to support communication and language
Setting 7: …[I'm] quite confident in using [ICT] and have used it for a number of years in terms of assessment [and with] different apps and things like that… [I] want to [investigate] how to use it with the children
Setting 8: ... [I] have explored some of what is out there but want to focus on a specific need

This may not have been how others would have described them; for instance, the 'technophobe' had introduced the use of email to engage some of her children's parents.

> *This year I did start something … I didn't realise how scary it was until [an LA advisor] said 'wow you are opening a kettle of fish' … I got everyone's emails, parents' emails and I emailed parents videos of [their child] doing maths… as the year progressed, I understood what a nightmare it was. Luckily, I'd only done it with 10 parents … it was fab because you got to see the child in the moment and you had a great relationship with the parents (Setting 3)*

Her lack of knowledge of technology meant that she did not realise how ambitious her use of email to engage parents was until later in the year. Despite the workload involved she recognised the positive impact it made. She went on to look for an alternative way of using EdTech to support parental engagement.

8.4. Ethics

When conducting research there is a need to inform relevant stakeholders about what is involved (British Educational Research Association, 2018). Researchers need to be open and honest about what each stage of the research involves (Karnieli-Miller et al.,

2009) and it is important to be clear about the agreement between the researcher and the research participants (Blaxter, Hughes, & Tight, 2002). All participants and their head teachers/managers were asked to sign a declaration of informed consent at the start of the project (see the Participant Information Sheet in Appendix D, section E). This made it clear that participation was voluntary, participants had the right to withdraw at any point, and anonymity was guaranteed. All data was stored securely and kept confidential. Practitioners' consent for audio recording group meetings was obtained at the start of each meeting.

All field notes and recordings were transcribed for analysis. Jenks (2011) highlights the need to ensure anonymity when sharing transcripts. While the full transcripts were not shared, they were used to generate notes from the meetings, which were shared with the group. Anonymised versions were also shared on my blog (Appendix D, section I) and care was taken to ensure it was not possible to identify participants from these.

Traditional ethical guidelines, especially those that refer to quantitative research are not always appropriate for action research projects (Zeni, 1998). Action research involves 'insiders' researching their own settings and practice and open discussions with colleagues and other people. Given the nature of the project, it was not possible for participants to remain anonymous within the group. The initial meeting discussed the need for any discussions to remain confidential.

The practitioners' action research projects were focused on classroom practice with their pupils. This involved activities that could be seen as part of their normal, day to day practice. This has been described as the 'zone of accepted practice', which is a term that has been used when determining whether formal ethical approval is necessary (Zeni, 1998) and means that permission did not need to be obtained from the children or their parents. All activities were governed by the schools' own policies (see Appendix E).

It was important for all members of the group to feel that the group was a collaborative and non-judgemental space (Nind, Kilburn, & Wiles, 2015). When collaborating it is important to establish ethical issues and working principles at the start of the project (Somekh & Lewin, 2008b). At the first meeting the booklet 'Community-based participatory research: A guide to ethical principles and practice' (Banks & Manners, 2012) , see Figure 21 provided the stimulus for a discussion of ethics and how the research would be conducted, along with protocols for meetings, managing data and communication.

Figure 21: Community based participatory research guide

Section 2.8 introduced the concept of power in research. Qualitative research aims to balance the power of researcher and researched. It was important to create a nonthreatening environment in which the interviewees were willing to share their experiences and beliefs (Karnieli-Miller et al., 2009).The community based participatory research guide (Banks & Manners, 2012) was used to stimulate a discussion about the need for all participants to benefit from the research project, how all participants could share their experiences in an atmosphere of mutual respect and how these experiences would be recorded and shared outside the group. The discussion was useful for establishing clear expectations of what the participants would be expected to do as part of the project, for example, number of meetings, length of project, and what record keeping would be necessary. It was agreed that these expectations would be reviewed at different points during the project. This discussion was especially important given the expected duration of the project. The project was expected to last at least a year and most of the group stayed with the project for two years. It was important that the participants had an overview of the whole project from the start, even though it was accepted that this may change (Cohen et al., 2007). Where possible, the group were encouraged to have a role in suggesting agenda items for meetings and I tried to ensure that discussions were led by the participants rather than myself.

It was important for me to ensure that the participants voices were present in the final report (Karnieli-Miller et al., 2009), notes from each meeting were shared and participants were able to approve my interpretation, my findings were available to the group before the thesis was published and again the group were asked for comments. Participants were provided with opportunities to provide feedback on my interpretations, though there is a question about how comfortable they would have been about challenging my findings and whether they would have had time to review the findings in detail.

8.5. Group meetings

Termly meetings were arranged to provide opportunities for the group to meet and discuss their progress. Six meetings were held over the course of the two-year project. There was never a meeting where all participants were able to attend and only one participant attended every meeting. One participant did not manage to attend any meetings. She did meet regularly with me and arrangements were made for her to visit one of the other settings, so she could benefit from some aspects of sharing practice.

Group meetings provided an opportunity for participants to collaborate and share information about their projects. The aim was for the research process to be more rigorous than the reflection that naturally occurs within classrooms. Participants were encouraged to justify their decisions and actions, and to use questioning to challenge each other. I was able to use my visits to identify common themes and activities that other members of the group may find useful. I was able to prompt participants to reflect on these during group meetings. I tried to limit this role as my main aim was to support the group to ask questions of each other.

Participants were able to direct the discussions to meet their needs, but prompts were available (Appendix D, section H). These prompts were developed to help the group be more challenging and to support them in looking at their familiar practice in a different way (Baumfield, Hall, Higgins, & Wall, 2009).

The early meetings were held at City Learning Centres (CLCs) which provide support in using educational technologies across their local authorities. At the first CLC, participants were able to explore a wide range of technologies designed for use in EYFS. At the second CLC, two advisors talked to the group about the work they were doing to support their EYFS and SEN settings. They also provided ideas for activities the group could try out in their own settings e.g. squishy circuits [1], electronics and 'the computational thinking' approach from Barefoot Computing see Figure 27 in section 10.6.2).

The later meetings were hosted by members of the group and included a tour of their setting. This gave participants a better understanding of the contexts that other members of the group were working in. Meetings were held during the day, which allowed participants to see the children in the setting and provided opportunities for them to see how EdTech was being used.

Meetings included discussions about key themes that had emerged during Cycles One and Two. The group also shared information about EdTech and resources they had tried. Discussions included:

- What does effective EYFS pedagogy look like?
- What is meant by 'educational technology'?
- What are the features of appropriate EdTech resources?
- How is educational technology being used?
- Barriers to the use of educational technology
- Attitudes towards educational technology

While I organised the meetings, I made it clear that the content of the meetings should meet the group's needs and members of the group were able to contribute to identifying the focus of future discussions.

Audio recordings were made at every meeting. These were transcribed, and notes were shared with the group after each meeting. Anonymised versions of the notes were also available publicly on my blog (see Appendix D, section I for examples).

Outside of the meetings, some members of the group asked questions related to their specific needs. For example, one setting wanted links to resources to support their children to develop mouse control. These links were shared on my blog for the group to access. Another participant asked for training on the use of their setting's IWB and other resources. I delivered this training in their setting to several members of staff.

[1] https://kaleidoscopeforlearning.wordpress.com/2016/05/18/squishy-circuits

8.6. Aims and expectations

Reflections

Participants were volunteers who already have very busy lives as classroom practitioners. I needed to make sure that they were not overburdened by the expectations of the project. This presents challenges as an action research approach necessarily involves more time and commitment than a standard training approach.

I wanted to make sure that expectations were clear from the start and that practitioners were involved in clarifying these and the aims of the project. This meant I had less control over how projects were managed. It was not possible for me to ask all participants to complete documentation or use specific evaluation methods or even attend all meetings. While I think this is appropriate in terms of their projects, it did mean the evidence I collected about the action research approach was less systematic and rigorous than it could have been.

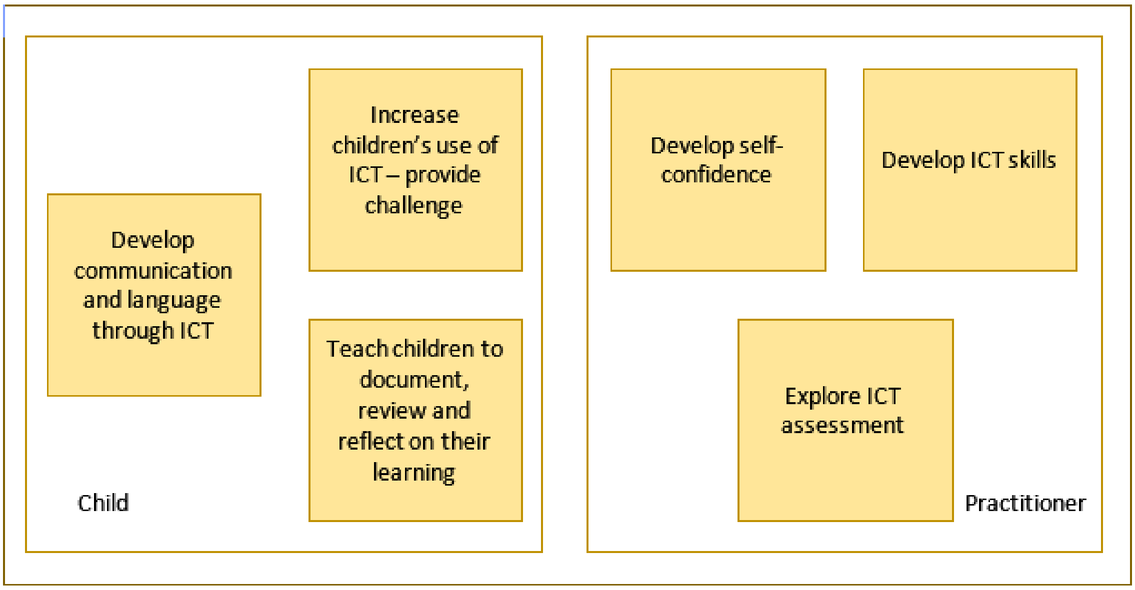


Figure 22: Action Research participants' aims and expectations

The purpose of the initial meeting was to introduce the participants to each other and to action research. The group discussed their own settings and their approaches to teaching and learning and what they hoped to get out of the project. Figure 22 shows the aims the group identified. These could be divided into two types. Some aims were specific to the development of teacher skills, others related to how children might benefit from using EdTech. Even at this early stage, some of the practitioners had ideas about the focus of their action research projects and how they would use technology with their children. Participants were provided with a template project plan, which they were able to use to develop their initial ideas in to research questions (see Appendix D, section D).

The meeting included an introduction to action research (see Appendix D, section C for details) and a discussion about ethics and how the group should work. It was important to emphasise the need for mutual respect from the start and for the group to know that they could share information and experiences in confidence.

8.7. Developing research questions

No restrictions were placed on the participants' research questions, other than the fact that they should have some reference to educational technology. They were encouraged to base their questions on their own context and on a problem they wanted to solve.

> *The inquiry should, I think, be rooted in acutely felt curiosity, and research suffers when it is not (Stenhouse, 1979, p. 11).*

Research questions are important, as they help to narrow the research objectives and identify how they can be addressed; they lead to decisions about research methods and data collection (Onwuegbuzie & Leech, 2006). Developing research questions has been described as the 'most difficult stage of action research' (Adelman, 1993, p. 18). Members of the group did not have any problems identifying what they wanted their projects to focus on. Most came to the first meeting with some general ideas and more specific questions evolved during the course of the project.

More time could have been spent on reviewing and refining the research questions at the start of the project, but I was not convinced that this would have been a good use of the practitioners' time. Meetings and visits to settings were used to discuss and challenge their process, allowing questions to be refined.

8.8. Project planning

Before the participants started to plan their projects, I shared an example of a planning sheet (Appendix D, section D) which included sections for information about their setting, the focus of their project, their aims and how they planned to measure the success of their actions. As the projects progressed, they were able to add details about the actions they had implemented and complete the evaluation section.

While there was no expectation that they should use this format or that, if they did, it should be completed in a certain way, they all completed the first part of the plan at the beginning of the project. Some used it to make brief notes, others provided more detail. Some updated the form regularly and used it as part of their evaluation process. Copies of the project plans can be found in Appendix D, section G.

I supported the participants to plan a project that would target a specific need in their setting; these included:

- identifying what EdTech is available and evaluating the most appropriate devices and activities to implement within their own setting
- using EdTech to allow children to record their learning, using these records to support later reflection
- identifying how ICT could support a specific area of the curriculum, or a specific type of activity e.g. role play
- exploring how EdTech could enhance parental engagement
- exploring how EdTech could enhance the children's language and communication skills

8.9. Links with existing research

Reflections

One of the ways action research can help practitioners is by providing opportunities to access information and expertise that will support their projects. This expertise came from members of the group, but also from their colleagues and from the literature.

Practitioner action research projects have been criticised for not making links with existing research, as this can mean practitioners ‘simply reinvent the wheel’, rather than build on what has already been learned (Baumfield et al., 2008). All of the areas the group chose to focus their research on had been investigated before. Information existed about these topics and engaging with research literature could have been a useful starting point for identifying actions.

Some members of the group already engaged with research regularly and found this very beneficial for their own practice, and for supporting their decisions about practice when discussing it with senior leaders or local authority advisors.

> *I use theory and research to increase my self-confidence; it’s not ‘me’ actually saying this, it’s this person, or that person also says it backed up by research … I would love more time actually to look at and do more reading about research… if I can have a paper with research that gives me conclusions that I can take to management, that I can use in my job to say well I do this because it has been proven that… and I know this because… that empowers me (Setting 3)*

Discussions of existing research did happen during the group meetings; occasionally these were planned by me but often they emerged naturally as the participants talked about their projects. Sometimes when I mentioned research, I found that some other members of the group were familiar with it, having read about it on social media.

Examples of research the group discussed included:

- Children explore new devices more if adults do not explain all of its functionality (Bonawitz et al., 2011)
- Adults working alongside children using electronic devices can interact less than if they were using more traditional resources (Sosa, 2016)

On reflection, there could have been more opportunities to bring research to the group and this could have been a more formal part of the exploration phase of their project, but I felt that these links needed to fit with groups priorities and workload. Not everyone had the same focus, so they would find different research useful. I felt it was important that they were not presented with too much information that was not directly relevant to their projects. Ideally, links to research should emerge from the research projects.

> *We find that if teachers begin with investigating their own questions directly in an enquiry this will lead them at a later stage to look beyond their own experience and to take account of what other people may have said about an issue (Baumfield et al., 2013, p. 161).*

Members of the group valued this opportunity to discuss research, which some described as ‘reassuring’. It was seen to be especially valuable when talking to senior leaders who do not have an EYFS background.

> *It’s always good to hear that you are on the right track or thinking the right way (Setting 5)*

My visits to settings also provided opportunities to discuss specific research. Again, this came from both me and the practitioners, and again this could have been made a higher priority.

While I did not explicitly ask participants about their own use of research, one of the participants talked in her initial interview about the fact that she read and reflected on research regularly.

> *I tend to use research and read …and sort of look at recent thinking … I think it is to reassure myself, [and ask myself] ‘is this right?’ (Setting 3)*

Using research can be very useful but not all teachers value it in the same way.

> *I heard two teachers talking, they didn’t realise I was a teacher. And they did say ‘I keep getting this paper to read, that paper to read … what a waste of time. I mean I’ve got my planning to do’. Now I’m the complete opposite of that. (Setting 3)*

The above quote refers to teachers outside of the project; all members of the group seemed to be eager to engage with research.

It would have been good to discuss research more critically and explore alternative findings, but there was limited time at the group meetings. Ideally the project would have made more links with the literature, existing research and data (Nind &

Lewthwaite, 2018), however, it was still a more systematic approach than normal reflective practice.

The participants' engagement with action research could have provided an opportunity for them to learn more about how to evaluate research more generally. This could result in them becoming more receptive to using research in the future (Noffke & Zeichner, 1987).

It would have been useful to ask all of the participants whether they used research and if so, what they accessed and how they used it. This would have allowed me to evaluate whether being involved in action research had made an impact on their use of research.

8.10. Data collection

All settings were visited at least once. Most were visited twice, usually at the beginning and end of the project. During these visits I observed practice and interviewed participants.

Interviews included questions about the participant's project and the action research process. During the visits, I tried to use my role as observer to support the practitioners to reflect on their projects and clarify their thinking. Audio recordings and field notes were written up after each meeting. The transcripts were analysed using NVivo. I analysed notes from interviews, visits and group meetings using the process outlined in section 4.2. The analysis was undertaken in relation to the research questions and codes were identified based on the finding from Cycle One and Two; these related to different technologies, teacher beliefs and pedagogical approaches.

The action plans (Appendix D, section G) included a section on evaluation and the group were encouraged to think about evidence they could use to judge the success of their actions. There was no mandatory way of evaluating the projects or expectation that they should be written up. The group did examine outputs from other research projects (Higgins et al., 2006) and prompts for discussion were provided (Appendix D, section H). Workload was an issue and most made use of evidence that they already had access to e.g. progress data. The focus was on providing evidence that would support their decisions about which actions to continue and what changes they wanted to make to the project. Most evidence came in the form of oral reports; this is not unique to this project. Somekh (1995) describes how discussions can move on a practitioner's thinking.

At the end of the project members of the group were asked to complete an evaluation questionnaire which provided extra details about the action research process, see Appendix D, section J for more details and Table 49 in Appendix D, section K for a summary of responses. Not all participants were part of the project at the end, but questions about the action research process were threaded through interviews from the start.

8.11. Data analysis

In Chapter 2, I said that in an ideal action research project participants would be involved in all elements of the research from planning to analysis to writing up, as this means that findings are more likely to be valid (Argyris & Schön, 1989). I also made the point that this is not always possible,

The participants were involved in all stages of the practitioner projects. They planned and evaluated their own projects but, due to their workloads, they were not expected to formally write up their findings. They were not directly involved in the data analysis for this stage, though the findings from this process were shared during group meetings. They were also used to produce overviews of each project (see Chapter 9). Findings from the overarching project and the written overviews were shared with members of the group, so they could check them for accuracy. Participants were also given the opportunity to review and comment on the final write up of the whole project.

8.12. Summary

This chapter has provided an overview of the action research projects. For the participants the aim of these projects was to improve an element of their practice. They identified a problem they wanted to solve, then used the action research approach to try and find a solution. They were the drivers of their own projects; they decided how to plan their project, record their findings and analyse the effectiveness of what they had done.

For me, the aim was to support these practitioners with their aims but also to evaluate whether an action research approach was appropriate when supporting educational professionals to use educational technology. This meant that as well as using the group meetings to discuss their projects, we also tackled some of the key issues that were identified during earlier cycles.

We all worked on our own individual projects, but we also collaborated through whole group meetings and my visits to the different settings. We were able to provide support and challenge for each other.

The following chapter provides an overview of the individual projects and Chapter 10 discusses the findings of these projects. An evaluation of my overarching research, including Cycles One and Two, can be found in Chapter 11.

Chapter 9. Cycle Three: Practitioner Projects

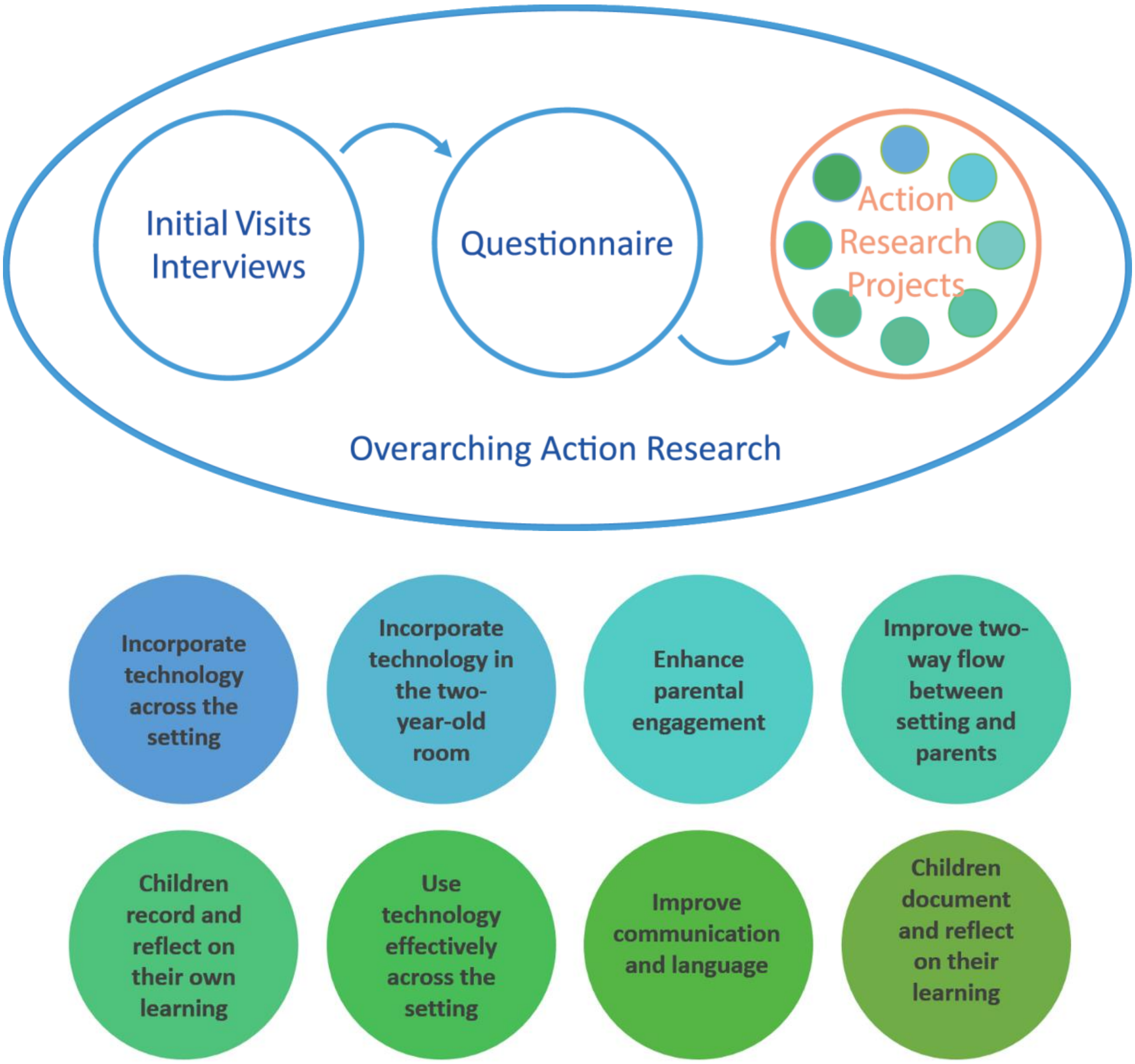


Figure 23: Action Research projects' focus

> *What 'is going on' is made intelligible by reference to the subjective meanings ascribed to it by the participants… accounts of dialogue with participants about the interpretations and explanations emerging from the research should be an integral part of any action-research report…* (Elliott, 1978, p. 356).

It would not be possible to write this thesis without providing an overview of the participants' research projects. Each project had a specific focus, see Figure 23. It is not possible to go into detail about each of them, so this chapter contains a brief overview of each one.

While all participants initially completed a project plan (see Appendix D, section G), the information these provide varies between the settings. Each person planned and evaluated their project in their own way. Not everyone produced a written evaluation or kept the project plan up to date. I used field notes and recordings to record interviews and observations conducted during visits to the settings. Discussions at group meetings were also recorded. All audio recordings were transcribed. The information in each overview was taken from the project plans, field notes and transcripts.

The overviews include:

- Information about the setting and the practitioner's role within it
- A summary of where the setting and practitioners were at the start of the project e.g. what their attitudes towards technology were, what technology they had access to, how they were already using technology
- Their project's aim
- A summary of what they did
- An evaluation of their project
- A summary of where they were at the end of the project
- An indication of what they planned to do next

Some key themes had emerged when talking to the participants about their projects during the initial visits:

- All projects had a clear focus on teaching and learning; technology was being used to support this rather than being the focus
- All projects involved introducing children to technology; it was not just the adults who were using technology
- Most participants spoke about the importance of the adults' role; all projects had adults supporting the children to use technology, rather than simply providing technology and letting children use it independently
- All settings spoke about the value of being part of the project and the positive impact it was having on their class or setting
- All participants mentioned barriers or challenges they have had to overcome while working on the project.

Several members of the group used pupil progress as a measure of the impact of their project. To do this they used information about how many pupils were making ‘expected’ progress or ‘exceeding’ progress. This refers to the judgement practitioners need to make for each child and each ELG.

According to the Standards and Testing Agency (2017, p. 15), the judgement must say whether the child’s learning and development is:

- best described by the level of development expected at the end of the EYFS (expected)
- not yet at the level of development expected at the end of the EYFS (emerging)
- beyond the level of development expected at the end of the EYFS (exceeding)

The Early Learning Goals (ELGs) levels for the technology strand and how they fit with the different levels are shown in Table 22, (School Improvement Liverpool, 2013).

Table 22: Explanation of progress levels

Judgement Level	Understanding the World: Technology
Emerging	Completes a simple program on a computer. Uses ICT hardware to interact with age appropriate computer software.
Expected	Children recognise that a range of technology is used in places such as homes and schools. They select and use technology for particular purposes.
Exceeding	Children find out about and use a range of everyday technology. They select appropriate applications that support an identified need, for example, in deciding how best to make a record of a special event in their lives, such as a journey on a steam train.

There are limitations to this approach, especially given the earlier discussion about the appropriateness of the early years curriculum with regard to technology. Members of the group felt that it was easier to get ‘exceeding’ in technology than in other areas of the curriculum, especially maths and writing.

Most members wanted to do more than teach the technology part of the curriculum. They wanted to use technology across all subject areas and to support all characteristics of learning (see section 3.7).

9.1. Setting 1

Setting	• Preschool
Practitioner	• Manager • Only member of the group who attended all meetings
Description (at the start of the project)	*The problem is knowing where to start* • Described her skills and knowledge as limited • Colleagues had more skills, but she wanted to be able to model how technology could be used • Setting had limited funds and technological resources
Aim	• To be more ambitious in their use of technology • To expand the use of Tapestry[2] to enable children to reflect on their learning • To increase the use of technology by specific children • To increase practitioner knowledge and confidence
Actions	• Developed the use of Tapestry; they already uploaded photos that were shared with parents, many of whom were in the armed services and away from home • Meetings and visits were opportunities to find out about what technology was available and how other settings were using it • The project provided some resources • Staff discussed how technology sourced through the project could be used • Fundraising activities resulted in purchasing additional resources • Tried out activities using EdTech; these were of varying success as old or broken equipment meant they did not always go to plan • Meetings were a regular prompt to think about technology and often led to staff discussions about how it was being used
Evaluation	• The only member of the group to use the action plan throughout the project as a tool for reflecting on the project • Observations of how children were using technology
Outcome (at the end of the project)	• Increased personal knowledge and awareness of how technology can be used effectively • Increased use of technology by all staff within the setting
Next steps	• Revisit activities now they have better equipment • Think about the rules for using EdTech and the practical issues that may be faced e.g. accessible storage, managing batteries

[2] Tapestry is an online learning journal - https://www.tapestry.info

	• Make Tapestry a part of the everyday routine to support children's reflection and parental engagement,
Key messages	*It's important to identify the learning needs before identifying how to use technology.* *The project supported us to explore what was possible; it was useful to link into a wider network and visit other schools.*

9.2. Setting 2

Setting	• Stand alone nursery
Practitioner	• Teaching assistant (manager also participated in early meetings) • Left the project after a year - moved to another setting
Description (at the start of the project)	*I want to develop my knowledge and have time to find appropriate resources* • The setting already had a range of technologies which were readily available for children to use • The setting had recently expanded their provision to two-year-olds
Aim	• To develop the use of ICT to support the children's learning, especially in the new two-year-old room
Actions	• To introduce ICT into the role-playing area • To explore the use of iPads for children to document their own work
Evaluation	• Observations of how children were using technology • Documenting conversations with parents who commented on changes
Outcome (at the end of the project)	• Children's level of engagement had increased • Practitioners were being supported to reflect on how children were learning in the different areas
Next steps	• Follow children's interests • Explore the use of social media to support parental engagement

9.3. Setting 3

Setting	• Nursery class within a primary school
Practitioner	• Class teacher • During visits to the setting, I met a range of staff (from the head teacher to the caretaker) who were all keen to talk about the use of technology in the school
Description (at the start of the project)	*I am a technophobe I don't think they [the children] need any more technology I think these [indicates some of the resources] last [clicks fingers] and then … I can do lots of other things that are more important, I have to say, sorry* • At the start of the project, she described herself as a technophobe who was unconvinced about the benefits of EdTech • She had already tried out the use of email for parental engagement • The setting had a range of resources that could be used by the children • Children were taught how to use, and look after EdTech, this was done alongside EdTech being used to support specific learning objectives e.g. using remote-controlled cars to learn about colours and shapes
Aim	• To set up and create electronic learning journals using Seesaw[3]. • To support regular two-way flow between school and home.
Actions	• Developed strong links with LA and Trust advisory teachers • Introduced Seesaw as an electronic learning journal • Implemented and evaluated apps discussed at group meetings and recommended by advisors
Evaluation	• Oral reports about activities • Interested in more formal evaluation *I'm going to have to do a more in-depth evaluation, I think. I think I'll do that properly in the Easter holidays when I've got time to reflect out of school.*
Outcome	*The project has changed my whole mindset*

[3] Seesaw is an online learning journal - https://web.seesaw.me

(at the end of the project)	• Shared her knowledge about the use of EdTech at an international conference • Described project as 'empowering' • 100% take up of Seesaw after initial parental meeting • Seesaw was introduced in other classes higher up the school
Next steps	• Explore how the new systems will work with the new two-year-old provision • Still some practical issues to address e.g. setting up backups • Address concerns from some parents e.g. who can access photos of their child
Key messages	• Working with advisors helped to increase confidence *But when you do [make contact], it is exciting, once you make a start you think 'I could have been doing it all the time'* • There is a need for discrete instruction on how to use EdTech safely

9.4. Setting 4

Setting	• Reception class in primary school
Practitioner	• Class Teacher / ICT Coordinator • Left project after a year - maternity leave
Description (at the start of the project)	• Shared room with nursery class • Had access to a range of devices
Aim	• Initial aim was to increase cross curricular use of iPads in the classroom and increase staff confidence • This developed to children recording and reflecting on their own learning • Aims came from school's self-evaluation which showed that they had lots of evidence of children's work on adult initiated activities but not of child-initiated activities.
Actions	• Introduced Seesaw • Organized a parents' session to introduce them to Seesaw • Supported children to use EdTech independently, encouraging them to decide what they wanted to document by taking photos, adding audio and adding this to their own area on Seesaw

	• Supported children to use QR codes to upload their work • Staff supported the use of iPads including having children use apps discussed at group meetings
Evaluation	• Monitoring take up of Seesaw over the year – 58% in EYFS compared to 33% in the rest of the school • Getting feedback from parents through questionnaires
Outcome **(at the end of the project)**	• Have evidence of a broader range of activities including child initiated • An increase in children's engagement with EdTech • The biggest impact was with parental engagement; in the past only a few parent helpers were aware of what children were doing in class or on trips
Next steps	• Address practical issues, e.g. children learning to log out of the system so it is ready for the next child • Allow parents to upload and add comments to Seesaw, start by providing information about what it is appropriate for parents to do and say • Continue to support children to use Seesaw independently, build up their confidence, support them to move on from recording what they enjoy doing to recording what they are learning
Key messages	*The parents get to see things like music lessons and PE lessons which you can't see in a literacy or maths book*

9.5. Setting 5

Setting	• EYFS provision in a primary School
Practitioner	• Year 1 Teacher / EYFS Lead
Description (at the start of the project)	• A confident practitioner with a good knowledge of apps and what EdTech is available • Already using EdTech regularly
Aim	• To increase the number of children leaving the unit at the 'exceeding' level of development • To establish an evidence bank, to record evidence of independent, reflective learners; this is currently evidenced mostly by information collected by the teacher during teacher-initiated tasks • Aims came from school's development plan

Actions	• Introduced iPads to record learning and not just for app-based activities • Used iPads to evidence children's learning from the children's point of view
Evaluation	• Monitoring progress data
Outcome **(at the end of the project)**	• At start of the project very few children were judged as exceeding expectation in the use of Technology, this increased significantly to 28.8% • Increased confidence of children when sharing reflections on their learning, producing evidence of a wide range of activities • Children having a growing understanding of what is valuable evidence of their learning
Next steps	• Embed the use of EdTech, support children to document and reflect on their own learning • Move on from using photos to record work to using videos *if the children say what they are doing at the time they record it you get better results than if they reflect on a photo later in the day*
Key messages	*You can't just put technology in and expect children to pick them up and use them in appropriate ways*

9.6. Setting 6

Setting	• Nursery / reception classes in a primary school
Description (at the start of the project)	• EYFS Lead / Reception teacher • Left project after a year - long term sickness
Description	*Children are over reliant on tablets, phones and other instant technology, a lot of children have very little verbal interaction at home* • High number of children who move schools frequently, lots of EAL and other needs • High level of behaviour problems
Aim	• To use EdTech to support language and communication

	• Aim linked to school development plan, language and communication is a major issue for the school
Actions	• Reviewed the ICT provision with the ICT coordinator • Identified how EdTech can be used to promote communication and language • Prioritised the purchasing of resources to support project e.g. Talking Pegs • Established clear expectations for children using equipment • Started to discuss the use of Seesaw and QR codes in books for links to electronic evidence
Evaluation	• Oral reports about activities
Outcome (at the end of the project)	• Review of school computing curriculum produced medium term planning for the EYFS classes • Using more EdTech e.g. Talking Pegs and Talking Magnifying Glasses to support children to use language more
Next steps	• Gradually add in more equipment, get the basics embedded first • Introduce more EdTech into role play area e.g. Walkie Talkies in the ‘police station’ • Consider using Seesaw to support parental engagement
Key messages	*It is important to introduce new technologies slowly to ensure they are embedded* *Give them a purpose for using the EdTech, not instant gratification like they would have at home*

9.7. Setting 7

Setting	• Reception class within a primary school
Practitioner	• Assistant Head / EYFS Lead • Another reception teacher joined the project in the second year
Description (at the start of the project)	• A high number of children are referred for speech and language support • Already had access to a range of EdTech • At the start of the project they had 4 staff iPads (at the end of the project they had access to a bank of iPads)
Aim	• Initial aim was to use technology to support speech and language

	• This developed into children having ownership of their learning and using technology to record and reflect on their learning
Actions	• Introduced a range of apps to support discussion or to provide a writing prompt • Used Seesaw to support evidence collection, this was done alongside their use of Floorbooks[4] which tended to involve the same children all the time • Introduced Seesaw to support children to record work by independently using the camera and audio recording apps, these recordings were shared at key group time • Teachers supported children to reflect on their learning • Encouraged independence by showing children how to use the iPad before leaving them to do it by themselves
Evaluation	• Range of evidence available on Seesaw, staff and subject coordinators are better able to see progression • Using progress data *This year we have had the highest number of ‘exceeding’ children with ICT*
Outcome **(at the end of the project)**	• Children enjoy doing the activities other children have talked about • Children now go to more areas e.g. writing area, maths area more often as they want to be able to talk about their work there as well their usual activities • The original intention was to target lower ability children, but the project has been valuable for children of all abilities • Having reviewed the effectiveness of Seesaw they have purchased the full version for the whole school
Next steps	• Support children to upload their work straight to Seesaw • Investigate adding parents to Seesaw • Review other projects from the group to evaluate whether there is something else they could try or improve
Key messages	• Give children time to explore; the first week they just wanted to take selfies but over time they focused more on recording learning • Get the basics in place first *It’s important to have a clear vision when embarking on a project though that vision may change over time*

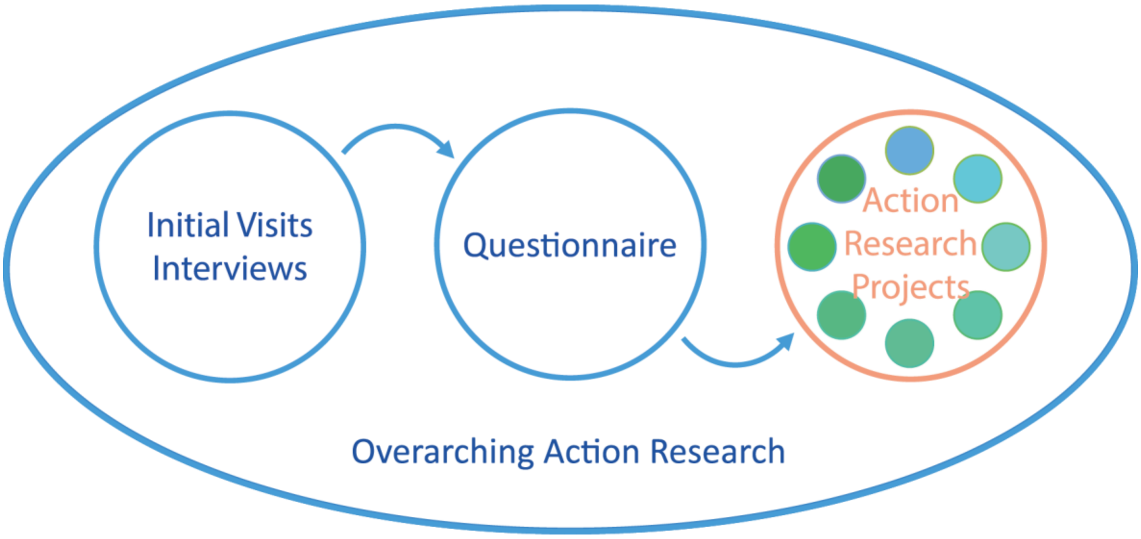
[4] The Floorbook approach is described at https://www.claire-warden.com/floorbook-approach

9.8. Setting 8

Setting	• Pre-school room (3 to 5-year olds) within a standalone nursery
Practitioner	• Room Lead • Joined project after 6 months • Was not able to get to the group meetings but did visit one of the other settings
Description (at the start of the project)	• Had some equipment which children could choose to use • EdTech was not being used for adult initiated activities • Limited knowledge of how EdTech could be used effectively
Aim	• To learn about specific resources and how they can be used with the children • To encourage children to use ICT equipment to support their learning
Actions	• Project provided two training sessions on the use of the setting's IWB and other resources • Training was attended by several members of staff • The project provided some resources • Staff discussed how EdTech sourced through the project could be used
Evaluation	• Using progress data
Outcome (at the end of the project)	• Children really enjoy having the new resources and trying something new • Children are gaining confidence when using the new resources • The children's progress part way through the project was in line with previous assessments
Next steps	• Continue to identify the EdTech that is appropriate for them and their children to use • Continue to monitor progress data once resources were more embedded • Monitor which children accessed EdTech during free choice time
Key messages	*If the staff don't know how to use it how can they support the children?* • EdTech can be used for a range of purposes, not just the one it was designed for

The project plans for each setting can be found in Appendix D, section G.

Chapter 10. Cycle Three: Action Research Findings



Reflections

In an ideal world action research would involve all participants in the analysis. Due to time restrictions it was not possible to arrange a formal review with the group, but findings were discussed during the process, at group meetings and during visits to settings.

Members of the group had opportunities to review my findings, check them for accuracy and review my conclusions.

10.1. Research Questions

Research Question 2: *How can early years practitioners be helped to integrate educational technologies into their practice in a way that supports their pedagogical beliefs?*

- How would early years practitioners like to use educational technologies?
- Is action research an appropriate route to enable early years practitioners to reflect on pedagogy and improve their use of technology?

There may not be a natural conclusion to an action research project (Somekh & Lewin, 2008a) but it was always intended that the projects would last at least a year and that practitioners would aim to complete at least one full cycle. Most of the practitioners stayed with the project for two years, though some left after the first year due to personal circumstances. Not all participants completed the same number of cycles and this could have been anticipated, even for the participants who stayed with the project for the full two years. Cycles are not a fixed length; a single cycle can last days or months (Somekh, 1995).

10.2. Pedagogical beliefs

At the first group meeting participants were asked to share something from their class that they felt was a good indication of their approach to teaching and learning. While they were encouraged to discuss any aspect of their practice, most chose to share experiences of how they were already using EdTech.

After this discussion the group identified key words and phrases that reflected their approaches:

- Child-centred
- Promoting independence
- Purposeful activities
- Challenging the children
- Supporting assessment
- Encouraging reflection and discussions about how they, the children, learn
- Creativity
- Giving children a voice

Participants were not selected for their beliefs and there was no expectation that they would have a particular pedagogical approach. It is, however, no surprise that members of the group tended towards a child-centred, exploratory approach to pedagogy. Section 3.8 showed that this is the most common approach in early years settings.

> *I can change the technology to my teaching and learning rather than me having to adapt my teaching and learning, and my pedagogy to fit*

in with the technology … Which makes me feel much more happy, confident, and interested to go forward. (Setting 3)

The above quote came from an interview during one of my visits to the settings. It supports the view that beliefs can have an important impact on how EdTech is used, or even whether it is used at all, as discussed in section 5.3. This practitioner was clear that her pedagogical beliefs should determine her practice; technology should not be the driver.

10.3. What is Educational Technology?

The question of what the term 'educational technology' meant was discussed at most meetings, I did not provide a definition for the group. At the first meeting, the group were asked how they used education technology; this allowed me to gauge their understanding of the term.

Examples of activities included:

- Using apps to enthuse children and encourage them to write
- Using apps and devices to support speech and communication
- Recording children's learning with Floorbooks, photographs and video
- Supporting children to reflect on what they have done and what they have learned
- Using apps to support a learning challenge curriculum
- Supporting learning outside the setting
- Using email to engage parents
- Children using broken technology, taking it apart, writing about what they would make with it

As the other cycles of this research suggested, technology was being used in pedagogically appropriate ways with limited use of 'drill and practice' activities.

One of the benefits of the group was the opportunities it provided for discussions about resources. Participants were introduced to new resources and to new ways of using existing resources, some of which can be used in ways the designers did not intend.

Figure 24: Examples of EdTech for early years

For the second group meeting we went to a City Learning Centre and were able to explore the wide range of resources they had that were available for settings within that local authority to borrow (Figure 24). This gave the participants the opportunity to explore a range of educational technologies that are appropriate for early years settings. Members of the group were also able to share their experience of EdTech in their own settings; what they found useful and what did not work so well.

They liked robust and flexible resources which supported particular aspects of learning, e.g. speaking and listening, and were easy for the children to use.

There were some resources that they did not think would be appropriate; reasons included:

- too easy to damage or chew
- too noisy for a busy classroom
- having hidden charges e.g. having to buy recordings of stories on top of an audio device
- practical considerations e.g. how easy it was to charge devices; whether children would be able to use them independently; whether audio devices pick up too much background noise; and how easily young children with small hands would find it to use a device.

In an ideal world

The practitioners talked about the resources they already had and were asked about what other resources they would like. Answers included:

- More equipment, especially iPads, so that technology was available all of the time and not seen as a novelty or something to fight over
- Video cameras or other devices that could record children's activities and support communication and language
- Access to an ICT expert who could help them develop their knowledge
- Tools to support parental engagement and communication to help practitioners know what children are doing at home, and to share information with parents about what children had done in the setting – e.g. Tapestry, Seesaw, email or Twitter

At a later meeting the group were asked to sort cards which showed images of a range of resources (Figure 25). The group were not given any instructions about how to sort the cards. My aim was to get a definition of 'educational technology'.

Figure 25: Discussion cards for 'What is educational technology?' activity

Nearly all cards went on the educational technology pile. They thought pencils and paper were probably not technology but there was a discussion about some things being seen as technology in the past, even if they were no longer seen that way.

The group felt all technology could be educational depending on how and when it was used.

- Some technology would only be used by adults, e.g. a USB stick
- Domestic technology like microwaves and washing machines could be used for looking at numbers and count downs
- Things with buttons to press were good for the youngest children e.g. babies and toddlers but not older ones.

When the group was asked for a definition of ‘educational technology’ they said:

- Education is supporting some sort of learning, the development of knowledge or skills
- Technology allows you to do something that you would not have been able to do without it, or to do something in an easier or more efficient way.

10.4. Evaluating EdTech

The next exercise was based on triadic questioning where participants were given three objects and asked how two of the items were the same and how the other one was different (Higgins & Moseley, 2001). In this case, the group were shown three random cards and asked which one they would want and which two they would not. This led to discussions about:

- the use of technology (real and otherwise) in role play
- keeping children safe, e.g. children knowing that they should not use technology to communicate with people outside the setting
- whether games were useful or not; whether children needed to learn how and when it was appropriate to use games or if is it better to do things for real e.g. bowling outside rather than using a bowling game on a Wii
- making sure children learn how to cope if they are not able to choose technology all the time
- whether some technologies may be appropriate for different ages e.g. tape recorders for younger children, iPad recording apps for older children.
- whether some aspects of technology can be dangerous and, if so, how children can be taught how to behave around them e.g. hot bulbs in overhead projectors

Given the choices they had, the technology they would choose included:

- Robot Dog – children can learn about caring/nurturing, children could work together to use it rather than using it in isolation
- An Interactive Book – children or adults can add their own pictures and audio recordings; this book could be used in lots of different ways and would be useful for supporting speaking and listening
- Metal detectors – can be used as a group activity; children are not using the device to learn about technology but to support learning in other areas. The device provides an experience they probably would not get outside of the setting
- Toy microwave – several members of the group already had these and they are well used in their settings; they are familiar and encourage lots of language and role play

Given the choices they had, the technology they would not choose included:

- Toy laptop – the group felt this would be used by children working in isolation; there are not many different ways of using it
- Remote control car – children may all want it at the same time and may fight over it
- Video camera – there may be other devices in class that will take videos; if there were not, they would choose this
- Electronic book – ‘I can read the children a story’
- Music keyboard – ‘there are lots of way to make noises in the classroom’

When they were given all the cards to choose from and asked to choose three items they would definitely want in their setting, all of the practitioners chose iPads. They also chose:

- Talking pegs or tins
- A sensory room
- A lightbox and/or overhead projector

Their main considerations when choosing devices were:

- Is the resource flexible – can it be used in lots of different ways?
- Can it support communication and language?

- Can it be used in collaboration with others?
- Is it practical e.g. is it robust, does it fit in with other resources in their setting?

10.5. How is EdTech being used?

As the overviews of the settings in Chapter 9 show, the members of the group were at very different stages in their use of technology and had different attitudes towards EdTech; this was reflected in their comments made during the initial visits.

I've also just taken over as ICT coordinator this year so that's fun (Setting 4)

I have to say I am one of the technophobes, very much wary of technology. I do like it, I do want to embrace it, but my confidence is a major factor… I still have those anxieties which I want to dispel (Setting 3)

I find a lot of my children, they have iPads and things at home and are quite good at using them. And then if you look at the EYFS alongside it, they can sort of do what they need to do at the end [of the EYFS] … it's about using it in a way that challenges them and is appropriate (Setting 7)

All of the settings were using technology to some extent and some settings were already using a range of technology effectively to support teaching and learning. Some examples of how technology was used at the start of the project included:

- Using digital cameras to record activities, so children could reflect on them later (Setting 1).
- Children learning to take turns when using remote controlled cars (Setting 2).
- Children using remote controlled cars and a large mat on the floor with pictures of different shapes and colours. They were learning to control the cars and using language about shapes, colours and directions (Setting 3).
- Children working in groups with a School-Centred Initial Teacher Training (SCITT) student and using Story Creator on an iPad to sequence photos of an

activity. Children used the audio record function to add a commentary (Setting 4).

- Using a Green Screen app on an iPad to record children acting out ‘We’re going on a bear hunt’, sharing the recordings with the class and more publicly on social media and the setting’s website (Setting 5).
- Teaching children that they need to use technology for a purpose; they cannot do what they would normally do at home and access it as a toy whenever they want (Setting 6).
- Using apps, e.g. Morfo, to support the development of language skills (Setting 7).
- Children using cause and effect software, so they can see how their actions using the mouse or keyboard make things happen on the screen (Setting 8).

Some of the ways the practitioners were using technology at the end of the project are described in the overviews in Chapter 9. These included:

- Using Talking Turtles to sequence nursery rhymes (Setting 1).
- Introducing technology into the role play area, e.g. a light table was introduced when it was set up as a hospital (Setting 2).
- All parents accessing Seesaw to share information about what the children were doing (Setting 3).
- Using Seesaw and QR codes to allow children to document their own learning (Setting 4).
- Using iPads for recording learning and to support reflection (Setting 5).
- Using new equipment in class after establishing clear expectations for how it should be used (Setting 6).
- Using Seesaw to evidence learning and for children to record independently what they had been doing; sharing these recordings at group time (Setting 7).
- Children exploring the setting’s new resources (Setting 8).

Some projects were still at an early stage of using technology and not all of the uses were innovative if compared to some other settings, for example, digital portfolios have been used to support pupils’ reflection for many years (Wall, Higgins, Miller, & Packard, 2006). The uses could be seen as being innovative within their own settings.

10.6. Barriers to the use of EdTech

> *I thought if I use that, I've got to do this, and this, and this… [and] trying to match that with my ingrained beliefs and pedagogy. If it doesn't fit, it's very much a battle for teachers and I think that's what puts them off (Setting 3).*

This also supports the view that practitioners want to be able to use technology in a way that supports their pedagogical beliefs. This practitioner had believed that technology had to be used in a particular way which did not match her usual approach to teaching and learning.

This provides support for the view that beliefs can have an important impact on how, and if, EdTech is used. While this seems to be about intrinsic barriers, a group discussion suggested that extrinsic barriers were still a significant impediment to using EdTech.

The group identified a number of barriers:

- Access to resources; the participants came from different settings and not all of them had access to much EdTech.
- EdTech resources can be expensive.
- Some technology can be easily broken.
- EdTech can be seen as a novelty, it needs to become an everyday resource.
- Some of the group lacked knowledge about what EdTech is available and how it can support teaching and learning.
- Some practitioners lacked confidence.
- Parents may be reluctant to engage with EdTech. In one setting they were reluctant to look at children's work on iPads but enjoyed looking at Floorbooks.
- Some settings had limited time to train children and staff to use EdTech purposefully.
- It can be difficult to manage resources that are not available all the time.
- Settings can experience technical problems e.g. problems with accessing Wi-Fi.

These responses support the findings of the interviews as outlined in section 4.5.3. Unlike the findings for schools which have been reviewed in the literature, extrinsic barriers were still causing problems. There were also a number of challenges that related to the ‘final frontier’ of intrinsic barriers described by Ertmer (2005) (see section 3.11).

Just because a barrier is perceived, it does not necessarily mean it is having an impact on the setting (Plumb & Kautz, 2015). It is also possible that practitioners may not be aware of the real barriers they face. For example, some of the settings had limited access to EdTech. As part of the project, a commercial company donated some resources which were given to the settings with the least amount of EdTech. This could have been seen as a way of overcoming this barrier, but these settings did not significantly increase their use of EdTech as soon as the new resources arrived. As part of the project these settings spent time on familiarisation with the resources, training and planning before the resources were introduced.

This could be seen as an indication that asking practitioners about barriers may not be the most accurate way of getting the relevant information. Alternatively, it could be that these practitioners had moved on from seeing technology as something for the children to ‘play with’ or explore, to seeing that EdTech can be purposeful and linked to specific objectives and needs more time to set up.

10.6.1. Attitudes towards EdTech

The group discussed attitudes towards educational technology a number of times. In order to join the project participants had to be interested in developing the use of technology in their setting, so it is not surprising that all of the participants felt that technology could support teaching and learning. An analysis of the discussions at the first group meeting suggested that there was a very consistent view from all members of the group. They felt that EdTech could be used anywhere and could support the whole curriculum, but they believed that the technology should not be the most important thing. EdTech should only be used if it supported the practitioner’s learning objectives. EdTech was seen as a resource that could be integrated across the setting but there was also a view that sometimes it was necessary to have discrete ICT lessons either to teach children how to operate devices or software, or to teach them rules about how to look after them.

> *I think [technology] can be anything, anywhere, you just need to make sure it’s not the most important thing… it needs to support the rest of*

> *it, not being the key thing, you are not using technology to get there, you are using technology to support… (Setting 5)*

While attitudes were generally positive, some of the group felt there were times that technology was not appropriate, and one participant was less enthusiastic than the others.

At the first group meeting one of the participants (Setting 3), talked about the use of Floorbooks in her setting. As she was describing her practice, she said that she did not think that electronic journals were appropriate for ‘our children or parents’. She talked about parents’ evenings and felt that parents within her setting were reluctant to access EdTech. They were much more comfortable looking at their child’s work in their traditional books.

> *I’ve had iPads out on the table for parents to look at and listen to parents go ‘er I’ll just leave that’; they immediately go back to the books (Setting 3)*

I talked to the group about the previous stages of this research and at the fourth group meeting I shared responses to the question about attitudes from the questionnaire as described in section 6.5.5.

The group were given examples of some of the responses to discuss, see Figure 26.

From their discussion, I was able to identify themes which provided more information than I had gained from the initial discussion mentioned above.

The group felt that technology can be very useful for keeping children occupied, but there needs to be a clear purpose for using it. They thought that if a setting had too many devices, children could end up working on their own with a device, which could affect their confidence, speech and language. Using technology too much can mean they are over reliant on the device and they do not develop other skills, for example, they thought that some children are not using pencils and pens at home, just iPads. They can come to the setting without being able to hold a pencil.

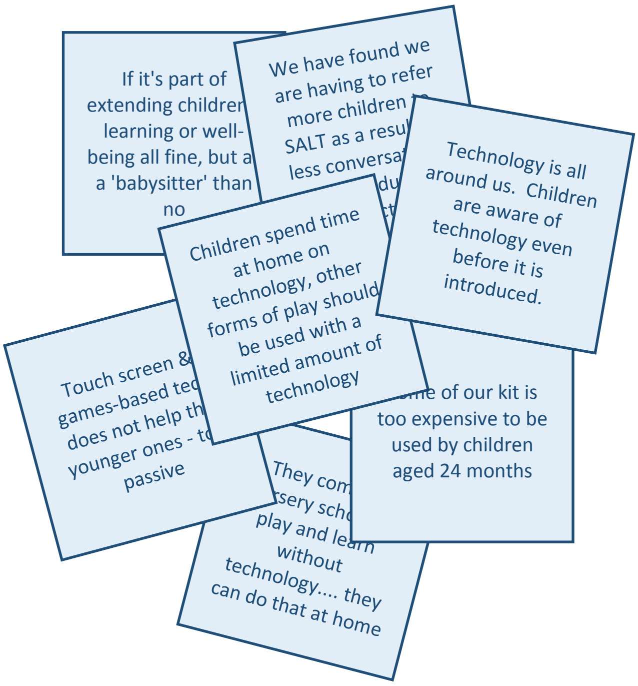


Figure 26: Prompt cards for 'Attitudes towards educational technology' discussion

The group never completely agreed or disagreed with a statement. The discussion showed that this is a complicated area, with different views that could vary depending on context.

There was some discussion about the fact that children may have access to a lot of technology at home, so a setting might feel that they do not want to use too much technology. Alternatively, children may have very little technology at home and the setting may need to fill this gap in their experience. The group felt that it was necessary to be selective in how technology was used, and this might vary depending on catchment area and what children were doing at home.

Further details of answers to question 16 of the questionnaire can be found in Appendix C, section A.

10.6.2. Technology in the Early Years curriculum

Reflections

In a previous role I worked with teachers to develop online content to support teaching and learning. I always tried to ascertain teachers' ideas first, to establish what they wanted the resource to be able to do. Only then did we look at the technology and what it was possible to do with it. It was not always possible to create the content the teachers wanted and sometimes compromises had to be made. Technology can have limitations; it may not do everything you need it to do. But it is changing, as technology evolves you can revisit approaches and get closer to your original intentions.

When using technology to support the curriculum, you can only work with the resources you have at the time. If it does not match your learning objectives you may need to do things in a different way, or it may be more appropriate to not use technology at all.

We're looking at the ICT curriculum as well and haven't seen a lot that would be challenging them, so we've used it more as a way to hit the other areas like speech and communication (Setting 5)

Over the course of the project most of the group talked about technology in the EYFS curriculum (Standards and Testing Agency, 2017). There was a common feeling that the curriculum was quite simplistic and that it would be easy to assess the children as having met the technology ELG quite quickly. They felt the Statutory Framework did not show the wide range of ways that technology can be used to support the whole curriculum (Standards and Testing Agency, 2017). Development Matters does show how this can be done (Early Education, 2012).

For me, it's hitting those characteristics of learning, having conversation about abstract thought, using technology to bring abstract to reality, the vocabulary that you get from using reflection, photographs… (Setting 3)

The group did feel that EdTech could be used to support more than just the Prime and Specific Areas of the curriculum, it could also be used to support the Characteristics of Effective Learning (see section 3.7).

The Understanding the World strand is not just about educational technology in terms of using devices or programs. It can also relate to children finding out about how things work. One setting was using broken technology to do this.

> *We had something in our classroom last year, the invention shed where the junk modelling area used to be, instead of having it the middle of the room making a mess we've put it in a specific area called the invention shed… (Setting 5)*

> *… that was really successful for the boys' writing … all the language that comes with ICT within the foundation stage doesn't have to be done on something that works, it's about pressing buttons and making things work… that button's going to make that work… the idea of ICT without it having to [work] … (Setting 5)*

At the third meeting, the group was introduced to the Barefoot Computing 'Computational Thinker' diagram[5] (Figure 27) which shows some of the key computing curriculum terms that children are introduced to in Key Stage One.

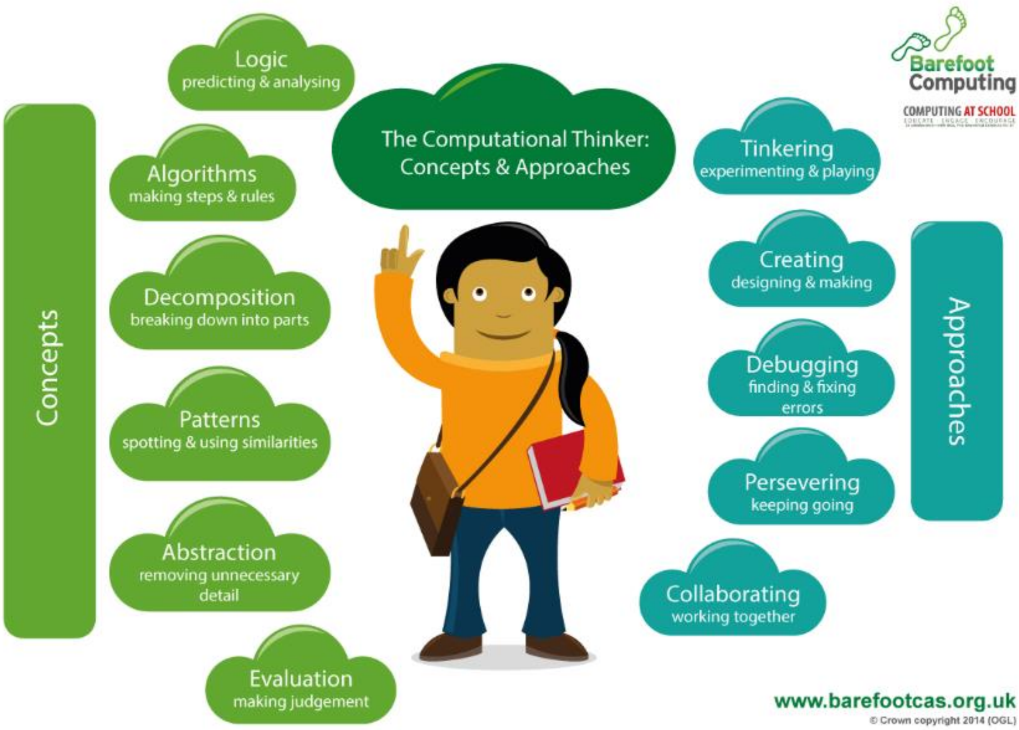


Figure 27: Barefoot Computing: Computational Thinkers

The learning approaches of tinkering, creating, persevering and collaborating were very familiar to the practitioners and regularly happened in their settings.

[5] https://barefootcas.org.uk/barefoot-primary-computing-resources/concepts/computational-thinking/

After a discussion about what the terms meant, members of the group agreed that they were covering a lot of the concepts already, albeit under different names, and that using these words could be useful when talking to practitioners who were not early years specialists. The language could be used to show how some activities that may look like play can be teaching quite complex concepts.

- **Logic** – children can build on what they already know
- **Algorithms** – children can do things step by step and follow instructions, these can become established routines
- **Decomposition** – children can break down big problems into little steps
- **Pattern recognition** – children are able to identify and recreate patterns
- **Abstraction** – children can put aside things that are not important
- **Evaluation** – children can reflect on what they have learned, what did they do that worked or did not work, and why was this?

> *We did a flow chart for getting ready at home time … so we did it all together as a class… at first, it was just the novelty of reading it … after a little while they started getting it … they enjoy doing it that way (Setting 3)*

> *I'm quite impressed that I can do algorithms... it makes you see getting ready for lunch in a whole different light (Setting 1)*

None of these activities have to involve technology or devices; the concepts can be taught through problem solving. There is a growing recognition that computing is not just about what you do with a computer or another device. It is important to identify what you are trying to achieve and then decide how, or if, technology will be able to support your objectives. It may be useful to think about these concepts more and see whether computational thinking can be used as a way of supporting learning dispositions in the early years.

In section 3.2, I mentioned that Reiser and Ely (1997) defined Educational Technology as being the devices or applications used to support education, but they also described how the term can mean the process of teaching and learning. This group of practitioners were starting to use the definition in its broadest sense.

Comparisons with training

Feedback was collected throughout the project. Even participants who left before the end were able to comment on the value of the action research process. Everyone said the project was better than traditional training.

Members of the group were able to provide examples of CPD they had attended which had not been implemented.

> *I went to a conference in London on self-motivation in June and still haven't had time to sit down and think and reflect about it … that's why [this] project is useful because I'm more likely to make that time even if it's just before coming here. (Setting 1)*

Training could be useful for learning new things but often it was not aimed at their specific needs so was not put into practice. Action research allowed them to focus on their own priorities and regular meetings meant they had to reflect regularly, so they could share their progress with others.

> *With training, a lot of the things you look at are 'yes that's brilliant' but then you come back into the classroom and you just fall straight back into the old routines and you forget about things … [with this project] I've always had a very clear objective… it's very clearly set out ... [and] because I've always had that in my head I have done it. (Setting 4)*

My involvement in the projects was always going to be restricted to two years. All participants who were still with the project at the end of the two years wanted to a continue their projects after my involvement ended. This suggests that the changes in practice were likely to be sustainable. The action research projects had all lasted at least a year, much longer than traditional training. Action research is not for the impatient (Adelman, 1993). They had built on their practice over time, meaning that changes had time to be embedded. This supports findings from previous research that being involved in CPD activities for a longer period of time can help practitioners to embed practices within their own settings (Cordingley, Bell, Thomason, & Firth, 2005).

As well as the time and opportunities for reflection the project provided, some of the participants valued support they got from the group, both from other practitioners and from myself. This is something a short training course is unlikely to provide, though some settings do have access to this type of support from LA advisors. Not all of the group needed this support and participants with less experience or confidence tended to access it more.

> *you go on training and it's very surface learning, it's done and over with. Maybe for a couple of weeks you're keen. What's good in this respect is the long-term contact. So, I know that you can be emailed, if I've got a problem, I can email you and say, 'hi can you help'. It's that sort of offer of help above and beyond…. And also, just having time, and it sounds really basic, having time to reflect with someone like yourself (Setting 3)*

Although they all planned to continue their projects this may not be easy, action research can be difficult to sustain without support (Wallace, 1987).

10.7. Appropriateness of Action Research

Reflections

Although some of the projects used quantitative data as part of their evaluation, most of the data was qualitative. Much of their evidence was subjective and acquired through self-reporting. Is this robust enough to make decisions?
The group did challenge each other by asking questions, I would hope this would encourage the participants to think more deeply than they would normally do.
When we are thinking about improving practice within a particular setting, some might question how rigorously the data needs to be evaluated. The action research process is likely to be more robust than the usual methods practitioners use to make decisions about changing elements of their practice.

The group element seems to be very important to this project, but not everyone benefited from this in the same way. One participant did not attend any group meetings. Did her conversations with me and her colleagues fill this gap?
Most of the participants were involved in the project for two years. Would they have got as much out of the project if it had been shorter? Even the participants who were only involved for a year were able to describe benefits they had seen as a result of their involvement. How long would an action research project need to last for?
Is it possible to know what elements of change came from the project and which came from the participants? Would some of these effects have been seen without the project? What elements of the project were the most important?
While action research should come from the people most closely involved in the situation being examined, it has been appropriated at times by managers and imposed from above. For these projects, while the practitioners formed the core group, there was a need for buy in from head teachers and senior leadership teams. This could mean the headteachers providing the participants with time to be involved, additional technology or authority to roll out findings to other members of staff. Without this buy in the projects could be less successful and empowerment and autonomy could be difficult to achieve.
Each of the questions raised above show the need for future research to provide insights which may help with the planning of future training.

Meeting the settings' needs

The end of project evaluations indicated that the participants' main aims had been achieved. The settings were still at very different stages in terms of using EdTech. For some, the project was a way of exploring what was possible and identifying what resources they needed to purchase. Others already had access to a range of EdTech but wanted to use it more effectively to support their children's learning.

> *I was guilty of 'what do I do with these iPads we've been given?' We just got them out for an afternoon… [but now] we are using the iPad because it really enhances what we are trying to achieve (Setting 7)*

At the end of the project, all participants were able to describe their project's impact and provide evidence to support this; for some this included progress data.

> *This year we have had the greatest number of 'exceeding' children in ICT (Setting 7)*

When progress data was available, it usually showed 'good' progress, with children able to achieve more than in previous years. One setting, which started the project late, spent a lot of time exploring what was possible, rather than implementing new devices or activities. Their data showed no change by the time the new data was collected. They were planning to continue to measure progress and evaluate their data as they continued the project on their own.

Because the projects were all linked to an identified need within the settings, technology was being used for a clear purpose. Some had just started to evaluate what was possible, others had implemented technology in ways that had a significant impact on their children's learning, as evidenced by the progress data.

Even though each participant was able to plan their own project, and there was no expectation that they would all have the same focus, from the start there was a clustering of interests (see section 8.8). Despite the fact that participants were able to reflect on their research questions over the course of the project and change them if necessary, the focus of most of the projects remained the same over the two years. However, some of the activities did change.

They were able to make changes when they were necessary. This was sometimes due to a change in cohort when new pupils came in at the start of the second year. At other times it was due to a change in school priorities which could come from updates to a school's development plan. Sometimes it was due to a natural progression. New software or increased staff experience can mean progress is quicker than expected.

Other factors that influenced the project included what experiences the children came to the setting with, the increased confidence of staff within the setting and increased access to resources. During the project, the practitioners' expectations or knowledge of what it was possible to do with technology also changed.

Each participant had their own specific focus, but they all participated in discussions about each of the projects and the interviews indicated that they were taking on some lessons learned from people who had looked at the other areas. Several of them also let the children they worked with influence the direction of the project.

We had an idea and they [the children] took it in a different way (Setting7)

Collaboration

[The best things were] … the opportunity to 'try' something. Working alongside other professionals in an area that doesn't tend to get the focus that other areas of the curriculum do. The benefit to the learning of children over time and the change in how reflective they are as a cohort (Setting 5 Evaluation Sheet)

The role of collaboration in action research is frequently mentioned, with many people saying it is essential. My group of action researchers said that the links with other practitioners were an important element of the project. However, the amount of collaboration they were involved in varied considerably between the different participants. The participant who was unable to attend any meetings did work closely with other practitioners within her own setting and had regular meetings with me. She also visited one of the other settings, outside of a group meeting.

The fact that meetings were not consistently attended could be seen as a problem, as it would restrict opportunities to develop relationships and build trust (McTaggart, 1998). Only one member of the group attended all of the meetings, but none of them identified this as a problem or as a barrier to the success of their projects. It is not possible to tell from this study how much contact with a group would be necessary or desirable. It is interesting that the only member of the group who said they would not participate in another action research project was the person who did not attend any of the meetings.

The ideas of group decision making and commitment to improvement are seen as crucial in Lewin's work (Kemmis & McTaggart, 1992). This project did not include these elements. It was not a group working on a single project, but a group of practitioners supporting each other to work on their own individual projects. This is not what Kemmis and McTaggart were talking about. This was more like the research 'made public' approach (Stenhouse, 1981). The action research in this instance is not solitary, it is a way of individuals finding, in the company of others, ways to improve what they are doing.

Working alongside others was useful for a number of reasons. The group can play a role in evaluating decisions and evidence and evaluating whether the claims are ‘trustworthy or defensible’ (Johnson & Onwuegbuzie, 2004). The relatively low level of participation may mean that the ‘coherence of arguments’ was not challenged (McTaggart, 1998) and more challenge could have been beneficial.

> *The inquiry mode of investigation implies an evaluation that goes beyond mere observation and description. A diagnostic mode is applied towards the existing situation in order to reveal problems. Evaluation means judgement and judgement entails explicit or implicit criteria. (Goldkuhl, 2011, p. 89)*

While prompts were provided for the group to use when discussing and evaluating their project (see Appendix D, section H), these were not seen as fixed evaluation criteria that everyone had to use so discussions were, perhaps, not as rigorous as they could have been.

Impact on participants

One of the main purposes of action research is for participants to generate new knowledge (Hammond, 2013) this does not mean that it is new to everyone or the educational community generally, but that it is new to the participants and can impact on practice in their setting.

> *In terms of the influence it’s had for moving us on to thinking more about ICT, it has been great (Setting 1)*

In this group not everyone had significantly changed their practice; some were still at the initial stage of reviewing their understanding. But all participants felt that practice in their setting had improved.

Participants wanted to continue to develop their knowledge and skills. While confidence had increased for all participants, it still remained an issue for some. This supports the view that change is an evolutionary process.

> *It's still quite scary I have to say because it's a whole different way of working, but I am excited by it because I can see the potential (Setting 3)*

One person thought they would have been able to make changes to their own practice without being involved in the group, but the project had enabled them to talk to colleagues within their own setting and support them to make changes to their practice.

> *I might have done this myself anyway, but I'm not sure other staff would have (Setting 5)*

Others felt the project gave structure to the development of educational technology within their setting, moving them on from a focus on applications, to a focus on how EdTech could meet their settings' and their children's specific needs.

> *[without the project we] did not have the starting board, a plan for what to do, we started off very much wanting to develop speech and language in our low ability children and that could quite easily have been 'let's buy this app and use that', rather than 'let's develop everybody's speaking and listening and for a purpose'.* It would just *have been 'here are some apps, let's use them'* (Setting 7)

Although all the settings reported using EdTech more often, this did not necessarily mean they were using it a lot, even when they knew it could be used in many ways.

> *It can support anything really [especially] if you look at the SEN stuff, but I would never use it just for the sake of it… we don't use it most of the time (Setting 1)*

They were able to make informed decisions about when, and when not, to use the technology. One practitioner described her visit to one of the other settings and was encouraged to see that technology was not the most important focus for the tasks they were doing.

> *It's nice to see [EdTech] is integrated in the classroom but not dominant, I was sitting with a few [children] talking about them making patterns with cubes and asked them if they preferred to do*

> *that sort of thing or if they preferred to be on the interactive whiteboard. They said they still prefer to use their imagination and to turn the cube boards into ships and Peter Pan scenarios, so it's nice to see it … doesn't just take over. (Setting 1)*

The project did not leave people with all the skills they needed. Participants had different skill levels at the start and this was still true at the end. Settings who had not been using much EdTech before the project had benefited from exploring what was possible. Some had asked for training or other support, and they were now ready to implement what they had learned. Some would benefit from more support.

> *My main problem would be, with all this stuff, that my actual IT skills are so low that I actually could do with some really basic training. Because putting a lot of this stuff into practice is quite challenging really (Setting 1)*

Other members of the group came with more skills and after discussing possibilities were able to go and implement them without too many problems. They were then able to evaluate their actions and identify next steps.

> *As I say I didn't think a technology project would impact so much on the way I work and my self-confidence, but it has and I'm very grateful for that, very grateful indeed (Setting 3)*

The evaluations show that all of the participants valued the project and saw that it had an impact on their practice and on their settings. One of action research's aims is to deepen practitioners' understanding of their own context; the impact of the action research does not need to last for a long time but can inform the practitioners' future decision making (Somekh, 1995). Given that this was the aim of the research, there may be little need to think about a broader impact but sharing findings with others is a way of validating the findings.

Empowering

> *It is dead exciting, and I am really pleased I took part in the project… having it clear in my mind empowers me to be able to talk to others (Setting 3)*

The project increased people's confidence, enabling some of the group to ask for more resources, or to justify their use of EdTech to colleagues who did not see the potential benefits.

> *I'd put my action plan together … we had a meeting with our LA advisor … I said we were doing this … she said, 'I don't see the point' … I was 'I really do' … it has made me re-evaluate [and say] 'no, this is really important for us as a school' (Setting 6)*

Despite some of the language used by the participants, including the use of the word 'empowering', it is debatable whether the project could accurately be described as emancipatory. Emancipatory action research refers to a process where the participants control all aspects (Grundy, 1987).

There is a question about whether participants want to control all aspects or have the time and resources to do so. There is also a question about whether they should be expected to do this, or if they would want to. If they are to be empowered, they would need to have more input to the management of the project. They may manage it differently to an outside researcher. If they were to be more involved in directing and managing the project, it might be important to think about the roles of the participants. Some participants would have more flexibility to take control than others, depending on their roles and their relationships with other staff within their settings.

Practical challenges

The project ran alongside the practitioners' normal busy workload. Although their head teachers/managers had signed a consent form at the beginning of the process, there was no expectation that they would be involved in the project themselves or provide any support or time for the participants to work on their projects. Some of the headteachers/managers had been the initial drivers, they had suggested their setting took part. For most of the participants, they had been the person to identify the project as something they wanted to take part in.

> *when I first spoke to my head and she said, 'what is [the project] is this going to cause more work' and I was 'no cos it's what we're doing anyway, it's part of the action plan' (Setting 6)*

Even though meetings and visits to other settings were seen as the most valuable aspects of the project, as I have mentioned, attendance varied. Exact reasons for this varied, but it was usually due to the challenge of running the project alongside the practitioners' already busy workloads.

> *time and money are big challenges, especially time (Setting 1)*

Three of the group left after a year due to sickness, maternity leave and changing settings. The projects were very much linked to the individuals concerned. The practitioner who moved settings was offered the chance to continue in her new setting, but this was not possible. The other two practitioners would have been able to continue once they returned to their schools but, in the end, this did not happen.

At the first group meeting, we had discussed what the project expectations were. I tried not to put too much pressure on the participants. I did not expect them to do formal planning or record keeping, just what was helpful for them. This could have resulted in too much of an unstructured approach, but participants seemed to appreciate the approach.

> *this is really good … that it's not having great expectations on us it is giving nudges along in the right direction, not great expectations you can't fulfil (Setting 1)*

Despite the challenges they faced, all of the participants were positive about the approach and the impact it had made on their thinking and practice.

> *Once you make a start you think 'I could have been doing it all the time' (Setting 3)*

Only the person who had not managed to attend any meetings said they would not participate in action research again.

It would be interesting to do a more focused comparison between participants who regularly attended meetings and those that were not able to and how this impacted on their experience. Did the meetings provide a better balance between action and reflection?

10.8. Is this 'quality' research?

Did the project make a difference?

Questions have been asked about whether reflective practice results in a significant difference to student outcomes (Timperley et al., 2009). This project aimed to be more rigorous than everyday reflective practice, but it is still an important question. From the evaluations of the projects, it seems clear that these projects did make a difference to the participants, but it would be possible to challenge the rigour of some of the success criteria the practitioners used. Some participants used formal evaluation tools, including parent questionnaires and progress data, but evaluations were often based on informal observations. Were the participants' judgements biased? Did they believe the project was successful because this is what they wanted to see? They had put time and effort into the project and would be keen to identify signs of success.

It seems to me that it might be difficult to identify action research projects that are not successful, at least to some extent, especially when they last for a significant period of time. If things are not working, the action research approach is to use this information to plan the next steps. After two years it may be difficult to remember the things that did not work, as these may be less likely to be recorded during the project. This would be especially true when detailed record keeping was not a requirement. Would the practitioners have seen any outcomes as positive? Literature has been described as being full of positive case studies involving enthusiastic teachers and this could be more to do with the Hawthorne effect than the focus of the research (Selwyn, 2008).

Not all innovations are good or appropriate for a particular setting; it is important to avoid bias towards implementing any new innovation (Phillips, 2015). People who are planning to implement new technologies need to learn what they should not do, just as much as they need to know what could be helpful. This was recognised by the group.

> *And I suppose sharing the mistakes as well, sharing the things that didn't work. Just that friendly sort of relationship is important.*
> *(Setting 3)*

Discussions at group meetings often referred to the challenges people had faced. These were often presented in the forms of key messages or 'top tips' for other members of the group to learn from. Discussions of this type took the form of 'steps along the way' and were not formally acknowledged as a lack of success or a failure.

Prompts were available for the practitioners to use when they evaluated or talked about their projects. These can be found in Appendix D, section H and included:

- What worked – why?
- What did not work – why?
- What could stop it from working?
- How will you know if it works?
- What evidence do you need to continue?
- What evidence do you need to stop?

There was no expectation that they would use these prompts and if they did, they did not have to use them all. While the practitioners involved all felt the projects were successful, it may have been useful to focus more formally on the 'failures'. This could have been useful information for other practitioners wanting to learn from their experience and it could also be reassuring to recognise that problems are often surmountable.

Impact is likely to be the most important element when trying to persuade senior leaders to dedicate time and resources to a new initiative, but it is often the hardest to quantify. When measuring the impact of an intervention, there are four important factors to consider, inputs, outputs, outcomes and impact (Balanskat et al., 2006). Some of these factors can be hard to measure, and the further you move from the initial input the more difficult it is to establish a causal relationship, as the number of potential variables increases. These terms can be interpreted differently, and my interpretation is shown in Table 23. The descriptions are collated from all eight projects and not all outcomes or impacts apply to all projects.

Table 23: Impact Factors - Practitioner projects

Factor	Definition	Practitioner projects
Input	• What resources did the settings have at the start of the project?	• Different settings had different amounts of equipment • Some settings were provided with training • Some EdTech was sourced through the project

	• Were any resources provided as part of the project?	• One setting held fundraising activities to purchase additional resources
Output	• Directly quantifiable • What resources did the settings have at the end of the project?	• Some settings acquired extra resources through the project • Some settings identified and purchased new resources
Outcome	• Measurable outcomes	• EdTech was being used more often • Most progress data showed children working at a higher level • Settings had collected more evidence of children's use of EdTech • Parental engagement had increased • Settings had updated documentation e.g. a computing scheme of work
Impact	• What were the broader results achieved by the project	• Increased practitioner knowledge, confidence and skills • Increased reflection by practitioners • A sense of empowerment • Increased pupil skills • Increased pupil engagement with their learning and with EdTech

These judgements were made by the practitioners; would others agree? See section 11.6.

Research Question 2: *How can early years practitioners be helped to integrate educational technologies into their practice in a way that supports their pedagogical beliefs?*

- Is action research an appropriate route to enable early years practitioners to reflect on pedagogy and improve their use of technology?

My response to the main research question for this phase of the research, is that action research is appropriate. There have clearly been changes to some of the practitioners' practice and they all felt the process had been beneficial. The practitioners are using technology to do the types of activities they have always done, but to do them more effectively; some have also started to use technology to allow them to do things they were never able to do before.

Roles

> *It is assumed that purposeful actions can be taken by change facilitators that will assist participants involved in the process (Hall & Hord, 1984, p. 276).*

This view assumes that the change facilitator is separate from the participants; this is not always the case. In this project I did take on the role of facilitating the dialogue: stimulating debate, providing information from the literature and encouraging the exploration of tacit knowledge (Cordingley et al., 2005). Over the course of the project I needed to do this less often, as different people took on this role at different times.

It can be difficult to get the balance right in discussions; it is important to give participants the chance to talk and to hear about other people's experiences, but it is also important to move the discussion on and to prompt all members of the group to answer questions about the benefits of their project. A balance had to be struck between the need to produce quality research and the need to provide practical help for the teachers. This dilemma was inevitable given that participants were more interested in improving classroom practice than in becoming researchers.

I tried to make the best use of limited time and to cover all of the different elements, but, for me, the most important consideration was always 'is it useful for the group?' I was reluctant to shut down discussions that all participants were finding interesting. I found the sessions worked best when they became a conversation between the participants, they knew best what they needed to find out.

I did try to use individual meetings to ask questions related to the overarching project and find out their views on the action research process. But I was not always sure this was an appropriate use of their time, so these discussions were usually quite short.

10.9. Summary

For these practitioners, action research effectively supported their use of EdTech. They were all using EdTech more and some were linking it more closely to their pedagogical beliefs. They all planned to continue their projects after my research finished. This supported the view that an activity is not finished when an action research project ends (Bell, 2003)**.**

> *[I'm] only really pretending it is a project for your purposes… we are doing so many things we are doing anyway so we are looking at how to do that, but it isn't really a self-contained project... so we will continue... absolutely… (Setting 1)*

Evidence from interviews and the evaluation forms suggested that the change to their practice was sustainable. It was sustainable in the sense that they were committed to ensuring technology is being used more to support their priorities. There is no expectation that they will continue to use it in the same way and in fact, action research would expect the specific practice to continue to change and evolve.

Hodgkinson (1957) cautions that action research could lead to practitioners becoming 'stagnant'. He thought there was a danger that they may say 'I tested this approach through action research several years ago, so I continue to use it now'. If this were the case, I would argue that the action research approach has not been understood. Improving practice now is certainly not incompatible with recognising the need to continue to evolve.

This need to continue to change is true of teaching generally; there are always improvements that can be made.

> *teachers must be educated to develop their art, not to master it for the claim to mastery merely signals the abandoning of aspiration. Teaching is not to be regarded as a static accomplishment (Stenhouse, 1979, p. 17).*

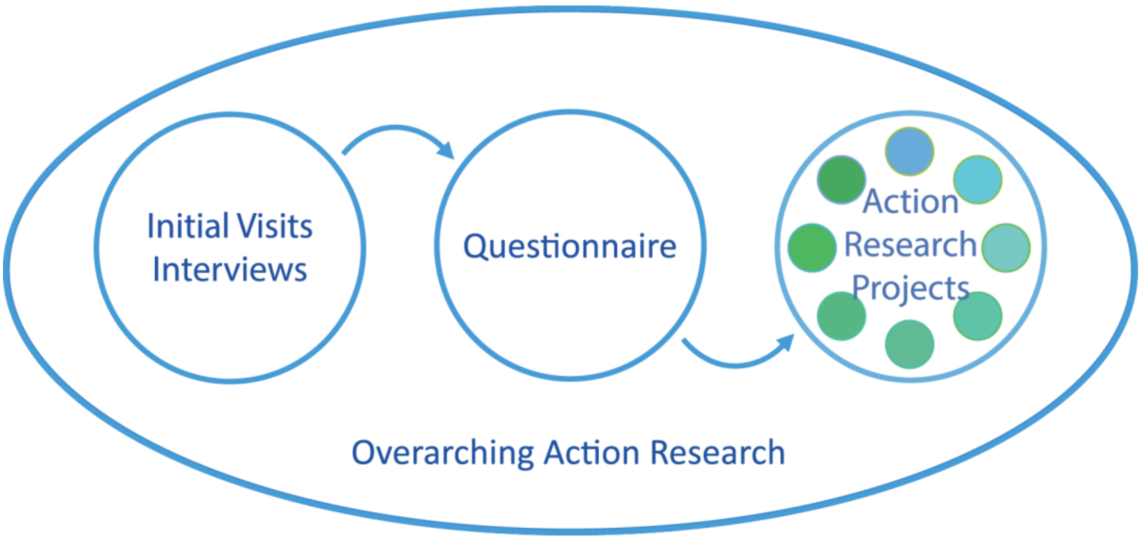
The main aim of the action research project was to have a positive impact on the settings involved. It is possible that the findings and process could also be useful to other settings.

I would recommend this approach to other settings wanting to use EdTech more effectively, but it is not possible to say if it would always be successful. Action research cannot be validated by replication (Wallace, 1987); new participants would adapt the process to meet their own priorities.

When asked, all of the participants agreed that there would be benefits to extending the project to other settings but acknowledged the practical problems this would involve. I have attended a number of academic and practitioner conferences which has allowed me to share the project more widely and this thesis will be publicly available.

There have been calls for developing a bank of action research to support others to improve their own use of technology. As this project has found, the problem with writing up research is time. The practitioners involved in this project already have a heavy workload and recording the outcomes of their projects in this way was not necessary for them to benefit from the project themselves (Somekh, 1995). Yet an important stage of the teachers' development may be for them to become, in effect, teacher-researchers.

Chapter 11. Discussion



Reflections

Each cycle was planned in relation to the relevant research questions and was an opportunity to find evidence and information to answer each one. Over the course of the project, I have been able to follow different threads linking to key themes:

- How is the term 'Education Technology' being defined?
- Why are EYFS practitioners using EdTech?
- How are EYFS practitioners using EdTech?
- How does this practice link to their pedagogical beliefs?
- What is the best way to support practitioners to use EdTech effectively?

As the project came to an end, I needed to draw these threads together and draw some conclusions. I also needed to review the research process and evaluate whether it could have been done better.
Research is not neat; at the end of the project you do not have all the answers. Along with the answers you have, you also have a lot more questions.

11.1. Research Questions

This chapter will review all three cycles of the research and draw together the conclusions from each. Its structure will follow the research questions identified in section 1.3 and shown in the box below. The final section of this chapter will evaluate this research project as a whole and consider how well the research addressed the original research aims, and whether it was ‘quality’ research.

Research Question 1: *What is the relationship between early years practitioners’ use of educational technologies and their pedagogical beliefs?*

- What are the pedagogical beliefs of early years practitioners?
- How are early years practitioners using educational technologies to support teaching and learning?

This question requires the exploration of two key issues:

- What is educational technology?
- What does effective teaching and learning look like in early years education?

Research Question 2: *How can early years practitioners be helped to integrate educational technologies into their practice in a way that supports their pedagogical beliefs?*

- How would early years practitioners like to use educational technologies?
- Is action research an appropriate route to enable early years practitioners to reflect on pedagogy and improve their use of technology?

When exploring how educational technologies are implemented, another issue needs to be explored:

- How does their use and their understanding of technology relate to current theories of educational technology implementation?

11.2. RQ1: EYFS practitioners’ use of EdTech and their pedagogical beliefs?

The following section will examine the findings related to the first research question and explore the definition of educational technology, what EdTech EYFS practitioners have access to and whether this technology is being used in pedagogically appropriate ways. It will include a review of how the respondents are using educational technology, how appropriate the early years technology curriculum is and will examine the implications of different rationales.

Most of the settings involved in the action research acquired more resources as a result of their participation, but the more significant outcome was how the technology was being used and the difference it made to teaching and learning. Participants were not trying to use all of the technology they had access to, or to use all of the affordances the devices supported, their aim was to use technology to meet their identified needs.

11.2.1. Defining Educational Technology

In all three cycles of this research project, the term ‘educational technology’ has been defined much more broadly than the initial literature review suggested (see sections 3.3 and 3.4). In section 10.6.2, I showed that ‘educational technology’ is about more than just devices, it can also be about the learning process. In this section, I am just going to be thinking about the more limited definition as it relates to using technological devices.

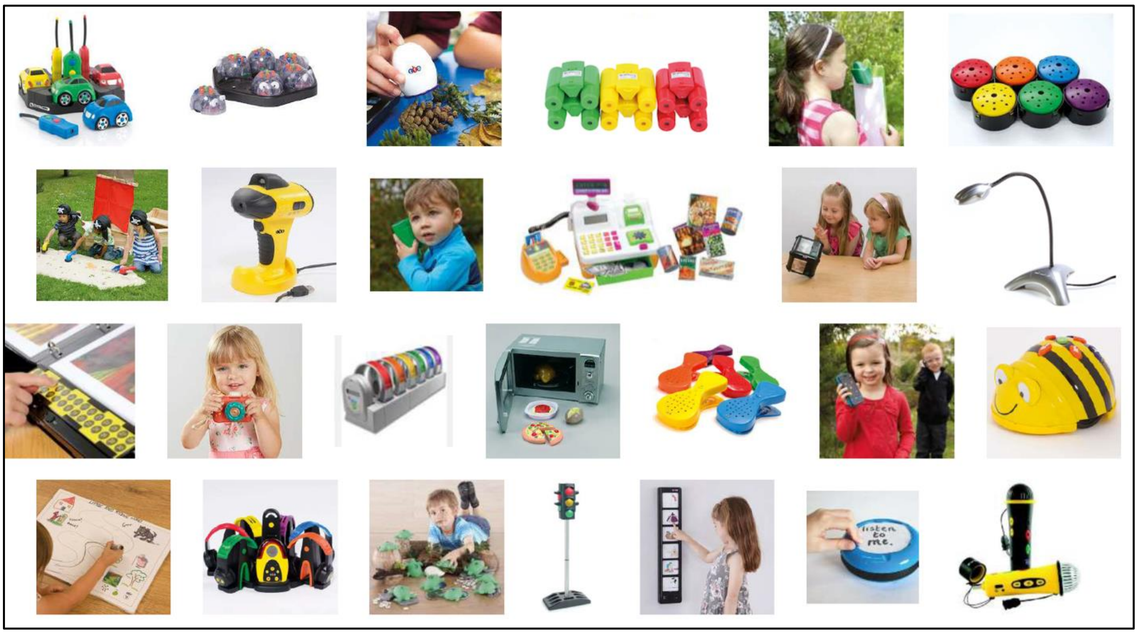


Figure 28: Examples of EdTech available for EYFS

Practitioners did not limit their definition of the term educational technology to computers, IWBs and tablets. There are many more types of technology available now and many of these have been designed specifically for young children to use. Figure 28 shows examples of these, with images taken from one commercial provider's website[6].

The fact that EdTech includes such a wide range of devices, means it is a very broad field. However, statements are often made about it in its entirety. Hatzigianni (2017) cites literature saying technology has been shown to have positive benefits, as well as other literature which says the opposite. Is it possible to make such statements about the whole of technology? These articles are often not directly comparable and focus on different devices. Hatzigianni cites Choi et al. (2018) who look at the use of TV and video, and compares this with Hatzigianni and Margetts (2012) who are looking at computers.

Even when articles focus on the same type of technology, they are often used in very different ways. Is making a broad statement about an individual device equally problematic? Would starting with the pedagogical objective be more appropriate? For example, we could ask whether reflecting on learning is beneficial for children. If evidence suggests it is, then we could go on to look at how technology can be used to enhance this process. This is the method the practitioners in the action research network used.

There are significant differences in how many devices different early years settings have access to. All of the settings that were interviewed during Cycle One had at least five devices. More variation was found during Cycle Two, with the number of devices ranging from one to over twenty. In Cycle Three, there were also differences, but all had at least a few devices. It is important to remember that just because a setting has resources, it does not mean they are being used or that they are working. In section 6.5.2, I reported on the amount of broken equipment that needed repairing. There are other reasons for not using technology; some practitioners may have other priorities, or it may be due to something as seemingly simple as the need to replace batteries. This may appear to have an easy solution, but it is yet another thing for busy practitioners to have to do. This was something a number of settings identified as a barrier (see Setting 1 overview in section 9.1).

Not all settings will be using the devices they have, and even if they are, they may not be making use of all their affordances. In Cycle Two some respondents to the

[6] https://www.tts-group.co.uk/primary/computing

questionnaire said they had tablets but no digital cameras, showing a lack of awareness of what tablets can be used for.

It has also been possible to build up a picture of what technology settings would like, an indication of the type of technology they find most useful. The most common response, in all cycles of the research, was iPads. This was because they are flexible and have a number of affordances. This means they can support a range of learning opportunities. Cycle Three (section 10.4) identified some of the criteria practitioners used when selecting new EdTech; these included flexibility, robustness, practicality and their ability to support collaboration, communication and language.

11.2.2. Links between EdTech and practitioners' pedagogical beliefs

This research has produced many examples of EdTech being used to support practitioners' pedagogical beliefs. Cycle One showed that technology was being used across the whole EYFS curriculum and to support the development of learning dispositions (see section 4.5.2). This finding was in contrast to the literature reviewed in Cycle One, which suggested a much more limited use of technology. While the information provided by the questionnaire was not as detailed, it supported the view that EdTech is being used across the curriculum in pedagogically appropriate ways. In both of these cycles, it was not possible to determine if the respondents' descriptions of activities provided an accurate reflection of practice or the children's experiences. However, it is likely that this link with pedagogy is at least understood, even if it is not embedded in practice. It has been suggested that this link would be more common if practitioners' reasons for using EdTech were more closely aligned to the pedagogical rationale than the social rationale.

11.2.3. Rationales for using EdTech

Section 6.5.3 showed that the most common rationale questionnaire respondents gave for using EdTech in the early years was the social rationale. The pedagogical rationale was also mentioned frequently. The social rationale is explicit in the current Statutory Framework handbook in England (Department for Education, 2014) while the pedagogical rationale is implicit in Development Matters (Early Education, 2012).

Social

It is perhaps not surprising that the social rationale is so prevalent. Research has indicated that young children are growing up in a digital world and engaging with technology from a very young age (Aubrey & Dahl, 2008). At home, many children are surrounded by technology, though there appears to be a disconnect between children's experience of technology at home and in educational settings (Aubrey & Dahl, 2014; Palaiologou, 2016a).

Home use is often more sophisticated than school use, as EdTech is being used for more relevant, real life tasks (Somekh, 2003). This makes a difference to how children learn to use technology. At school children are often taught how to operate the devices, a mechanistic approach (see section 3.2). At home, children are not trying to improve their technical abilities but using technology for particular objectives. Learning how to operate technology is incidental to the main activity (Facer, Sutherland, Furlong, & Furlong, 2001). The focus of Facer and colleagues' (2001) research is on 9-10 and 13-14-year olds, but the lessons may apply to younger children as well.

Would a greater focus on the pedagogical rationale mean that the process of learning about technology in school would move closer to how it happens at home? Would children who are focused on a learning objective learn to use the technology almost without realising it?

Pedagogical

In the next section, I will explore how EdTech can be a catalyst and prompt significant changes to the whole education system. Of course, the catalytic impact of EdTech could be narrower than this. It could be a catalyst for changing practice within the classroom, though even this does not always happen.

> *in many cases computers are being used to perpetuate the mundane, rather than act as a catalyst for innovation in pedagogy and learning (Yelland, 1999).*

But, while the changes made by the practitioners in this project were limited in scope, they were hardly mundane. The practitioners identified a problem, a pedagogical objective, then looked at how technology could help. A project about technology was a catalyst for improving practice.

Catalytic

It is claimed that EdTech can do much more than improve classroom practice, it can be a catalyst for significant change in education. Some very strong claims have been made about the power of technology, for example:

> *The prevalence of digital technology has not only changed the way children learn and absorb knowledge, but also transformed the way they communicate and interact with each other (Shin & Li, 2017, p. 1).*

> *As Internet access has become ubiquitous, childhood has been transformed… learning in the digital age is also perceived to have changed (Arnott, 2016b, p. 331).*

Has technology really had this much of an impact? Has childhood been transformed?

This seems hyperbolic. It is suggested that one reason for the limited take up of technology is that practitioners cannot keep up with the 'constantly changing nature of technology' (Zevenbergen & Logan, 2008).

> *ICT has the potential [for]enabling teachers and students to construct rich multi-sensory, interactive environments with almost unlimited teaching and learning potential (Balanskat et al., 2006, p. 12).*

What does this actually mean? Isn't any educational setting filled with unlimited potential? What difference does technology actually make?

> *The constantly changing nature of technology makes it difficult for teachers to stay current with new developments (Zhao & Frank, 2003, p. 812).*

I regularly hear educationalists suggest that practitioners can find it difficult to keep up with the constant change in technology (Hall & Higgins, 2002), I also hear that this means that educational technology use also has to change rapidly.

This could be a reason for using action research. Other approaches, for example, a randomised control trial would be restricted to focusing on the device or activity selected at the start of the research, even if new, potentially more appropriate resources emerged. In action research, the research can evolve and adapt to changes.

But is this view of rapidly changing technology really the case? Is it so hard for practitioners and researchers to keep up?

> *Education is on the brink of being transformed through learning technologies; however, it has been on that brink for some decades now (Laurillard, 2008, p. 1).*

New devices do emerge regularly, but are they so different from those that came before? Even if they are, what impact does this have in educational settings.

Some schools may implement new devices as soon as possible. However, in my experience, most schools are not early adopters with the newest equipment (see section 7.2.1). This is especially the case in early years where many of their resources are handed down to them. The questionnaire (Appendix B) allowed respondents to identify whether equipment they had was broken, and some of the action research settings provided evidence of the amount of old and broken equipment that can be found in early years settings.

Researchers who are investigating new technologies may have more of a challenge in keeping up to date with new equipment. Early adopters may drive the need for research about new devices almost as soon as they become available. These early adopters tend to be trying to solve a problem, while mid and later adopters may be more likely to use technology to do what they always did (Higgins, Xiao, et al., 2012).

In all of the previous examples, there is a focus on change. Should this always be the focus of discussions about EdTech? Why focus on rapidly changing devices rather than slower changing pedagogy? It seems more important to think about what people are using technology for. This view is supported by Manches and Plowman (2017) who suggest that the pace of change leads to attention being focused on devices or tools rather than the pedagogy.

11.2.4. The appropriateness of the EYFS curriculum

Discussions during Cycles One and Three highlighted practitioners' views about technology in the early years curriculum. Most felt it could be improved. There was a feeling that the curriculum was limited, it would benefit from more detail about how technology could be used to support teaching and learning across all areas of learning. It can be easier for children to achieve higher levels of attainment in technology. Progress was more difficult to demonstrate in other, more 'academic', subjects such as writing.

This view that it is easier to achieve higher levels in technology than in other subjects is supported by the statistics Ofsted provide on the EYFS profile assessments (Ofsted, 2018).

Some of the group felt this was due to broad statements in the documentation. There is limited information about what children needed to do and the different ways technology could be used. This caused particular problems for practitioners who were less confident with EdTech as the following conversation shows:

> *It's a very easy one to get, I think it is an outdated curriculum, it was written in… (Setting 5)*
>
> *... 2013 but the IT, that hasn't changed... (Setting 1)*
>
> *…and if you look at what kids do now… (Setting 5)*
>
> *It's hard that it just says to use a program, it doesn't break it down any more so I'm thinking what should I be doing at different stages, and I'm not very IT literate… It's knowing how to break everything down into different stages… I think that's what I need in my next action [plan].... we could do with a more up-to-date scheme we need to look at more up-to-date stuff [we] need to know how to break it down. (Setting 1)*

The group also recognised that technology could be used across the whole of the curriculum; it should not be limited to the Knowledge and Understanding strand. Some of the practitioners felt that the way the curriculum documentation was written, meant it was too easy to put the priority on other subjects and neglect the use of technology.

> *Writing number and reading always take more of a focus … recognise a range of technology used in places like homes, that's never going to get the same [attention]. It's not as important really because you need to read and write. (Setting 5)*

I have already highlighted the importance of having the rationales for using technology included within curriculum documentation. This seems especially true of the pedagogical rationale. The current Development Matters documentation includes an element of this and identifies many ways technology can support the different areas of the curriculum (Early Education, 2012). Since this research was conducted the Early Learning Goals have been reviewed and a pilot evaluation of the new ELGs is in progress. The new framework and handbook make no reference to technology at all (Department for Education, 2018a, 2018b). It will be important to monitor the impact this has on practice. Is technology already sufficiently embedded, or will this change result in technology being used less often and for a more restrictive range of activities?

When looking at definitions of educational technology in Chapter 3, I mentioned that it can be interpreted more broadly than just devices. It can also refer to a teaching and learning process (Reiser & Ely, 1997). The 'Computational Thinker' diagram discussed in section 10.6.2 revealed that these processes were also being taught in early years, but practitioners and children may not be using these terms: logic, algorithms, decomposition, patterns, abstraction and evaluation.

The discussions about technology in the EYFS curriculum suggest that my view that the group only needed to focus on the T of TPACK was not correct. It is important to consider C, content, as well (Mishra & Koehler, 2006).

11.3. RQ2: How can EYFS practitioners be helped to integrate EdTech?

This section focuses on the second research question. This research has suggested that an action research approach is appropriate for supporting early years practitioners to implement educational technologies in their settings. The findings from the action research projects have provided information for evaluating the frameworks introduced in Chapter 7. Each of these will be re-examined here. I will show how some of the Macro and Meso models can be adapted to highlight how they align with an action research approach. I will then examine how collaboration can be incorporated into some of the Micro models and consider how collaboration supports the development of expertise. A new version of TPACK which considers the role of collaboration is presented. Not all of the implementation models are found to be appropriate and the reasons for this will be explained.

There was never any intention that this research should lead to technology being used in original or innovative ways. The aim was for the project to support the needs of this group of practitioners and settings. Many of the ways they decided to use technology have been done before. For example, in 2005 Ofsted reported that over half of the settings they had visited were using electronic assessment and recording systems (Ofsted, 2015). While the uses of technology described in this thesis may not be innovative to the education community, the changes were significant to members of the group.

> *Anyone interested in education should be demanding not just the placement of computers in classrooms, but also that the machines be used to their full potential (Yelland, 1999).*

My view is that technology should fit a need, it does not always need to be transformational. There is no need to always move up the SAMR model, or one of the other hierarchical models (see section 7.2.3). Contrary to Yelland my research shows that what is important to teachers is that their teaching should be improved. Pedagogy is their main focus not technology. It is not the ‘full’ potential of the machine that is important, but how it can support teaching and learning. Just because a device has an affordance, does not mean a practitioner always needs to use it.

This does not mean that technology should simply be used to do what we have always done, as some authors suggest is what happens in many settings (Admiraal et al., 2017; Burden, 2002), but that change should be driven by need.

11.3.1. Macro Level

Diffusion of Innovations

Rogers (1995) categorised people as innovators to laggards. He suggested that it was important that a society should be made up of people at all levels (see section 7.2.1). This may be true for networks as well. Members of the action research group were at very different stages when they started. It was easy to see what the ‘earlier adopters’ brought; they had experience and knowledge the others valued. But these ‘earlier adopters’ also benefited from working with people at the other levels. All of the group had used some technology and could share ideas. They were all there to learn. One important role of the group was to ask questions and ‘earlier adopters’ had to be able to explain their experiences clearly to the others. They had to reflect more deeply on their actions than they would ordinarily do. This process helped to make tacit knowledge explicit, exposing assumptions and helping participants to evaluate whether their practice really did match their pedagogical beliefs. This improved the rigour of the action research conducted by all the participants (Ampartzaki et al., 2013).

Participants were still at different stages at the end of the two-year project. Some were still at the early stage of finding things out. They were all persuaded that elements of technology would be beneficial and had decided to go ahead with implementing their research. They were at the stage Rogers (1995) called the decision phase (see 7.2.1, Figure 14) or the agenda setting phase of identifying a problem technology could help with (see 7.2.1, Table 18).Others had already implemented their plan and were at the confirmation phase or within the implementation stage of the innovation process (see 7.2.1, Figure 14).

Even though not all of the participants were early adopters as described by Rogers (1995), they all behaved more like them than the early or late majority. They focused on using technology to meet a teaching and learning need, rather than focusing on implementing the technology itself (Higgins, Xiao, et al., 2012). The important question here is why did this happen? While they may appear to fit the category of early or late majority as described by Rogers (1995) in section 7.2.1, did their interest in the project mean that they behaved differently from others in this category?

The macro level frameworks were useful for explaining some of the findings but did not seem to impact on how they group implemented technology. Reviewing the frameworks did suggest the need to involve people who were at different stages, but it is doubtful if knowing this at the start of the project would have changed anything. I am not sure that it would have been appropriate to try and deliberately find people at different stages. A diverse group was likely to happen anyway and how useful would it have been to label people especially if they did not know their own category?

Implementation Frameworks and Action Research

These macro level frameworks are useful as they can be used to show how implementation models are similar to action research. This section will show how the implementation frameworks can be aligned with a cyclical approach.

Stages in the innovation process (from Rogers)

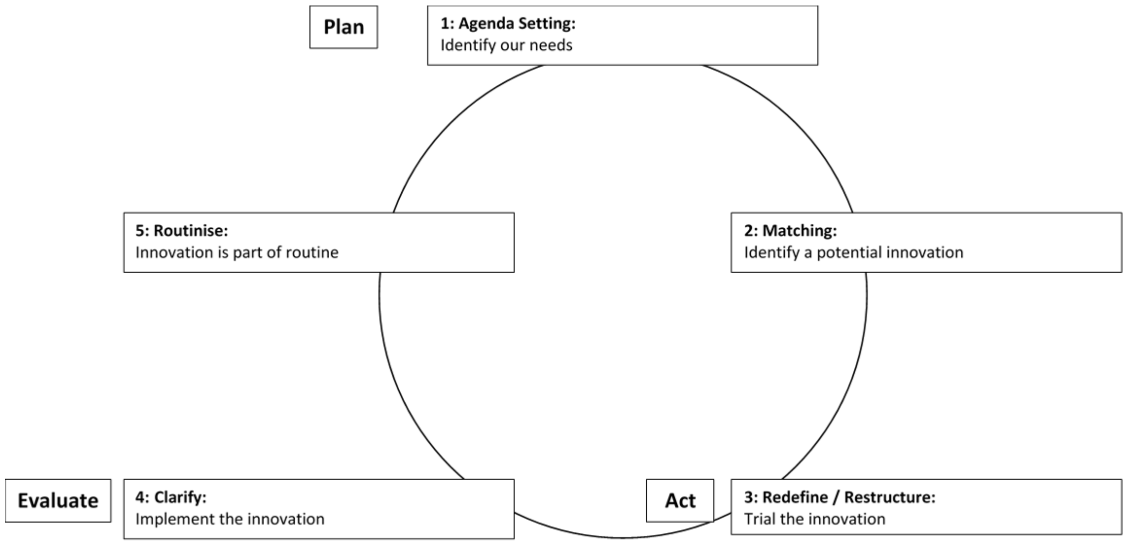


Figure 29: Implementation Framework - DOI Stages

The stages in the innovation process identified by Rogers (1995), see section 7.2.1, Table 18, can be converted into a cyclical process with each stage being seen as part of an action research approach, this is shown in Figure 29. As described in Chapter 2, the action research process is not always straightforward; planning, acting and evaluation can occur throughout the cycle and could be identified at all points of the diagram.

This diagram will be reviewed as the other frameworks are evaluated.

Implementation Framework Attributes (from Rogers)

Rogers (1995) also identified a number of attributes which can have an impact on whether innovative ideas are adopted, these are shown in red on Figure 30.

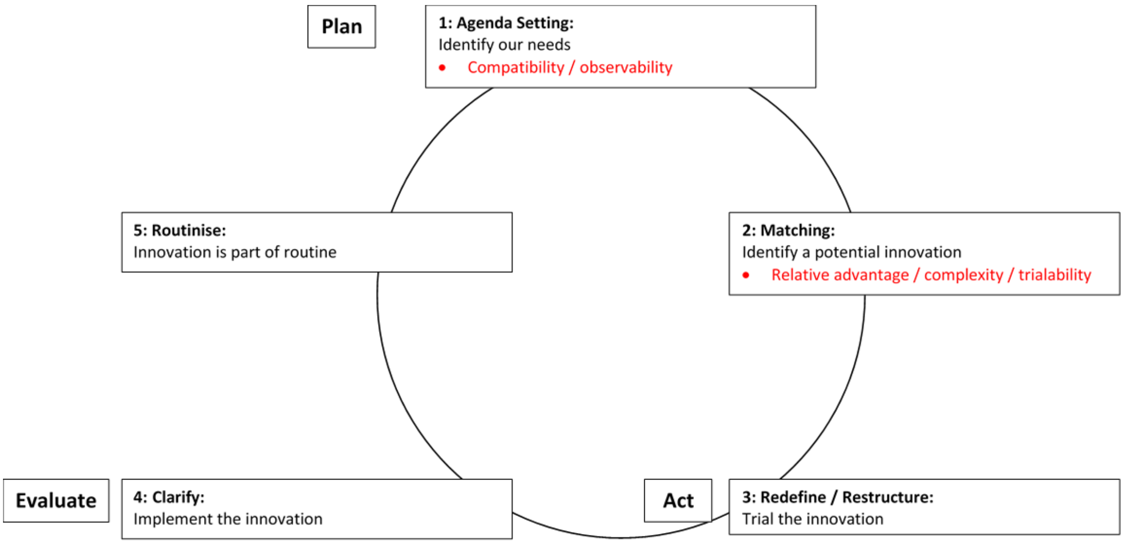


Figure 30: Implementation Framework - Attributes

1. **Agenda setting**

- **Compatibility** refers to how well an innovation fits with a user's values, knowledge and experience.

The agenda setting stage needs to clearly identify a context in terms of the environment, setting, learners and practitioners. It is essential to identify the problem they are trying to solve. This was the first task completed in the action research projects in Cycle Three. All participants were able to describe their context and their pedagogical beliefs, they then identified a particular problem that they wanted to solve.

- **Observability** refers to whether the success will be visible to others.

There are many factors that can influence the introduction of new innovations. Some will be barriers; others will be enablers. Observability can be seen as one of the influencers that may drive the identification of the need to try something new.

Respondents to the questionnaire were asked about a range of potential influencers that could have an impact on their use of EdTech (see section 6.5.5). They were asked whether the attitudes of senior leaders or colleagues would affect how much they used EdTech and findings showed that they did not. However, a number of the participants in the action research linked their project to priorities identified in their school development plans. This showed that priorities, which were usually set by others, did have an impact on their decision making.

2. **Matching**

- **Relative advantage** refers to whether the identified innovation will be better than what came before.
- **Complexity** refers to whether it will be easy to learn about and use the new innovation.
- **Trialability** refers to whether the new innovation will be easy to try out.

All of the action research participants were trying to improve an aspect of their practice and to use EdTech in a way that ensured their practice was better than what had come before. The shared experiences with the group meant the participants could learn from each other and identify which EdTech might be useful, and which might be problematic.

Some participants requested training to help them use resources meaning that complexity did not always stop them from implementing devices. The deciding factor was whether a resource would have benefits in their setting. Complexity may be a factor when practitioners compare similar approaches; if the benefits were equal, it is likely that they would select the least complex.

The participants were supported to plan a project that allowed them to test out the innovation they had identified, their plans ensured the projects were not too complex and could run alongside their usual practice.

Five stages in the innovation process (from Rogers)

Rogers (1995) identified five stages or communication channels in implementing innovations (see section 7.2.1). These have been added to the diagram and highlighted in blue, see Figure 31.

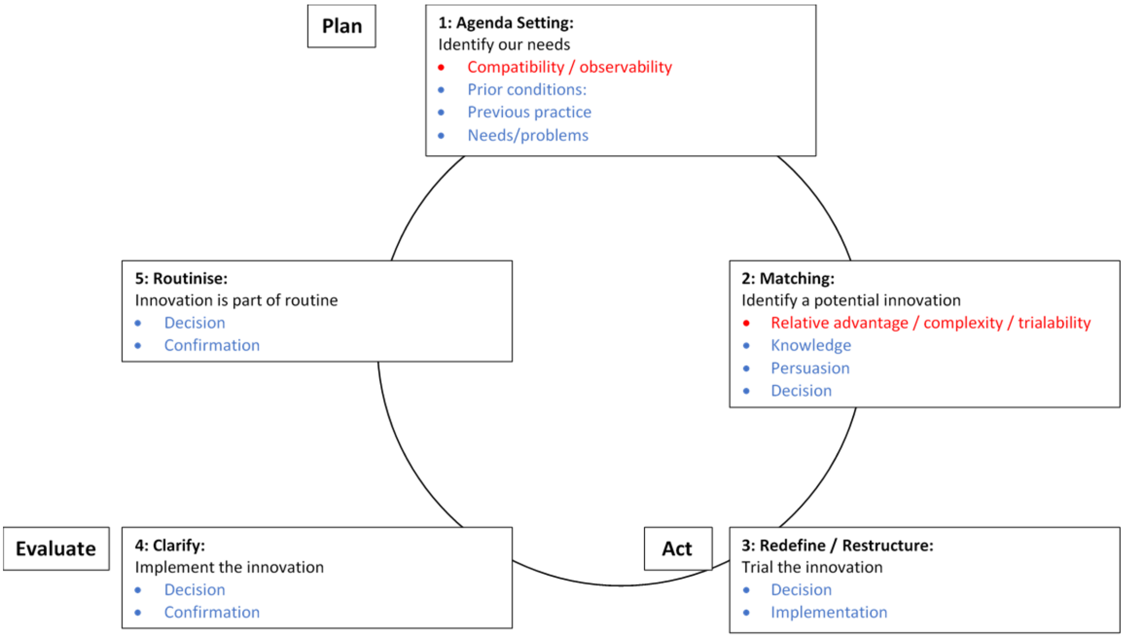


Figure 31: Implementation Framework – Stages / Communication Channels

1. **Agenda Setting**

- **Prior conditions** relate to the context in which the innovation will be implemented and relate to the setting and practitioners. They include previous practice and current needs/problems.

As mentioned above, using the setting's context to identify needs will be the first stage of any implementation, unless it is being imposed on a setting/practitioner or if an innovation is driven by desire for a particular device. There have been some national educational technology policies which have dictated that schools should purchase hardware, for example IWBs, and many schools have been accused of implementing iPads because they are 'shiny and new' rather than because they can be used to meet pedagogical needs. The action research projects in Cycle Three were focused very much on each setting's context and needs identified by the practitioners.

2. **Matching**

- **Knowledge:** practitioners learn about the innovation.

There are different ways of becoming aware of an innovation. Rogers suggests this may happen by accident, suggesting that the practitioner is passive. In such a case it is assumed that practitioners cannot seek out an innovation that they do not know about. Alternatively, a practitioner may be more sensitive to innovations that meet their needs and more likely to pay attention when they see or hear about them. Roger's calls this 'selective exposure' (1995, p. 164). By joining the action research group, it is likely that participants were open to finding out about innovations.

Rogers (1995) suggests that there are different types of knowledge:

- awareness knowledge: I know it exists,
- know-how: I know how to use it,
- principles knowledge: I know why I should use it and how it will meet my needs.

A question could be asked about whether principles knowledge is the aim for all practitioners: should they all be able to identify how using the technology they have chosen meets their needs? Could it be that the first two types of knowledge would be appropriate for the social rationale where children need to know about technology and be able to use it. Is it possible that the third type, principles knowledge, is more relevant for the pedagogical rationale? In this case the focus is on being able to say: I am using technology because I understand how it meets my pedagogical needs. This is probably a simplistic idea that would need further consideration.

Rogers (1995) suggests that change agents are more likely to focus on the first two types of knowledge. It could be argued that traditional training also focuses on these and that principles knowledge is much less common. If technology is the driver, then principle knowledge is less relevant, but if pedagogy is then the link appears to be much more obvious. The action research group focused very explicitly on principles knowledge.

- **Persuasion:** practitioners form a favourable or unfavourable impression of the innovation.

Persuasion can come in different forms, but Rogers (1995, p. 169) suggest that peers can be seen as the most important source of information, 'when someone who is like us tells us of their positive evaluation of a new idea, we are often motivated to adopt it'. This can be seen as highlighting the benefit of collaboration. or working as part of a network.

Rogers identifies the importance of the KAP (knowledge-attitude-practice) gap. Just because a practitioner sees the benefits of an innovation it does not mean they will implement it. There are other barriers that may prevent implementation. Rogers (1995, p. 169) again highlights the benefits of collaboration and networks, saying that engaging with a peer who is already a satisfied adopter may make it more likely that the innovation is implemented. He suggests that later adopters are more likely to have this KAP gap and may need more reassurance from their peers. Membership of a group or network could provide this.

- **Decision:** practitioners engage in activities before deciding whether to adopt the innovation.

While this is identified as a separate stage in Roger's model, a decision about whether to use an innovation can be made at any time. It precedes implementation and will be part of any evaluation. During the action research projects participants regularly reviewed their use of EdTech as part of their project and made adjustments when necessary.

3. **Redefine/restructure:**

- **Implementation:** the innovation is adopted.

As previously mentioned, the decision stage can happen at any stage of this model. The redefine/restructure stage often involves a trial of an innovation, this could mean only using part of the innovation, or using it on a small scale before deciding on a full implementation. While this trial may be carried out by the practitioner themselves Rogers (1995, p. 171) describes the value of learning from others. He describes this 'trial-by-others' as a vicarious trial. As with persuasion, this is an example of the benefits of collaboration or working as part of a network. The action research group shared experiences and learned from other people's successes and failures.

4. **Clarify:**

- **Confirmation:** practitioners review the original decision to adopt the innovation and decide whether to continue to use it.

As mentioned above the participants in the action research group reviewed their project regularly and revaluated whether the innovation they were implementing was appropriate.

5. **Routinise:**

Decision making can result in an innovation being adopted, being adapted or being rejected. Rogers (1995, p. 172) describes two types of rejection: passive and active.

- Active rejection: an innovation is rejected after being considered for adoption or after being implemented, for example as part of a trial.
- Passive rejection (or nonadoption): an innovation was never considered for adoption.

Rather than rejecting an innovation, a practitioner may decide to re-invent it. Rather than implementing it in the same way that others have, they can adapt it to meet their own needs or context. Even after implementing an innovation, a practitioner may decide to stop using it. Later adopters are more likely to discontinue an innovation (Rogers, 1995, p. 183) and they are more likely to not implement it fully or in the most effective way.

My findings suggest that the action research group supported all members to behave more like early adopters, it would be interesting to explore whether this has any implications for longer term implementation or discontinuance.

11.3.2. Meso Level

Technology Adoption Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT)

Elements of the TAM and UTAUT models are highlighted in green on the diagram, see Figure 32.

The TAM model was described in section 7.2.2, Figure 15, and while the terms ‘perceived usefulness’ and ‘perceived ease of use’ were not explicitly used by the action research participants, all members of the group were interested in how useful a technology was, and how easy it was to implement it in their classroom. These considerations affected their ‘behaviour intention’; their intention to use a new innovation.

The Unified Theory of Acceptance and Use of Technology (UTAUT) (see section 7.2.2, Figure 16) uses the terms ‘performance expectancy’ and ‘effort expectancy’ instead of ‘perceived usefulness’ and ‘perceived ease of use’. UTAUT goes further than the TAM and explores social influence and facilitating conditions, these form part of the context or environment which influences the use of technology. As discussed in section 10.6, members of the group faced both intrinsic and extrinsic barriers.

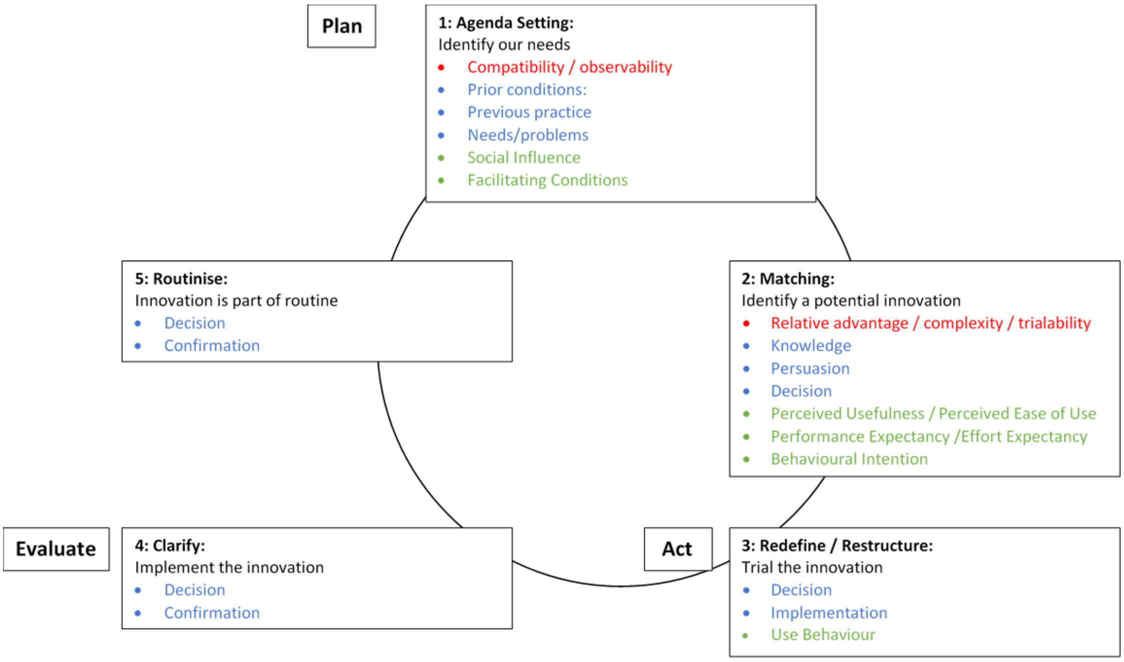


Figure 32: Implementation Framework - TAM/UTAUT

Interestingly, Venkatesh et al. (2003) found that attitudes do not always impact on whether an innovation is used. This is supported by my finding that practitioners with the most negative attitudes towards educational technology were not the practitioners that used it least, see section 6.5.5.

Concerns Based Adoption Model (CBAM)

As the primary focus of the CBAM is the innovation rather than pedagogy, it has not been included in the diagram.

The practitioners started the project on different levels of the CBAM. In terms of the Stages of Concerns (see Table 19, in section 7.2.2) some were between Stage 1: Informational and Stage 3: Management. They were focused on finding out more about certain technologies, they were thinking about how it would affect them and how they would manage using it within their setting.

Others who were already using EdTech to focus on pedagogy could be seen to be between Stage 4: Consequence and Stage 5: Collaboration. They were thinking about how the technology was having an impact on their learners, how they could improve their practice to ensure it had more of an impact and about what their colleagues were doing and whether they could extend their practice to other classes.

Similarly, they were at different Levels of Use (see Table 20, in section 7.2.2); some were at level II. Preparation, they were planning to introduce a new technology, others were already using technology effectively and were at stage IVB. Refinement or V. Integration. They were making changes to the innovation they had implemented or working with other staff in their setting to extend the innovation beyond their own class.

I found that they could be at different stages of concern at the same time. Most were using or exploring the use of more than one type of EdTech. Some were using EdTech at the Consequence and Collaboration stage; they were using it to support children's reflection on learning. These practitioners were simultaneously at the Informational level when looking at other possible uses of technology. All had moved beyond levels I. and OI., they had an interest in technology and had spent time learning about how it could be used.

While CBAM is often used with top down implementation (Khoboli & O'Toole, 2012), some of the stages of concern could be missed as practitioners are not involved in the decision making. Technology implementation has at times been driven by national policy and funding, as was the case with the introduction of Interactive Whiteboards (Higgins et al., 2007). Some types of action research have also been used when introducing management policies (Wallace, 1987), but it is more often used for bottom up projects. Effective action research of this type almost necessarily involves the stages that CBAM identifies as being central to successful organisational innovation. A project that allows participants adequate time for the early cycles of action research, will also allow time for the deep experience of the early CBAM stages and this will increase the likelihood of successful implementation (Khoboli & O'Toole, 2012).

Just as Rogers (1995) highlighted the value of people at different stages working together. In the CBAM collaboration is the fifth stage of concern, my findings show that collaboration can be incorporated in to an implementation model at a much earlier stage. Burke et al. (2018) recommended that people have opportunities to collaborate with people at other stages of the CBAM. As teachers progress to the final Stage of Concern with a particular technology, opportunities should be provided for them to explore other uses of EdTech, or to collaborate with other teachers in earlier stages (Burke et al., 2018). My findings support the view that it is not necessary to wait for a practitioner to be at the final stage before introducing opportunities for collaboration. This can be helpful for people at all stages.

11.3.3. Micro level

Apple Classroom of the Future (ACOT)

The ACOT stages discussed in section 7.2.3 are highlighted in purple on Figure 33.

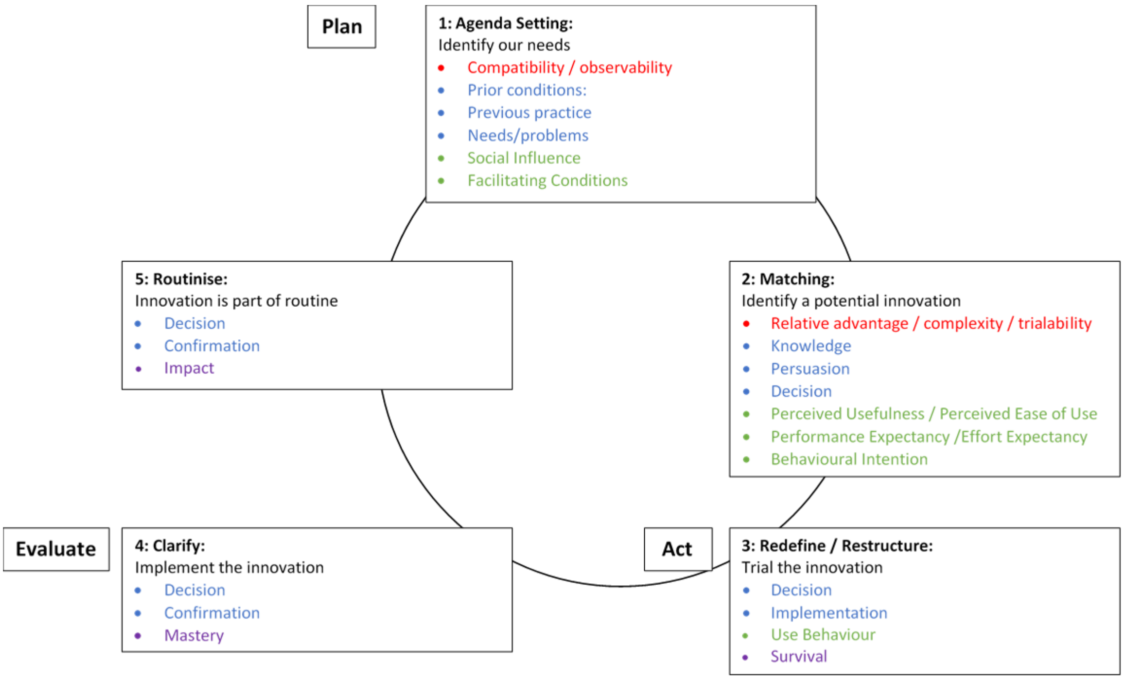


Figure 33: Implementation Framework – ACOT

- **Survival**: teachers find it difficult to anticipate problems, they focus on themselves and how they react to issues like controlling pupil behaviour.
- **Mastery:** teachers start to anticipate problems and develop strategies for solving them.
- **Impact:** rather than troubleshooting, teachers start to look at the impact their teaching has on the students' achievement and attitudes.

The position of these stages on the diagram is only one possibility. I believe that the group had an impact on this. All participants behaved more like early adopters. They were concerned with the potential impact of the innovation from the start, even though the impact may not be clear to others until later in the cycle.

SAMR – Substitution, Augmentation, Modification, Redefinition

While SAMR is regularly mentioned in online support materials and during training, it does not fit with the type of approach used in this project. SAMR is a hierarchy of technology rather than pedagogy. In this project, the aim was not to get to the top of a hierarchy, but to meet current needs and then move on. There was no expectation that when the practitioners completed a cycle of research they should move on to a higher step of a hierarchical model, the new focus was once again determined by examining current needs and priorities.

A danger of using hierarchies to describe technology implementation, is that some uses have been described as ‘trivial’ (Prensky, 2012) and other uses are seen as better, simply because of how the technology is used. Who decides what is trivial, and why should ‘transformational’ or ‘transcendental’ approaches be seen as better? This question is especially important in early years, where doing the same thing in lots of different ways is often seen to be beneficial. Doing things with technology does not always require a change in pedagogy, it can simply make it easier to achieve what they have always done, or to provide a way of doing new things they always wanted to do.

Hierarchies can imply that it is the use of the technology which is important. I would suggest that it is not the technology that needs to be innovative, but how it is being used to support practice. The focus should be on the activity, not the device.

The practitioners were focused on the pedagogy, deciding how to use EdTech to support their pedagogical aims rather than just to increase the use of the equipment they had. Rather than aiming to increase the number of affordances being used, the aim here was not to focus on learning about the different affordances or learning about them one at a time, the purpose was to focus on a single pedagogical purpose and then identify the most appropriate affordances and learn about the ones that were needed.

TPACK

Elements of TPACK have been highlighted in orange on Figure 34. For this project the participants came to the group with existing pedagogical and content knowledge. This could be seen as contributing to the context which helps with the agenda setting phase. The TPACK model shown in Section 7.2.3, Figure 19 is often presented within a circle which indicates context (Voogt, Fisser, Pareja Roblin, Tondeur, & van Braak, 2013). In my model, pedagogical knowledge and content knowledge are seen as forming part of the context which allows practitioners to identify their needs.

The matching phase was when appropriate technology was identified and the participants investigated what was possible. Once a decision was made to trial this technology, and as it was implemented, the practitioners continue to develop their technological knowledge.

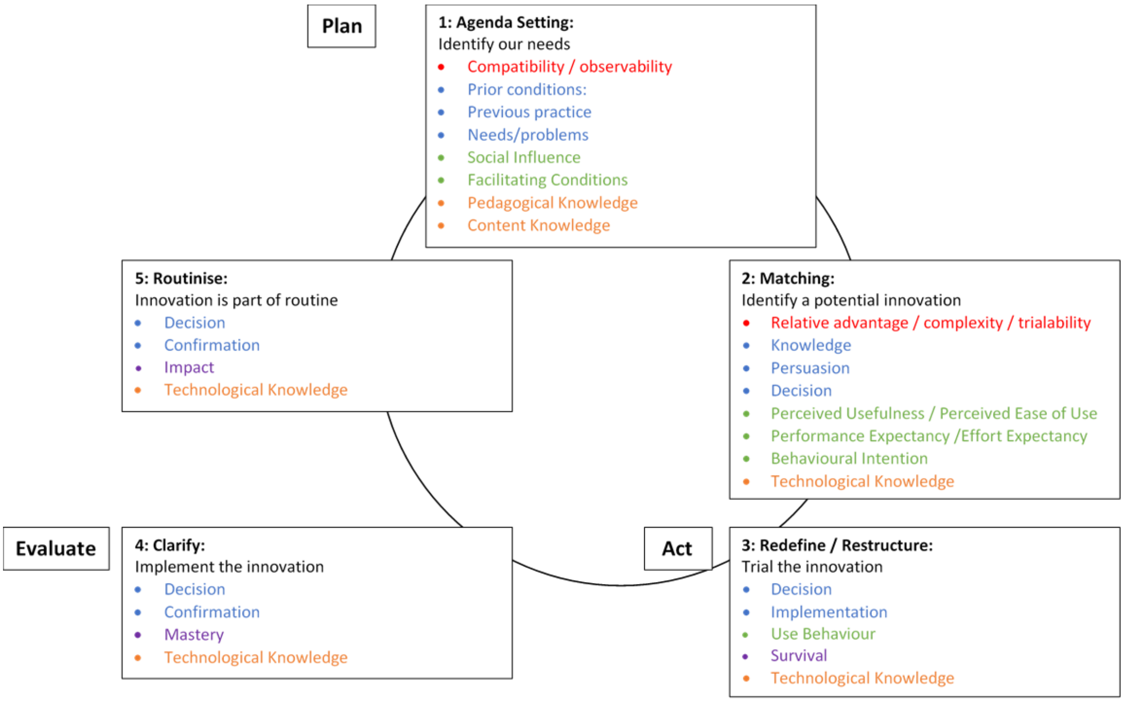


Figure 34: Implementation Framework - TPACK

The TPACK model will be considered again in the next section which looks at the outcome of implementing EdTech.

11.3.4. A Collaborative Implementation Model for EYFS

Implementing EdTech in EYFS

When supporting the implementation of EdTech, there are two aspects to consider. The process of implementation and the outcome. The process supports change within the setting, while the outcome relates to the result of the change. The review of implementation theories in this chapter showed that some of these theories can be adapted to reflect a cyclical, action research process. So far, I have used the language from the original theories. However, research has shown that even for models which are well used, for example TPACK, the terms are often interpreted very differently by different people and have been described as ‘fuzzy’ concepts (Archambault & Barnett, 2010; Voogt et al., 2013).

The diagram has been built up over the course of this chapter. It is now cluttered with a lot of text and there is duplication between the different models that have been used to create it. The diagram has been simplified in Figure 35.

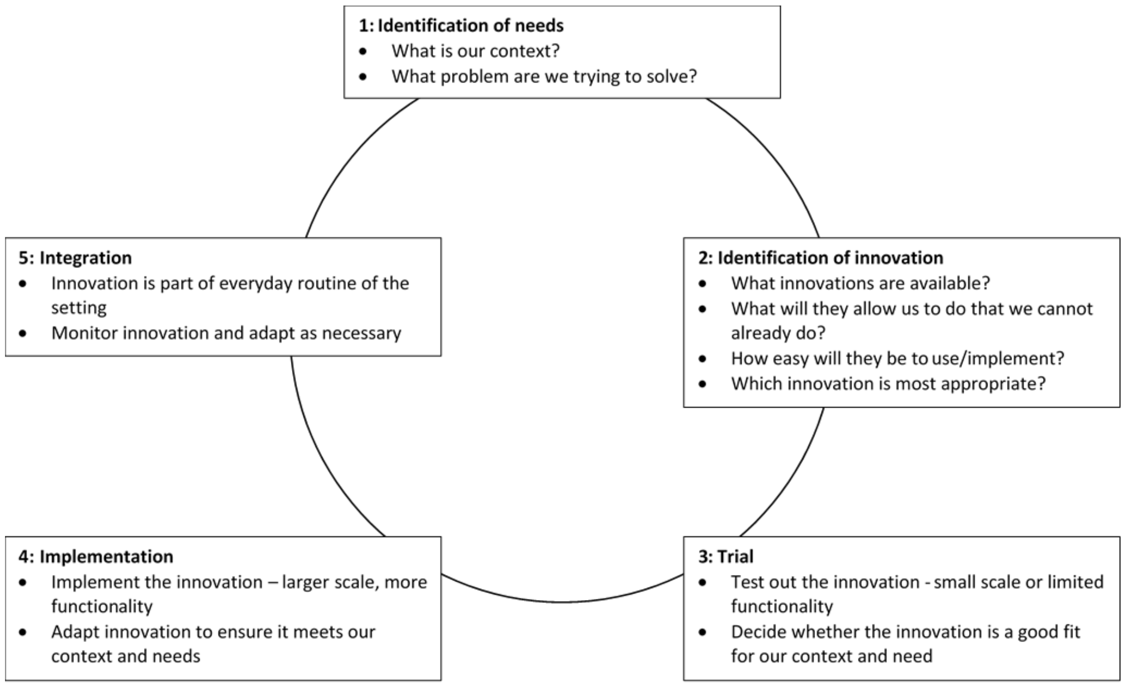


Figure 35: Implementing EdTech – Process

The process starts with understanding the context and identifying the problem that the process is trying to solve; it identifies the setting’s or the practitioner’s needs. This is the reason for undertaking the process. In the second stage, a solution to the identified problem is sought. This could be new educational technology or a new way of using existing resources. This innovation is evaluated to see if it is likely to be better than the current practice and practicalities are considered; is it likely to be easy to implement? Once an innovation is identified it is tested. This trial will enable a judgement to be made about whether the innovation is appropriate for the setting and the identified need. If it is found to be appropriate, a larger scale implementation is rolled out. Regular evaluation is part of the process meaning the innovation can be continued, adapted or abandoned at any point. If the innovation continues to be used it becomes integrated with everyday practice. Once this stage is reached, or if an innovation is abandoned, the process can start again, taking account of how the context has changed.

While this model is proposed for introducing educational technology into the early years, it is likely to be just as effective for introducing any innovation. Roger's Diffusion of Innovations had a much broader focus than just technology (1995). Unlike some of the original theories which contributed to this diagram, collaboration is not restricted to a single stage, collaboration can be beneficial at any, or all stages.

TPACK – The Impact of Collaboration

I have already explained how TPACK can contribute to the process of implementing new educational technologies. In this section I will use it to explain the outcome of the process. Figure 36 is a duplicate of Figure 19 in section 7.2.3. This time colours are used to help clarify my explanation.

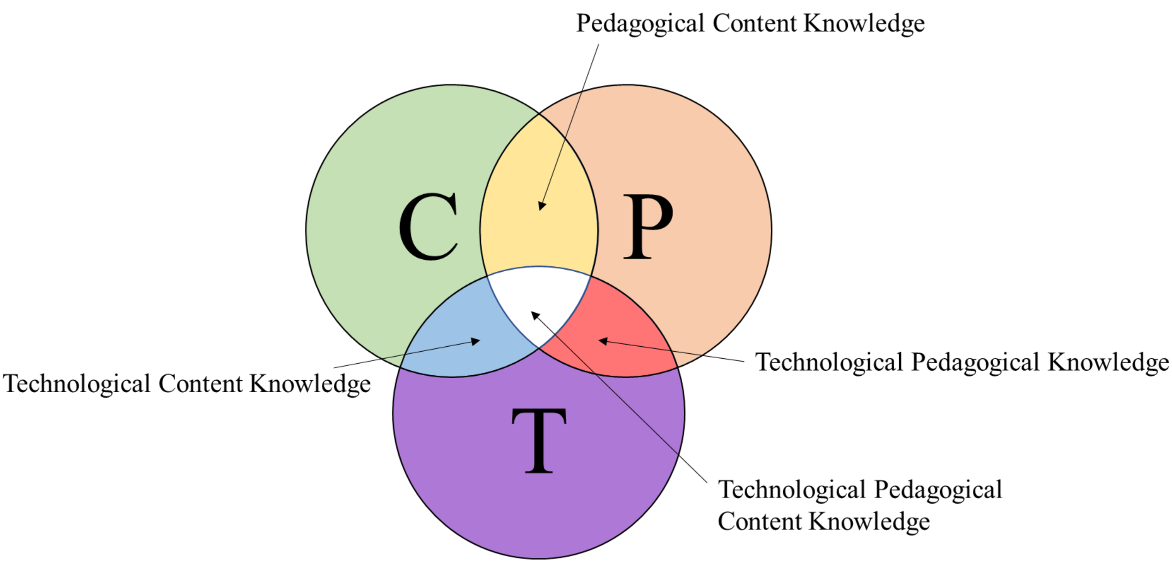


Figure 36: TPACK model from Mishra and Koehler (2006) - coloured

When I started this project, I did not plan to change the practitioners' pedagogical beliefs (unless this was an aim they identified for themselves). The P (pedagogy) element of TPACK did not need to change, neither did the C (content) aspect as early years practitioners are expected to follow the Statutory Framework for the Early Years Foundation Stage (Department for Education, 2014). The intention was to explore the T (technology) aspect (Mishra & Koehler, 2006). It was left to the practitioners to decide how they wanted to implement technology, whether that related to new devices or new activities that fit with their existing pedagogy and content.

During the project, the action research group did discuss aspects of pedagogy and content and their pedagogical and content knowledge may have increased, but the primary focus and main impact was on their technological knowledge.

Like most frameworks, TPACK is a simplified and idealised model. It appears simple but it can be interpreted in many different ways. For example, Angeli and Valanides (2009, p. 154) describe two interpretations of TPACK. In the transformative view Technological, Pedagogical and Content Knowledge is seen as a domain in its own right; it is a 'unique body of knowledge' made up of contributions from the three separate elements. The alternative, integrative view suggests it is not a unique body of knowledge that exists in its own right but is integrated 'on the spot' during teaching. It is possible that TPACK is increased simply by increasing knowledge in one of the component parts.

From the literature it is not clear whether it is possible to separate out pedagogy and content into separate domains and this is also true when technology is added in. There is likely to be an overlap between all of the areas. I accept that the model is more complex than it may first appear, but it's simplicity will help me to explain the benefit of collaboration.

Mishra and Koehler (2008, p. 10) suggest that expert teachers unconsciously 'integrate technology, pedagogy and content every time they teach'. Other authors also identify the difference between experts and novices in terms of PCK and TPACK (Kale, 2014; Koh & Divaharan, 2011; Phillips, 2013).

Koh and Divaharan (2011) suggest that novices consider the different elements separately, but experts are able to make links between them. This suggests that novices have little overlap between the different areas and as their level of expertise grows this overlap increases. Figure 37 shows an exaggerated example of this process; it is limited to the overlap between technological and pedagogical knowledge.

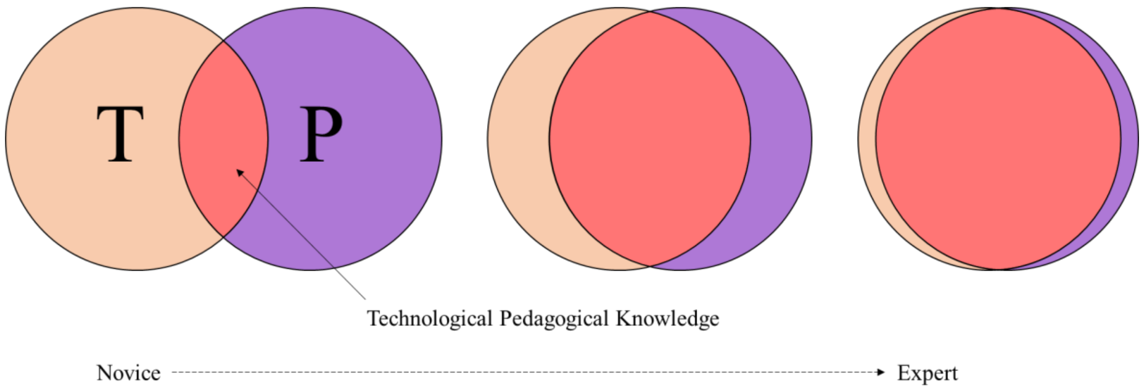


Figure 37: Impact of Growing Expertise on TPK

Section 11.3.1 described how vicarious trials can be useful for encouraging practitioners to implement an innovation. The innovation is not trialled by the practitioner themselves but by others who share their findings. This can speed up the decision making process about whether to implement a new innovation (Sahin, 2006). This is just one example of how collaboration can support implementation. Collaboration is recognised as a way of practitioners working together to increase knowledge and expertise (Wright, 2017) in the same way that action research is seen as useful for sharing and developing expertise (Solvason et al., 2017; Somekh, 1995).

Members of the action research group in Cycle Three were able to ask for advice and support and were able to learn from others' mistakes. During the evaluation of the research, members of the action research group reported that they felt their practice with EdTech had improved over the course of the project and that they had more confidence using technology, see Appendix D, section J. Their technological knowledge had improved and members of the group talked about the benefits of collaboration. During the course of the project, they developed their technological knowledge, which increased the overlap with the other areas of the TPACK model.

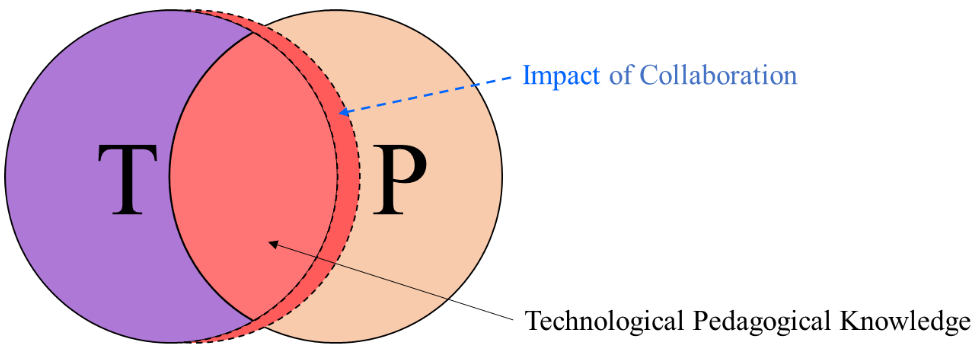


Figure 38: Impact of Collaboration on TPK

Figure 38 is a simplified diagram showing how this collaboration can be seen to extend an individual's technological expertise, increasing the area of technological pedagogical knowledge.

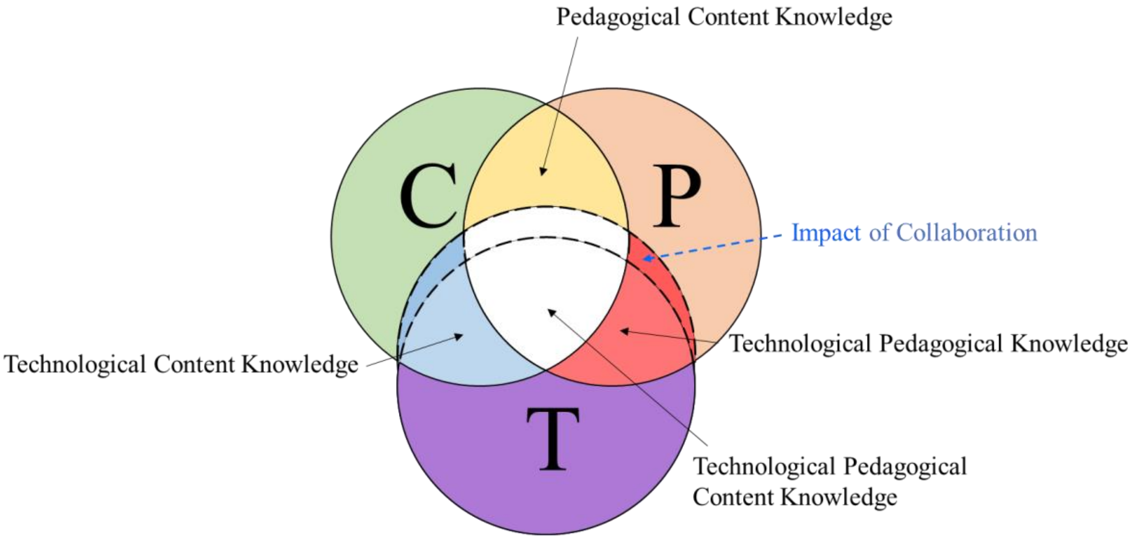


Figure 39: Impact of Collaboration on TPACK

Figure 39 is proposed as a model for how collaboration can impact on TPACK as a whole.

This model shares the limitations of the original TPACK model and other limitations may become apparent through further investigation. The model, however, has been considered against Whetten's Building Blocks for Theory Development to ensure it clarifies rather than obfuscates (Whetten, 1989, p. 490).

In developing the framework described in this section, I have considered:

- What factors need to be included: I have aimed for a balance between comprehensiveness and parsimony. The diagrams show that all three factors, **content**, **pedagogy** and **technology** are important. They help to set the context and identify a focus for developing the use of educational technologies, and it illustrates how practitioners knowledge can increase. **Collaboration** plays an important role in extending practitioners expertise and increasing the overlap between the three factors.

- How the factors are related: the diagrams show how participation in a project to support the implementation of educational technology increases participants' expertise and suggests that one of the causes of this is collaboration.

- Why the model has been developed: this chapter has aimed to show the rationale behind the development of this model.

This model emerged from the findings of this research, the next stage would be to consider the likely implications of the model and devise additional research to test these.

11.4. Implementing EdTech in the EYFS

This research project has shown that early years settings have access to more types of educational technology than in the past and that there are many examples of educational technology being used to support teaching and learning. However, it suggests that the number of pedagogically appropriate uses of technology would increase if the pedagogical rationale became more prevalent. The implementation models have been reviewed to show the importance of focusing on pedagogy from the start. This resulted in identifying a process for implementing EdTech in the early years (Figure 35) and a model showing the potential outcome of such a process and the impact of collaboration (Figure 39).

Section 3.11 highlighted the barriers and enablers identified in the interview phase of the project. One significant barrier was a lack of access to training in the use of educational technology. There were few opportunities for the early years practitioners to access any type of training, but the most common training accessed was linked to literacy and numeracy, as this tended to be a priority in most settings. Practitioners also had little time to find out about technology and learn how it could be used. Where technology was available, the main priorities in early years settings meant that adult support was rarely allocated to tasks involving educational technology. The action research phase suggested that the type of training that was available did not always result in a change of practice, the group felt an action research approach was better.

The suggested implementation model clearly links the implementation of educational technology to broader pedagogical issues in early years settings. This approach could raise the value early years practitioners place on the use of EdTech. Any testing of the model will need to consider the practicalities highlighted above. Even with an increased perception of the value of EdTech, will practitioners be able to justify the time and effort involved in taking part in this type of project to their colleagues?

11.5. How well did the research address its aims?

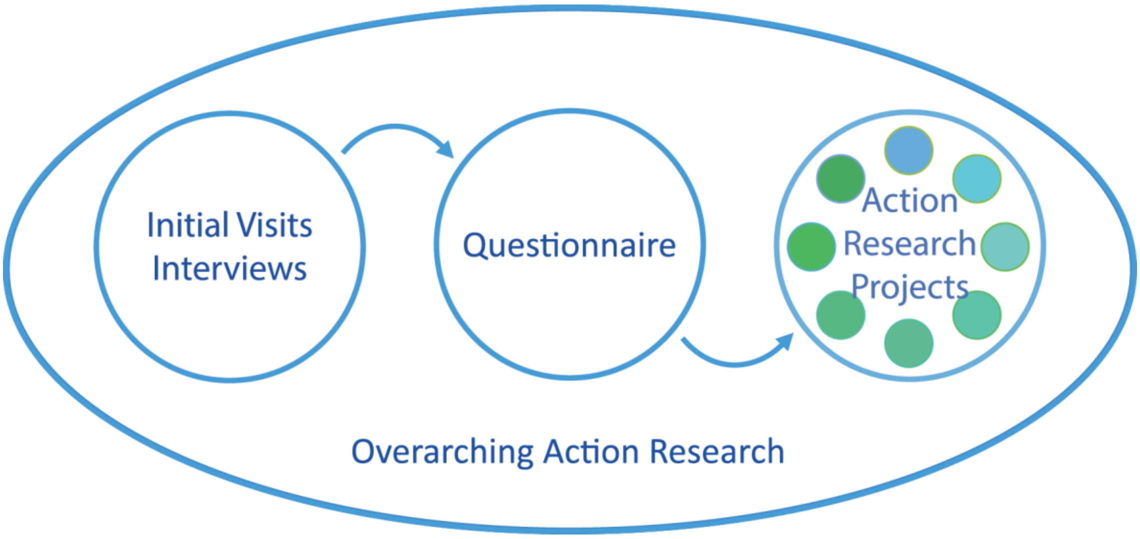
In section 2.1 I stated that my research is built on three personal beliefs and assumptions, how well did the final research address these?

- research should be about more than finding things out, it should make a practical difference:
- expertise resides in different places; it is important to learn from literature, conducting research, and from practitioners who have real experience and knowledge to draw on.
- that what works in practice will vary depending on people's experience, their beliefs and their environment.

Action research is associated with a change in practice and understanding (Atweh et al., 1998). In section 7.2 I stated that change is a key element of action research. In evaluating the action research network it is important to identify what has changed. Table 23 in section 10.8 provides an overview of the changes in terms of outputs, outcomes and impact.

Much of the literature reviewed in Cycle One focused on evaluating the impact of technology by measuring how much technology settings had. Some of the settings involved in this project have acquired more equipment and are using technology more often, but for me that is not the most important change. Some members of the group clearly had more knowledge and skills at the end of the process. They had developed their technological knowledge, but this did not mean that they were trying to use all the affordances the technology had to offer, or to use it to support all aspects of their curriculum. The biggest change was that their use of technology was tailored to meet their identified needs, needs that related to teaching and learning.

11.6. Is this ‘quality’ research? (overarching project)



Research Question 1: *What is the relationship between early years practitioners’ use of educational technologies and their pedagogical beliefs?*

- What are the pedagogical beliefs of early years practitioners?
- How are early years practitioners using educational technologies to support teaching and learning?

Research Question 2: *How can early years practitioners be helped to integrate educational technologies into their practice in a way that supports their pedagogical beliefs?*

- How would early years practitioners like to use educational technologies?
- Is action research an appropriate route to enable early years practitioners to reflect on pedagogy and improve their use of technology?

Did the project make a difference?

In section 10.8, I considered whether the participants’ action research projects could be considered ‘quality research’. I described the fact that participants were not required to keep a formal record of their activities. I did keep more rigorous notes, though looking back the ‘failures’ still tended to be recorded as thoughts about how to do things differently in later stages. They were usually found in planning sections of my notes rather than as part of a formal evaluation. These 'steps along the way' tended to be part of an evolutionary process, rather than significant revelations that would require big changes. They referred to the action research process rather than findings. Reflecting on findings and reading literature did result in new questions and new directions to follow, but the impact of these may be more easily seen in what I do next rather than in changes to this project. Time was naturally limited, and I was, to some extent, required to follow the participants and the expectations that had been set at the start of Cycle Three.

In section 10.8, Table 23, I identified four factors to consider while evaluating research, input, output, outcome, impact (Balanskat et al., 2006). I was initially unsure whether this way of evaluating projects would be useful for the overarching approach, but with some adaptation, it did provide a useful prompt. For the purpose of this exercise, I am equating resources (in input and output) with knowledge or evidence that I had at the start and end of the project, see Table 24.

Table 24: Impact Factors - Overarching project

Factor	Definition	Overarching project
Input	• What resources (evidence) did I have at the start of the project?	• Personal knowledge and experience of working with educational settings to support the use of EdTech • Literature reviews • Discussions with experts – doctoral supervisor, advisers and practitioners not directly involved in the project
Output	• Directly quantifiable • What resources (evidence) did I have at the end of the project?	• Knowledge of what technology a sample of settings has access to • Knowledge of what this technology is being used for • Knowledge of action research • Knowledge of changes in practice and the impact this has had on teachers, children and parents e.g. increased parental engagement
Outcome	• Measurable outcomes	• Findings presented in the thesis • Measurable changes in practice within the action research settings (see Table 23) • I presented my project and findings at three practitioner conferences • I presented my project and findings at one academic conference • Two journal articles published

		• One conference paper published in conference proceedings • Amount of literature read and evaluated
Impact	• What were the broader results achieved by the project	Established that: • EdTech is defined more broadly than in the past • EdTech is more physically and culturally embedded than in the past • EdTech can be used in pedagogically appropriate ways • Action research is an appropriate route to support EYFS practitioners to use EdTech more effectively • There are some practical challenges that arise when conducting action research

How reliable are the findings?

> *the value which action research places upon critical reflection made it particularly vulnerable to attacks upon its methodological rigour from traditional researchers—they needed to do little more than quote the shortcomings in the methodology described by the authors of action research reports (Somekh, 1995, p. 347).*

There are limitations to all research and it is important to identify and acknowledge these, even though this process can result in providing evidence for the limitations of action research to ‘traditional researchers’, as shown by the quote from Somekh above.

In section 2.5, I introduced the criteria that are often used to evaluate to qualitative research (Lincoln & Guba, 1985).

While this project has involved mixed methods, with both quantitative and qualitative data collection, I have decided to use these criteria to evaluate the project as a whole.

Credibility

> *Data from such studies in schools and classrooms are in a useful sense hard data. They are rooted in real situations and have a high degree of verisimilitude. Above all, conclusions drawn from them and interpretations of them are verifiable by teachers in a way that data from testing are not (Stenhouse, 1975, p. 136).*

Credibility refers to whether findings are true, credible and believable from the perspective of the participants. Action research findings can lack precision, but the outcomes are realistic (Corey, 1954). Involving the participants in the analysis helps to ensure the findings accurately represent their experiences. Ideally, practitioners should evaluate research, rather than external researchers (Stenhouse, 1978). For the overarching project, I am the practitioner and the researcher, and I evaluated the research. I did not do this alone. I was able to involve experts in the process. My supervisor, the action research participants and colleagues I met at practitioner and academic conferences all contributed to this process.

For action research the intention is not to validate theories through research and then apply them to practice; theories are validated through the practice (Bell, 2003). Throughout the project I have reflected on my findings and adapted my research, when new questions arose, I was, sometimes, able to modify my approach to try and answer them. I have tried to be transparent about my actions and analysis and this thesis has aimed to explain why I find my conclusions credible.

Dependability

Dependability evaluates the likelihood that someone else conducting this research would have come to the same conclusions. This is difficult to judge with action research. Each participant in an action research project brings their own experiences, knowledge and skills to share. Another researcher would have changed the approach and the process and outcome would have been affected. Action research is context dependent (Cordingley, 2008).

It would never be possible to replicate the research with someone else in order to establish whether the findings are dependable. Again, I have tried to make the process transparent, so others can judge my actions and conclusions and decide whether they are justified.

Inquiry is not a completely rational, logical approach; emotions and bias are there throughout the process (Morgan, 2014). Action research has been criticised on the grounds that it lacks objectivity and is biased (Wang, 2008). To address this, I have tried to make my background and biases explicit.

Confirmability

Building on dependability, confirmability asks whether my conclusions would convince a sceptical colleague. Conversations with colleagues indicate that they find my conclusions credible. However, I have mainly shared my findings with people at practitioner conferences, these people are likely to have similar interests to me and may have had a predisposition to be receptive to my findings. They are likely to be less sceptical than other educational practitioners.

This reflects one of my criticisms of this research. It aimed to improve local practice within the settings involved, rather than on a broader scale. This fits into one of the examples of inadequate action research described by Kemmis (2006). He suggests that this would mean the action research was not critical enough.

I aim to share my findings more widely and would hope to receive some more robust challenge. This can only improve my future research.

Transferability

> *Practitioner enquiry has been criticised for the difficulties of generalising results from projects beyond their specific context. While it has high validity for the teacher and the context within which the research was completed, its reliability and transferability can be questioned. This means that the role of partnerships in supporting the teacher-researchers can be crucial (Baumfield et al., 2013, p. 8).*

Transferability refers to whether the results can be transferred or generalised to other contexts or settings. The aim of action research is to find solutions to individual problems in particular contexts, so it can never be completely generalisable; each context is different.

The primary aim of my research is not for results to be generalisable to other practitioners, but to establish whether this approach is appropriate for me. I would hope that other people may be encouraged to try a similar approach and would find my research findings useful. I need to think about the aspects that make action research successful and identify when it would be appropriate to use this approach, I also need to consider when a different approach may be more appropriate. Through my sharing of the project through social media, blogs, articles and conferences others have learned about the project, and hopefully benefited from this information. There is no expectation that action research findings should be generalisable in other contexts; instead findings may help to produce hypotheses that could be tested elsewhere (Ampartzaki et al., 2013).

There has been an acceptance that action research can be biased as practitioners can bring their own assumptions with them to the process, but the action research process can be a solution to this problem. Action research is a way of making one's own values explicit, to call them into question and make us reconsider whether they are appropriate (Bridges, 2003). Addressing bias is one of the benefits of the collaborative approach; there is a need to explain our actions to others who will judge the results.

Reflections

The overarching aim of the Action Research project was to improve my own professional practice. Often my practice is linked to a commercial agreement, I get paid for working with schools. One of the best things about this project was the freedom from this commercial element. Would it have worked as well if schools were paying to participate? Would schools have the time/resources to buy into a long-term action research approach?

It would not be appropriate when I work with schools for a short time but may be a useful approach when I am contracted to work with teachers or settings for a number of months.

Even if it is not possible to do all the elements I have done here, are there lessons I can learn that will help me with my future practice?

11.7. Summary

The first success criterion for evaluating an action research project is that it should be of use to the participants. This project was directly related to my working life and the aim was to make my practice better. This did not mean that the findings should be of no value to others. As I mentioned earlier, I shared information about the project at regional practitioner conferences and through publications and presentations to academic audiences. This provided me with a useful opportunity to get feedback and gauge how credible others found the findings.

I believe that this research has been valuable. I have a better understanding of what technology is available in early years settings and how it is being used. I have shown that there can be strong links between the practice of using educational technology and pedagogical beliefs. I have studied the research literature and improved my understanding of research methods. I have found that action research projects can be a valuable way of supporting the use of EdTech. I believe I have evidence to support all of these conclusions. However, even with this evidence, I would not suggest that my findings are conclusive. My pragmatic approach means I recognise that I will need to continue to develop and deepen my understanding.

> *AR informed by pragmatism does not demand that the project succeed in a final way or even that it be realistic in terms of the long view, just that it forward understanding and change the situation in some way for the better. In fact, deepening understanding is success for pragmatic inquiry (Stark, 2014, p. 98).*

I wanted my research to have an impact on my future practice. Even though I do think action research can be a useful approach for practitioners, I have not established whether it is something I, as an educational consultant, could offer successfully. I have identified a number of challenges to implementing action research, which may mean it is not a viable approach.

I often work with groups of practitioners for a short time. Would it be possible to start them on an action research approach in just a few hours? Sometimes I work with individuals who have responsibility for the use of educational technology in their settings. I can share the findings from these projects, but would this process not be more like the normal training model I have criticised? I do sometimes work within settings for a longer period, sometimes for many months; this seems a more appropriate time to try an action research approach. I am concerned that barriers of time, resource and attitudes may mean a full action research project would be out of reach. Would it be something individual practitioners would opt in to? If not and it were a compulsory programme for a group, it would operate in a different way and may not have the same benefits.

I do know of some schools that have set up internal or external action research networks, but is it something others would buy into? To answer this question would require more research, including market research. Conducting this research was enjoyable and informative; part of the reason for this was that there was no commercial element. I was there to support and not to sell my services. I suspect a commercial element would change the culture of an action research group.

I am sure I will make use of the lessons I have learned, but whether it is a viable service is unclear.

Chapter 12. Reflections

12.1. What did I learn?

Reflections

Action research is an ongoing cycle, with no definite end point (Hammond, 2013).

This did not need to be the end point of the research, it was imposed by the constraints of the doctoral process. The practitioners and I will continue with our projects.

I know that the lessons I have learned will affect my future work. I hope the practitioners will also benefit from the lessons they have learned.

This chapter has helped me to reflect on the whole process and consider what lessons I will take with me into future research projects.

Reviewing the project

I wanted to find out what EdTech early years practitioners had access to and how it was being used. I found that they are using a larger range of devices than earlier literature reviews had suggested. They report using EdTech in pedagogically appropriate ways. I wanted to find out if action research was an appropriate approach to use when supporting practitioners to implement new EdTech. My findings suggest that it is. It is an approach that allows anyone, no matter what their rationale for using EdTech, to explore how it can be used. The adaptive nature of the approach responds to the needs of individuals and specific settings and can be seen as a strength (Solvason et al., 2017). Action research is very much an attempt to solve practical problems by using research methods (Corey, 1954).

Figure 6 in section 2.4 presented an overview of the whole project, Figure 30 is an updated version of this diagram. It brings together some of the key findings and starts to identify what the implications of these findings are. All stages of the research had limitations and rather than presenting definitive answers it identifies areas that would benefit from further research.

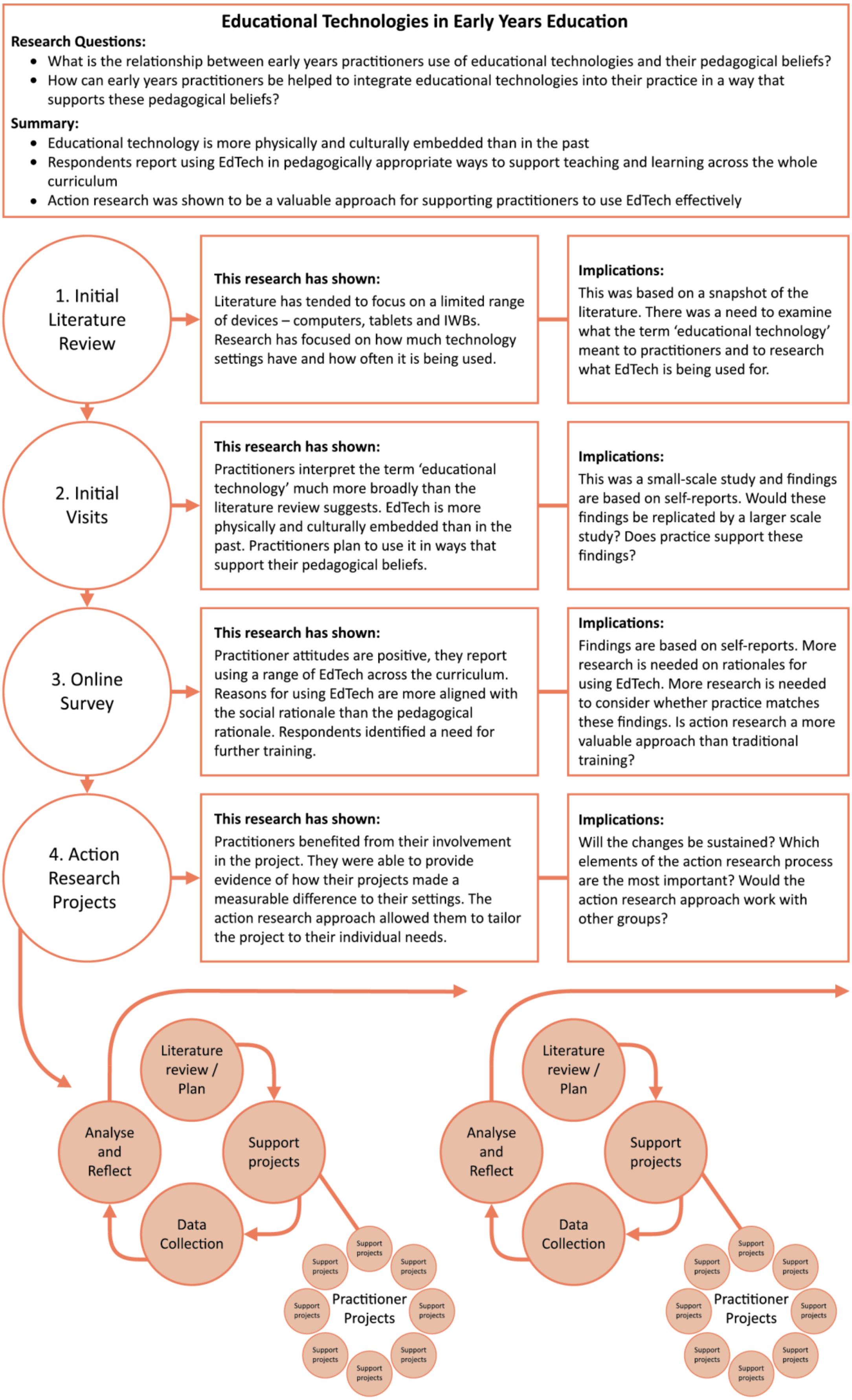


Figure 40: Review of the Action Research

A pragmatic approach means that conclusions cannot be fixed; it is necessary to keep learning. It is important to avoid making unrealistic claims about action research. While I have seen that it can be a viable approach, this does not mean it would always be the best method. Anyone conducting action research faces practical challenges including workload, finding time to engage and collaborate, and managing group dynamics (Bevins & Price, 2014). These challenges may mean it is not an appropriate approach to use. It may be possible to do a version of action research which does not involve all of the aspects described in this thesis, though that may result in it becoming more like reflection than research.

> *…the value of action research in enabling a reflective space in which teachers can pause to think about the tensions and difficulties of their teaching lives and this in itself is a reason for such [an] undertaking (Foreman‐Peck & Heilbronn, 2018, p. 128).*

In the case of the action research projects described here, the practitioners all had a pedagogical focus, though some also had other reasons for using technology. All of the participants valued technology and wanted to use it. I am not sure what I would do if I were working with someone who did not see any value in using technology, maybe someone who shared some of the less positive attitudes expressed in the questionnaire cycle of this project. If a practitioner genuinely believes that technology can have a harmful impact on language and communication or on social skills should they be expected to use it? Would any approach to CPD convince them to do so?

If a practitioner’s reason for using technology was social, and they did not have an interest in focusing on using it for teaching and learning, would I have a right to gently push this rationale as well?

This will become a more important question if the proposed changes to the early years curriculum are implemented and technology is removed, as discussed in section 3.7.

Rationales do change over time and the focus may move away from the social and pedagogical. In KS3 and 4 there is already more focus on the vocational rationale, and while the early years practitioners involved in this project did not refer to the catalytic rationale this is found in settings that work with older children.

Who decides what the rationale should be? I would say it is more important for settings and practitioners to decide this than an external consultant, though in my other roles as teacher, governor and researcher I still have an interest.

Reviewing the action research

> *Action research is something that you learn to do through its practice rather than by following a set of prescribed methods or technique (Somekh, 1995, p. 347).*

One of the problems with action research is that you can only learn how to do it by doing it (Corey, 1954). If I did the project again would I do things differently?

In this research, my project and the practitioner projects ran alongside each other and, to an extent, I was learning as I went. If I did it again, I would know more and have a better understanding of the need for a greater focus on some areas.

Of course, I will never have all of the answers; action research will never work the same way twice. The context, questions and participants will vary, and it is important to avoid thinking you have the one best solution. Checklists and rules will not work.

> *The seeker, the questioner, the researcher, is always at an advantage vis a vis the person who claims to be a knower (Stenhouse, 1979, p. 9).*

Many debates are repeated in the literature over many years; this could lead to ‘reifying existing approaches and resources, rather than informing future possibilities’ (Burnett, 2010, p. 251). I believe that by questioning and reflecting on these debates, it is possible to move on.

12.2. Looking to the future

Reflections

This section of the chapter has provided an opportunity to look forward and consider which aspects of this research I would like to explore further. I started by considering what remains to be done on this research project, or what I would have done differently if I did it again. I then looked further ahead and examined how this project has led to new questions that could be the focus of new projects.

Such study becomes research when it is made public by being published, at which point the student makes a claim intended to evoke a critical response (Stenhouse, 1979, p. 11).

The importance of sharing research and its findings in an accessible form is widely recognised. This could include access to case studies which some would argue are some of the most valuable types of literature (Bolstad, 2004). Whatever media are used, it is important to share findings widely; for action research a key element is making research public. I will continue to share my research through publications and conferences. I believe it would also be beneficial for the participants to share what they have done. Setting 3 has already had the opportunity to talk at an international event and I know that some settings have shared the project in more informal ways with colleagues in their schools and local authorities. Sharing the research more widely will also allow me to continue to evaluate and challenge my conclusions. The conference workshops I have already facilitated have shown how useful this approach can be, though they do tend to be self-selecting groups and involve people who already have a positive attitude towards technology.

It would be interesting to revisit the participants in a few years to see their practice and evaluate whether the change was sustained.

Future research

During the course of the project a number of interesting issues emerged. I would have liked to pursue these, but they were out of the scope of the research design. They could become new research projects. They included:

- This project suggests that action research can be an effective way of providing practitioners with support to use EdTech effectively. Questions have been raised about **the value of the different elements of the action research process** (see section 10.7). Further research would be useful to explore which elements are most important; this could be valuable when planning future training.
- Chapter 11 proposed a **new framework combining aspects of the implementation theories** reviewed in this project and a **new version of TPACK highlighting the role of collaboration.** Further research is needed to evaluate and develop these models.
- Action research is participatory; most of the projects involved using technology with children, but there is no pupil voice in my thesis. I was able to talk to some of the children during my visits, but this information was not directly relevant to my research questions. It would be interesting to focus on **the child's perspective** of using educational technology.
- Some discussions referred to **parents' attitudes** towards educational technology; some seem to be reluctant to use technology to access their children's work. They prefer the more comfortable, traditional approach of reviewing children's work in books. It would be useful to involve parents in future research on using digital learning journeys or portfolios.
- Some differences between the use of **EdTech in the home** and in settings were identified. This is an area that is increasingly being studied (Facer, Furlong, Furlong, & Sutherland, 2003; Plowman, 2015) but there are still opportunities to examine how EdTech is being used in each context.
- The findings from the questionnaire suggested that EdTech is becoming more physically and culturally embedded within the early years and raised a question about whether this would have an impact on **practitioners' rationales**. It would be useful to conduct research which explicitly focused on the different rationales for using EdTech and how these aligned with a settings' access to resources.
- The questionnaires highlighted differences between **childminders and settings**. It would be useful to explore these differences in more depth and examine how EdTech is being used in each of these contexts.

- **Gender** was mentioned occasionally and some participants thought that boys and girls had different interests. This seemed to be in reference to different activities, so the difference was not what device the children used, but what they were using it for. One example was using an app like YAKit[7] to create messages for the children, as if they came from fictional characters. The practitioner tailored this according to gender; girls were perceived to be interested in messages from Belle, boys in messages from the Beast in Beauty and the Beast. Is an approach that distinguishes tasks by gender necessary or appropriate?
- Many discussions touched on **assessment**. Ertmer (2005) suggested that pedagogical beliefs may be the final frontier, the last barrier to overcome before EdTech (she referred to computers) can be used to its full potential. Lim and Chai (2008) suggest that the final frontier may be the assessment system. Several of the practitioner projects used EdTech to support recording and reflecting on learning; practitioners were able to build up a bank of evidence about their children's progress. Assessment may be different in the early years with less reliance on formal written tests. Are the early years an ideal place to explore how EdTech can be used as an assessment tool?

[7] https://www.commonsensemedia.org/app-reviews/yakit-kids

Appendix A. Cycle One: Interviews

A. Discussion Guide

Interviewee Name: *Date:*

Setting:

Discussion Guide for Early Years and ICT Initial Visits

1. To identify the key issues in early years education and clarify any differences between different types of providers – nurseries, primary schools, free schools
2. To understand practitioners philosophies of teaching and learning and understand how educational technologies are perceived in this context
3. To identify research questions early years practitioners would value
4. To identify practitioners who would be interested in participating in future stages of the research and any routes to other practitioners for the survey and future interviews.

Background to visit. I am studying for a doctorate at Durham University. My background has given me an interest in early years and the use of educational technologies. I am at the beginning of the process and visiting a number of schools to help me scope out the focus of the research.

I will be writing up my research and it will be publicly available, but no comments will be associated with individuals unless I clear this with them first. Schools/individuals may have the opportunity to be listed as participants, again this will only happen if I am given permission to do this.

I would like to record the conversation so that I will be able to revisit what is said for my analysis. No one else will have access to the recording. Request permission to use recording device.

1. Confirm the interviewee's current role and background in EYFS and primary education. (also, any relevant school information e.g. SES)
2. What do you think are the key issues in EYFS education at the moment (e.g. assessment, curriculum, parental concerns, transition, resources, national policy)?
    - Nationally

- For your school/class
- Which ones are most important to you?
- Is there a difference between different types of providers, is your setting any different to others?
- How do you find out about the key issues/are there any key networks, publications, websites?

3. How do you support learning in your classroom?
    - What is the purpose of EY education?
    - What are your teaching and learning philosophies?
    - What is your approach to classroom management?
    - What is a typical day or week like for a child in your class? *(open / exploration closed / directed)*
    - Are there different approaches for different ages, subjects, time of year?

4. How are educational technologies used in your setting?
    - What technologies are used? *(Computers, iPads, whiteboards, recording devices, video, cameras, robots, toys, role play…)*
    - How are they used? How often? *(admin, communication, record keeping assessment, teaching, learning, play, school trips, blogs, website, internet …)*
    - Who uses them? *(staff, pupils, parents)*
    - Is there a school policy for educational technology? *(if so, what are the main points, what support do staff get linked to educational technologies)*
    - What are the benefits/challenges of using educational technologies?
    - Are there any barriers/pressures to using technology? *(training, resources, confidence, attitudes, safety…), are these different to other types of settings*
    - How does technology help or hinder your approach to teaching and learning?

5. My research is going to be in two parts
    a) A review of what is happening now: how is technology being used and it fits with EYFS practitioners' philosophies of teaching and learning.

This will involve a (large) survey of EYFS teachers and some in-depth interviews and observations with a smaller group focusing on current practice.

b) Action Research which will involve working with a small group of EYFS practitioners to share practice and provide support for implementing new approaches to the use of technology. The ways of using technology will then be evaluated. This stage will be directed by the participants.

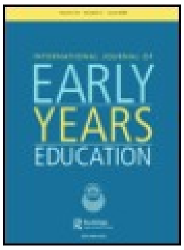
- Would you be interested in participating in either or both of these stages?
- Can you suggest a way of identifying EYFS practitioners who would be interested in participating?
- Are there any key networks or publications?
- Do you have any comments about the focus of the research, any suggestions, would it be useful?

Do you have any other comments?
Thanks, and close

B. Cycle One: Article

An account of Cycle One was published in August 2018. A copy of this article is included here.

Jack, C., & Higgins, S. (2018). What is educational technology and how is it being used to support teaching and learning in the early years? *International Journal of Early Years Education*, 1-16. doi:10.1080/09669760.2018.1504754



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What is educational technology and how is it being used to support teaching and learning in the early years?

Christine Jack & Steve Higgins

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What is educational technology and how is it being used to support teaching and learning in the early years?

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ABSTRACT

There are many digital technologies available to support teaching and learning. Historically the focus has tended to be on computers, but this has extended to include interactive whiteboards and tablets. As well as these technologies, which were originally designed for adults, there are devices specifically designed to support teaching and learning in the early years. These tend to be overlooked in the literature. This project aimed to find out if this reflected practice in early years settings. Participants from 20 early years settings in the North East of England were asked about 'educational technologies. This term was deliberately not defined, the aim was to find out what they thought it meant. They were asked about the technology they had, and how it was being used. This provided an opportunity to explore whether their use of technology fit with their beliefs about teaching and learning. Findings suggest that technology is seen as more than computers and that technology is being used to support a broad range of activities in line with practitioners' pedagogical beliefs.

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KEYWORDS
Early years education; preschool; educational technology; ICT; digital technology

Early years and technology

> [Technology] has opened new ways of working that I have never seen before …

This quote, from one participant, reflects a position that has been seen many times over the last couple of decades: technology can make a significant, positive impact on teaching and learning (Couse and Chen 2010; Higgins, Xiao, and Katsipataki 2012). However, opposing views are seen just as frequently, in social media, websites, blogs, mainstream media and publications (Hall and Higgins 2002; Marsh 2005, 181).

Given such different opinions this research was designed to find out what is actually happening in early years settings. One key issue is the definition of educational technology: is there consistency between curriculum documentation, the literature and practitioners' understanding of the term?

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Technology in the early years curriculum

Even in 1990 (Rumbold), curriculum documentation in the UK referred to more than just computers, with references to toys and domestic technology. The Desirable Learning Outcomes (School Curriculum and Assessment Authority and Department for Education and Employment 1996) were less explicit, stating only that children should 'use technology, where appropriate, to support their learning'. There is, however, a reference to the Key Stage 1 curriculum for 5–7-year-olds, which says that 'many everyday devices respond to signals and commands'. The Curriculum Guidance for the Foundation Stage (Qualifications and Curriculum Authority 2000) identifies a number of devices including: programmable toys, cameras, tape recorders, talking books, domestic technology and technology in the environment. This range of devices is also referred to in the 2008 and subsequent Statutory Frameworks as well as in Development Matters (Department for Children Schools and Families 2008; Department for Education 2012, 2014; Early Education 2012). Curricular frameworks in the UK clearly identify a range of technologies, though this did not appear to be reflected in the contemporary literature.

What is educational technology?

A selection of literature from 1996 was reviewed and compared with an equivalent selection from 2016. These dates were chosen as 1996 was when the Desirable Outcomes for Children's Learning were published in England (School Curriculum and Assessment Authority and Department for Education and Employment 1996). It also reflects a time before interactive whiteboards (IWBs) became prevalent in schools.

To be manageable, the search was limited to the Education Resources Information Centre (ERIC). The following Boolean string search was used: ('computer' OR 'technology' OR 'digital' OR 'ICT') AND ('early years' OR 'preschool' OR 'kindergarten' OR 'young children') and the search was limited to peer-reviewed journal articles. The search resulted in 44 articles from 1996. After reviewing the abstracts, 15 were excluded as they did not meet the criteria for this study. 240 articles were identified for 2016, 156 were excluded after review.

Studies which were excluded:

- did not focus on children or practitioners within early years settings,
- focused on assistive technology which supported individual students' needs but would not be described as educational for all pupils e.g. cochlear implants,
- focused on design and technology, science or medicine,
- used technology for data collection rather than as the focus of the research.

Twenty-eight of the 29 articles from 1996 focused on using computers, or on software accessed through a computer. Even the remaining article, which evaluates the appropriateness of technology and its potential benefits, focuses mainly on computers (NAEYC 1996). In 2016, there initially appeared to be a focus on a wider range of resources. Tablets and IWBs were now common. However, these were often used to access resources, software or apps that would previously have been used on a computer. Tablets and computers were mentioned most frequently. These, or resources accessed through them, are the focus in 62 of the 84 articles. Robots were the focus of seven articles. In five, the focus was on technology or digital play, but it was unclear which technology was being used.

An initial look at the remaining 10 suggested that they focused on more than computers, but a closer examination showed that this was not always the case. For example, even when the term used was 'digital technologies' or a list of technologies was given in the overview, the analysis often focused on computers or screen-based technologies (Ebbeck et al. 2016; Hsu 2016; Konca, Ozel, and Zelyurt 2016; Mangen 2016; Palaiologou 2016a; Preradović, Lešin, and Šagud 2016).

Only four explicitly looked at a broader range of technologies than this. Two focused on practitioner perceptions (Dong and Newman 2016; Palaiologou 2016b), one on technology and social interactions

(Arnott 2016). The last one looked at technology use in settings. Its findings referred to how often technology was used and which curriculum areas it supported, but there were no references to what technology was actually being used for (Aldhafeeri, Palaiologou, and Folorunsho 2016). This finding is similar to that of Burnett (2010), while her search criteria allowed for the identification of studies using a wide range of technologies, all of the studies in her review were based on computer applications.

This was only a snapshot of the literature and literature can be found which has a broader focus, for example, referring to how a range of technologies can be used to support authentic learning experiences (Garvis and Lemon 2015).

Defining educational technology

It is not possible to find a consistent definition of educational technology or a consensus on what terms to use. A quick review of literature on technology in the early years provides a long list including: digital technology, internet-enabled technology, ICT, mobile technologies, digital tools, digital resources, digital artefacts, interactive devices, information technology, digital literacy, learning technology and digital media. Sometimes these are accompanied by definitions, often not.

When a definition is given, it is often simply a list of the devices to which the article is referring (Ekici, 2016; McPake, Stephen, Plowman, Sime, and Downey, 2005; Stephen and Plowman 2013). There is also evidence that definitions differ between researchers and practitioners (Plowman and Stephen 2005).

How educational technology is defined is important as practitioners' perceptions impact on their practice. A narrow focus has been linked to a 'mechanistic approach' and a broader range as providing 'scope for more imaginative, creative and collaborative activities' (Plowman, McPake, and Stephen 2012).

The case for moving away from a narrow definition of 'technology as computers' has

been made many times (Plowman and Stephen 2005; Siraj-Blatchford and Siraj-Blatchford 2003). However, this review suggests that this is not reflected in the literature. The mentions of IWBs and tablets could be perceived as a broadening out of the devices used, or they could be seen as replacing or enhancing computers. They have additional functionality that makes them easier for early years children to use. Even with the addition of tablets and IWBs, the range of devices the articles refer to is very limited when compared to the range of technology available.

The aim of this study was to give practitioners an opportunity to talk about the range of technologies they had access to and how they are being used. The definition of 'educational technologies' was deliberately left open to find out if practitioners' understanding was similar to the focus found in the literature.

Technology and early years pedagogy

Nearly all early years pedagogies are based on play and student-centred practices which favour exploratory learning (Allen and Whalley 2010; Mertala 2017; Roberts-Holmes 2012). Non-statutory guidance in England identifies the characteristics of effective early learning as: playing and exploring, active learning and creating and thinking critically (Early Education 2012).

Even in 1991, it was possible to find examples of technology being used these types of

open-ended activities (Fields 1991), however, this did not appear to be typical (Yelland 2005). Until recently, there has been a perception that technology in schools has been used for 'drill and practice' activities, or to broadcast information using audio or video (Goodwin 2012; Murray and Olcese 2011; Wang et al. 2010), even now the majority of educational apps are based on 'drill and practice' principles (Papadakis and Kalogiannakis 2017).

If early years teachers prefer a flexible, active, exploratory approach to learning, this use of technology may be considered inappropriate (O'Hara 2008). Marcon (1999) found that children perform better in classrooms where there is a single and consistent pedagogical approach, technology use should match practitioners' beliefs.

There is a perception that early years practitioners may not be under the same academic pressures faced by teachers of older children and that their more child-centred approach, could provide an opportunity for them to lead the way in more appropriate and effective uses of technology (Brooker 2003; Mishra and Joseph 2012). However, even Brooker who is often cited as identifying this perception has said that curriculum guidance could be seen as 'an instruction to adults to replace children's own play agenda with adult-designed learning intentions' (2011). Others, who accept that early years curricula are more flexible, suggest that technology is seen as an extension of the curriculum and not necessarily integrated with broader learning experiences (Edwards 2005).

Mertala (2017) found the use of technology was limited to more whole class instruction and drill and practice exercises. Other evidence suggests technology in preschool settings is usually interpreted as computers, used mainly during free play (Plowman and Stephen 2007). To address these issues in the existing research, and as a preparation for a further study, interviewees were asked about their teaching and learning philosophies and how these fit with their use of technology.

How is educational technology being used?

The snapshot of the literature from 1996 and 2016 suggests that there are a number of studies investigating specific technologies, usually individual devices or digital resources, and often with a focus on evaluating the efficacy of a particular resource. However, there is limited research that looks at how a broader range of technologies is being used. Where this does happen, the focus tends to be on the amount of time spent using a resource, or the area of the curriculum being supported, rather than how it is being used to support learning (Aldhafeeri, Palaiologou, and Folorunsho 2016).

Stephen and Plowman (2013) identified three kinds of learning associated with technologies:

- operational: how to use technology
- curricular knowledge and understanding: learning specific content
- developing positive learning dispositions: e.g. independence, confidence and persistence.

They suggested that children's home experiences were likely to support all these types of learning, but in educational settings the learning was more likely to be limited to basic operational skills, limited learning dispositions, e.g. taking turns, and some content e.g. basic reading or number skills. Recent research suggests that technology is used infrequently in early years and is usually used for developing ICT skills, administrative tasks or for more didactic practices (Blackwell, Lauricella, and Wartella 2014; Kerckaert, Vanderlinde, and van Braak 2015).

There appears to be a disconnect between children's experience of technology at home and in educational settings (Aubrey and Dahl 2014; Palaiologou 2016a). The lack of integration of technology into early years teaching and learning is often attributed to teachers (Edwards 2013). In one study, practitioners did not see the value of using digital technology to support learning, so even when technology is available, it may not be used. Teachers can be sceptical and hesitant about its use (Aldhafeeri, Palaiologou, and Folorunsho 2016). However, this is not always the case, Mertala (2017, 1) found that the 'vast majority of early childhood educators feel positive about using ICT with children'.

Ertmer suggests that teacher beliefs are the 'final frontier' for introducing technology

into schools, believing that barriers such as time, training, access to resources and support had been overcome (Ertmer 2005). Practitioner interviews allowed them to identify their beliefs about technology and how it was being used in their setting.

Interactions with technology

Research suggests that technology is more likely to have a positive effect when children use it alongside adults or more experienced peers (McCarrick and Li 2007). Of course, the need for adult support is not restricted to technology. Claxton and Carr (2004) recommend a potentiating environment, with 'frequent participation in shared activity'. It is not enough to make resources available, adults need to play an active role through explaining and modelling learning. While practitioners are familiar with supporting young children's learning, this does not always happen when using technology. Plowman and Stephen (2007) suggest this may be because other activities take priority over technology and that practitioners have limited confidence with ICT.

Research focusing on parents also suggests that adults interact with children differently when using technologies. The amount of talking can be affected by the use of electronic devices (Kucirkova et al. 2013; Sosa 2015).

The interviews in this study were designed to identify what kind of activities happened in practitioners' settings and the role of adults in this learning.

Methodology

The research questions are:

- How do early years practitioners define educational technologies?
- What educational technologies are available in early years settings and how are they being used?
- How does the use of educational technologies fit with practitioners' pedagogical beliefs?

Settings from six local authorities in the North East of England were visited between January and May 2015. They included eight individual settings: Local Authority (LA) nursery schools, a private nursery, LA primary schools and a free school. A focus group was also held with 12 practitioners from one Local Authority's Children's Centres. Semi-structured interviews were conducted and focused on teaching and learning philosophies, beliefs about technology and how technology is being used in the setting.

Most of the settings were known to the researcher through previous work. Other settings were identified through LA advisors. None of the interviewees had previously worked with the researcher. Almost all the settings took pupils from a range of socioeconomic backgrounds. Two catchment areas were described as deprived and one as affluent.

All interviews lasted between 30–60 minutes, they were recorded, transcribed and analysed using NVivo by QSR International which is designed for qualitative researchers working with very rich text-based and/or multimedia information, where deep levels of analysis on small or large volumes of data are required. A series of codes based on descriptive categories relating to different technologies, teacher beliefs and pedagogical approaches were applied. A thematic analysis was also undertaken in relation to the research questions following the principles in Schreier (2014). The themes which emerged from this analysis have been used as headings when presenting the findings.

Ethical approval for the study was granted by the School of Education Ethics Committee, Durham University, UK. Participation in this study was voluntary, informed consent was gained from participants, with the right to withdraw at any point, and anonymity was guaranteed. Practitioners' consent for audio recording the interview was also obtained.

Findings

What are practitioners' pedagogical beliefs?

Almost all interviewees believed that the purpose of early years education was to support children to develop life skills. They thought education should focus on the whole child; on developing social skills, confidence and independence rather than how well they perform academic tasks. While all but two of the interviewees did refer to the need to prepare the children for school, they said this would be the purpose identified by the local authority or school leaders rather than being their own priority.

All practitioners talked about the need to provide time for exploratory, child-led, play-based activities. These were balanced with teacher-led, directed learning and opportunities for children to practice what they had learned during free-choice time. Most interviewees talked about the importance of providing opportunities for children to reflect on their learning. All settings emphasised the need to develop links with parents and to provide opportunities for children to develop social skills.

For technology to fit in with the practitioners' beliefs about pedagogy, it would need to support this approach:

- Is it being used to support collaboration, links with parents and carers and to focus on children's interests?
- Does it provide opportunities for children to be in control and to spend time on creative activities?
- Is it supporting adults in their role as 'scaffolders' of children's learning?
- Does it support the development of positive learning dispositions?

What educational technology is available in early years settings?

Table 1 shows responses to the question 'what educational technology do you have?' This question was open-ended and no prompts were given, so answers reflected the resources that interviewees most closely associate with the term 'educational technology'. Other resources may have been available and, even if an interviewee did not mention a technology, it does not necessarily mean they did not have it. The table does not show how often resources were used, what they were used for, or include information about the age or quality of the resources.

Discussions indicated that many of the resources were not being used regularly.

> We have an IWB here but, if I'm totally honest, we don't use it all the time. Programmable toys … but again we don't use those often.

Where technology was only available in a single setting, it was not included in the table. These resources were: Apple TV, calculators, an immersive room, lightbox, overhead projector, smart table, stopwatches, torches, digital toys with lights and buzzers.

The amount of technology varied between settings. Schools tended to have more technology and it was used more often than in other settings. However, this may include older equipment that has been passed down to the early years. This is an area where there is little research (Bolstad 2004), it would be interesting to investigate whether this variation is apparent within a larger sample.

Table 1. What technology do settings have?

Setting description (age range)	LA School 1 2-5	LA School 2 3-5	LA School 3 3-5	LA School 4 3-5	Free School 4-5	LA Nursery 1 2-4	LA Nursery 2 2-4	Private Nursery 0-5	Children's Centres 0-5
Cameras: video or still	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Computer	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IWB	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
iPads	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No
Recording device	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes
Programmable toys	Yes	No	No	Yes	Yes	Yes	No	No	Yes
Audio players	Yes	Yes	No	Yes	No	No	No	Yes	Yes
Remote control toys	Yes	Yes	No	No	No	No	No	No	Yes
Roleplay	Yes	No	No	No	No	No	No	Yes	Yes
iPods	No	No	No	Yes	Yes	No	No	No	No
Metal detectors	No	No	Yes	No	No	No	Yes	No	No
Musical	No	No	No	No	No	No	Yes	Yes	No
Phones	No	No	No	No	No	No	No	Yes	Yes
Visualiser	No	No	Yes	Yes	No	No	No	No	No
Walkie-talkies	No	No	No	No	No	No	No	Yes	Yes

Not surprisingly, all practitioners mentioned computers, but they also talked about a range of other resources, which supports the view that the discussion of technology has now moved beyond 'just computers'. Resources include those designed specifically for young children e.g. metal detectors and audio recording devices. While some of these provide opportunities that have been available before in other ways, they are much more child-friendly than devices used previously.

In an ideal world …

> … teachers may feel that their efforts are constrained by limited equipment, yet their reasons for wanting more computers may point to different goals and beliefs. (Ertmer 1999, 57)

All interviewees were asked what educational technology they would like if there were no barriers to buying and using technology. The technology they identified, and the reasons they gave for wanting it, provided a useful indicator of their beliefs about how technology can support teaching and learning.

Most talked about iPads and these were identified as desirable by all settings that did not already have them. Settings that had them wanted more. Software was also mentioned frequently. One interviewee thought the children had used the existing software extensively and needed to move on. Two people talked about needing software for their IWBs which were not being used effectively. One said they would love to have older software which was no longer available.

> I would like some of the old games … I loved them because they were very simple … it was linked to a story … I know things move on but it's a bit like stories, some of the old ones were still good ones.

Cameras were another popular choice, all the settings had at least one, but all wanted more, especially cameras children could use independently and safely. Some thought this would allow them to get the children's perspective on their experiences in the setting.

> Cameras for the children, I like helmet cams, I would like a day in the nursery, little 'Joe Bob' what did you do, I'd like hat cams please, to see interactions.

Two interviewees said they would like access to an expert. Someone who knew about technology and could work with them to identify how it could be used appropriately. This reflected their view that they did not know enough about what technology was available, or how it could be used. Their comments suggested they did not have time to research what was available or keep up to date with new developments.

> My knowledge of technology isn't good, I think technology could make my job so much easier, but my barrier is that I don't know it exists.

> A technician … who's savvy and knowledgeable about the curriculum … a very important person … someone to give guidance … who has got the time to research and source the better technology.

Some answers related to the convenience of having more resources allowing children to use them more often, so resources did not have to be borrowed or accessed elsewhere.

> We go [to the LA] to use their [green screen] but it would be good to have our own and not rely on someone else, and it costs money to get there.

> I would like sturdy equipment, like cameras, now they have to borrow the teachers' cameras that we use for observations, or they ask if we can take a picture of something for their learning journey, or they click the button. But if I had a class of 15, wow, you could have them all there and they could access it and just choose it, they can use it how they want.

Others talked about the value of using different interfaces, such as touch screens and voice-activated devices. These would make the technology easier for young children to use, though most people felt that children would still need to be familiar with a traditional keyboard and mouse.

How is technology being used?

Interviewees were asked to describe how they were using technology. Again, this was an open question and responses may have been different if they had been given a list of activities to choose from. While research in the past has focused on the use of technology by children (Bolstad 2004), all of the interviewees talked about how it was being used by both children and staff.

Technology being used by children

While in the past technology was often used for 'drill and practice' activities (Condie and Munro 2007), Table 2 includes very few examples of this. Except for some of the games the children played, all the activities showed a more creative use of technology.

The activities cover the whole early years curriculum (Early Education 2012). They all support the development of Communication and Language. Most link to the area of Understanding the World, the area of the curriculum which covers technology. The Physical strand is mentioned least often. Literacy and Numeracy are also mentioned infrequently, though many of the activities could support these areas even if they are not the specific focus.

The themes which emerged from the analysis suggested that developing learning dispositions is a key goal. While this can mean different things to different people (Claxton 2007; Siraj-Blatchford et al. 2002), the respondents described: confidence, curiosity, cooperation, perseverance, resilience and reflection. These are could be seen as developing the reference to positive dispositions to learning identified by Stephen and Plowman (2013), mentioned above.

Interviewees highlighted the role of adults. Although there are times when children use technology independently, adult input is very important. Adults need to ensure children know how to use devices. The type of technology found at home is often more sophisticated than that found in early years settings (Plowman and Stephen 2013), so children may learn how to use devices here. Over time they are likely to come to the setting with more skills, meaning support for operational aspects could be reduced. This could allow more time for adults to support other types of learning.

Table 2. How are children using technology?

Activities	Areas of learning	Kind of learning	Learning dispositions	Adult involvement
Home/school projects: e.g. sending Teddy home with a camera	C&L UW	Operational Dispositions	Cooperation	Ongoing Support/ Move to Independence
Searching the Internet for information to support their play	PSE C&L UW	Operational Dispositions Curriculum	Curiosity	Ongoing Support
Using YouTube to access songs and other stimulus materials	C&L UW	Dispositions Curriculum	Curiosity Reflection	Ongoing Support
Exploring cause and effect with toys with buttons to press and using this as a stimulus for language development	C&L UW	Operational Dispositions Curriculum	Cooperation Curiosity Perseverance	Ongoing Support/ Move to Independence
Working on open-ended language and number activities – computer software	C&L L M	Dispositions Curriculum	Perseverance Curiosity	Ongoing Support
Free play with Bee Bots e.g. creating mats for them to explore.	C&L UW EAD	Operational Dispositions Curriculum	Cooperation Curiosity	Ongoing Support /Move to Independence
Whole class or group role play including using large screens and projectors to support pretend play e.g. flying to the moon	C&L UW EAD	Dispositions Curriculum	Cooperation Curiosity	Ongoing Support/ Move to Independence
Making movies and animations using iPads	C&L L UW EAD	Operational Dispositions Curriculum	Cooperation Perseverance	Ongoing Support
Drawing and printing pictures on computers and iPads	C&L EAD	Operational Dispositions Curriculum	Perseverance	Move to Independence
Copying dances, which children had found on YouTube	P C&L UW	Dispositions	Confidence	Ongoing Support
Using iPads to take photos when outside, using them as a tally instead if children writing numbers	PSE C&L M UW EAD	Operational Dispositions Curriculum	Independence	Move to Independence
Taking photos and videos to help children reflect and identify good learning, using cameras and iPads	C&L UW	Operational Dispositions	Reflection	Ongoing Support/ Move to Independence
Recording messages using easispeak microphones	PSE C&L UW	Operational Dispositions	Cooperation Confidence Reflection	Ongoing Support/ Move to Independence
Using QR barcodes to access appropriate websites independently	PSE C&L UW	Operational Dispositions	Independence	Move to Independence
Supporting children with Special Needs e.g. using music to calm down an autistic child, using an audio player or a whiteboard to enlarge books for a visually impaired child	PSE C&L	Dispositions Curriculum	Cooperation Independence Resilience	Ongoing Support/ Move to Independence

Notes: PSE = Personal Social Emotional, P = Physical, C&L = Communication and Language, L = Literacy, M = Mathematics, UW = Understanding the World, EAD = Expressive Arts and Design

The examples in Table 2 suggest that there has been a change from those described in previous research (Plowman and McPake 2013; Plowman and Stephen 2005; Plowman and Stephen 2013;

Plowman, Stephen, and McPake 2008; Stephen 2014) which included:

- little evidence of young children using the internet
- computers being mainly used for playing games during free play
- young children being more likely to do 'authentic' activities at home than in educational settings
- teaching being mainly focused on operational skills or turn taking
- technologies supporting cognitive development being limited to computer games and 'closed' activities
- the creative use of technology being mainly limited to drawing.

Interviewees were asked about the benefits children obtained from using technology. While some answers suggested children were using technology to learn operational skills or to do closed activities, the majority supported the claim that technology was being used in a much more open-ended way.

Technology being used by adults

All interviewees gave numerous examples of adults using technology to support pedagogy. Most used these as opportunities to model the use of technology to the children. Some, especially those concerned about children damaging expensive resources, expected adults to work away from the children. All settings used technology to collect evidence or record assessments; using cameras to document children's work was the most common use. Settings also used technology for planning, parental engagement and communication.

Discussion

Interviewees talked about a broader range of technology than has been included in the literature reviewed as part of this research. This broad interpretation of 'educational technology' may have enabled them to focus more on how the technology could be used. 'Educational technology' has been seen as the broadest term and most appropriate when discussing the field as a whole (Reiser and Ely 1997), however, potential problems have been identified with making terms too broad or in discussing 'technology' as a whole. It has been suggested that this could mean that the wide range of activities it can support are less obvious (Burnett 2010), this is not the case here.

All practitioners in this study were able to discuss what they would use technology for, and what additional technology they would like. They indicated that they wanted child-friendly devices that can be used independently and support their pupils' interests. They were all using technology to support their teaching and learning philosophies. Technology was used across the whole curriculum and to help children develop positive learning dispositions. All settings described how adults worked with children to use technology to support their learning. This contrasts with findings which suggest that settings prioritise developing operational skills and that open-ended, exploratory activities are rarely observed (Plowman 2016).

This indicates that technology is more embedded in early years practice than some recent literature suggests, and practice has gone beyond the limited range of activities some may expect (Blackwell, Lauricella, and Wartella 2014; Kerckaert, Vanderlinde, and van Braak 2015; Plowman and Stephen 2013).

However, while all interviewees talked about a wide range of ways they use technology, it is unclear how much of this is actually happening. It is possible that the interesting activities practitioners plan may not match the children's experiences.

> We put out what we want them to use, but they very rarely do what we put out.

Details of how the technology was used were self-reported. When possible, the researcher toured the settings, which provided some additional evidence. However, it is possible that some interviewees may have been describing what they would like to happen, rather than current practice. Further research into the link between pedagogical beliefs and technological practice would be useful.

> All practitioners, including the most reluctant, had positive attitudes towards technology.
>
> I am a technophobe, I will run away … [but] they gave me an iPad a year ago, I can't live without it, I cannot live without it … it has opened new ways of working that I have never seen before.

It appears that Ertmer's 'final frontier' of beliefs is not a barrier for these practitioners (Ertmer 2005) but early years settings may still be facing barriers that schools have already addressed. Their use of technology is hindered by extrinsic barriers: a lack of funds, time and confidence. Access to adequate training and support also remains a challenge.

Conclusion

Many debates are repeated in the literature over many years, this could lead to 'reifying existing approaches and resources rather than informing future possibilities' (Burnett 2010, 251). While research literature appears to focus mainly on computers or other screen-based technology, the practitioners in this study have a much broader interpretation of the term 'educational technologies'. This broader interpretation may be linked to the differences in practice reported in this research and that described in previous literature. The way these practitioners describe using educational technology focuses on teaching and learning rather than devices and clearly supports their personal pedagogical beliefs.

This study involved a small sample and investigated teachers' beliefs and perceptions. It is not clear how generalisable this snapshot is. The interview questions were deliberately open-ended, a large-scale survey approach may have produced a different result. Another possible focus for the future is how all early years practitioners can be supported to use educational technology more effectively. Developing networks and collaborating with colleagues one of the best ways of showing how technology can be successfully integrated into the curriculum, but teachers often find it difficult to find time to do this (Shields and Behrman 2000).

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Appendix B. Cycle Two: Questionnaire

Educational Technologies in Early Years Settings

Page 1: Introduction

You are invited to take part in a research study into the use of educational technologies to support teaching and learning in early years settings. This survey aims to identify how technologies are being used and how this use links to practitioners' beliefs about teaching and learning.

The survey will take approximately 20 - 30 minutes to complete, if necessary, you can save your answers part way through and come back to the survey later. As a thank you, you can choose to enter a **prize draw for a £30 Amazon Voucher** by giving your email address at the end of the survey.

You will only be asked for your name if you wish to participate in future stages of the research or want to be included in the prize draw. All responses you give will be kept confidential and records will be kept secure and private. No information that would make it possible to identify you will be published in any report. There will be no way to connect your name to your responses at any time during or after the study.

The study is conducted by Christine Jack as part of her Doctoral (EdD) studies at Durham University and has received ethical approval from the university. The project is supervised by Professor Steven Higgins s.e.higgins@durham.ac.uk from the School of Education at Durham University. If you have any questions, requests or concerns regarding this research, please contact me via email at c.l.jack@durham.ac.uk or by telephone [redacted]

Page 2: About you and your setting

Q1 Where do you work? Please select the most appropriate description of the setting where you work.
Required

☐ Early years setting within a school
☐ A stand-alone local authority nursery
☐ A private nursery
☐ A children's centre
☐ Childminder
☐ Other

If you selected Other, please specify:

Q1a If you work in an early years setting within a school, what type of school is it?
☐ Local Authority
☐ Academy
☐ Free
☐ Independent
☐ Other

If you selected Other, please specify:

Q2 Where is your setting? Please choose the region of the UK you are from or select other to indicate you are from outside of the UK. *Required*
☐ East Midlands
☐ East of England
☐ London
☐ North East
☐ North West
☐ South East
☐ South West
☐ West Midlands
☐ Yorkshire and Humberside
☐ Northern Ireland
☐ Scotland
☐ Wales
☐ Other

If you selected Other, please specify:

Q3 How old are the children you work with? *Required*
Please select at least 1 answer(s).
☐ 0-2 years old
☐ 3-4 years old
☐ 4-5 years old
☐ 5+ years old
☐ Other

If you selected Other, please specify:

Q4 What is your role within your setting? *Required*
☐ Head teacher
☐ Teacher
☐ Teaching Assistant
☐ Student Teacher
☐ Other

If you selected Other, please specify:

Page 3: Educational technology in your setting

Q5 Which of the following technologies do you have in your setting? Please be aware that one device may have multiple functions. Please tick all relevant items on the list.

	Please indicate if you have a technology and how often it is used									
	Have								Don’t have	
	used daily	used 2-4 times a week	used weekly	used monthly	used occasionally	never use	broken, needs fixing	broken, don't need it	would like	not appropriate
Desktop computer(s)										
Laptop computer(s)										
Interactive whiteboard(s)										
Tablet(s)										
Audio recorder(s)										
Audio player(s)										
Digital camera(s)										
Video camera(s)										
Video player(s)										
Internet access										
Gaming device(s)										
Programmable toy(s)										
Remote control toy(s)										

Role play equipment that involves technology e.g. toy till, microwave										
eReader(s)										
Visualiser(s)										
Microscope(s)										
Metal detector(s)										
Walkie talkie(s)										
Television(s)										
Radio(s)										
Mobile Phone(s)										
Music technology e.g. keyboards/Karaoke										
Other										

If you have any technologies that are not on this list, please give details here.

Q6 Are children more or less likely to select activities that involve educational technology than activities using other types of resources?

☐ More likely to select activities that involve educational technologies

☐ Less likely to select activities that involve educational technologies

☐ No difference

Q7 When children choose to use educational technologies, do they spend more or less time on task than when they choose activities using other types of resources

☐ Spend more time on activities using educational technologies

☐ Spend less time on activities using educational technologies

☐ There is no difference

Page 4: How educational technology is being used - 1

Q8 How are children using technology in your setting?

	used daily	used 2- 4 times a week	used weekly	used monthly	used occasionally	Used never, would like to	Used never, not appropriate
Working on open ended computer programs e.g. to create pictures or music							
Taking photos							
To help them reflect on their work/activities							
As a stimulus e.g. looking at videos or images							
Using computer programs/games to practice literacy or numeracy skills							
To search for information							
To listen to stories/music							
Taking videos							
To celebrate their achievements							

Being shown how to use a new resource/device							
To support children with Special Educational Needs							
Other							

Are there any other ways your children are using technology?

Q9 How are staff using technology in your setting?	Used daily	Used 2-4 times a week	Used weekly	Used monthly	Used occasionally	Used never, would like to	Used never, not appropriate
Planning							
Recording observations							
Assessment							
Communication with multiple parents (a range of technology could be used)							
Communication with individual parents (a range of technology could be used)							
Communication with colleagues							
Communication with children							
Publishing examples of children's work							

Professional development							
Finding resources to use with children							
For displays							
Other							

Are there any other ways staff are using technology?

Page 5: How educational technology is being used - 2

Q10 Which areas of the curriculum are being supported by the use of educational technologies?

	Technology is used extensively	Technology is used regularly	Technology is used occasionally	Technology is not used
Playing and exploring				
Active learning				
Creating and thinking creatively				
Personal and social development				
Physical development				
Communication and language				
Literacy				
Mathematics				
Understanding the world				
Expressive arts and design				

Q11 How is technology used with children in your setting? How often is it used in this way?

	Technology is used extensively	Technology is used regularly	Technology is used occasionally	Technology is not used
During adult initiated activities - working with one or two children				
During adult initiated activities - working with small groups				
During adult initiated activities - working with large groups/whole class				
During child-initiated activities - without any support from an adult				
During child-initiated activities – with support from an adult				

Q12 Which of the following factors influence how you use technology in your setting? Do they encourage you to use technology/discourage you or make no difference?

	Encourages me to use technology/supports my use of technology	Makes no difference to whether I used technology	Discourages me from using technology/hinders my use of technology
The amount of equipment available			
The amount of time available			
Parental attitudes to technology			
Finance available			
Technical support			
eSafety			
Training and support available			
Personal confidence			
Personal ability to use educational technologies			
Children's ability to use educational technologies			
Children's age(s)			
Curriculum requirements			
Personal teaching and learning philosophies			
Attitudes of senior leaders			
Attitudes of colleagues			

Are there any other factors that influence how you use technology?

Page 6: Attitudes towards technology

Q13 Do you think that children in your setting should use technology more or less, or is the amount of use about right?

☐ I would like children to be able to use technology more often

☐ I think the amount of time children spend using technology is about right

☐ I think children should use technology less often

Q14 At what age do you think it is appropriate to introduce children to technology in an early years setting?

☐ 0-2 years old

☐ 3-4 years old

☐ 5-6 years old

☐ 7-8 years old

☐ Not appropriate for early years settings

☐ Depends on the technology (please explain)

If you answered 'depends on the technology' please explain

Q15 Which of the following statements most closely reflects your attitude towards using technology with children in early years settings?
☐ Technology is essential and should be integrated across the EYFS
☐ Technology should be used when it supports a specific curriculum target
☐ Technology is "nice to have" but not essential
☐ Technology is not appropriate in early years settings.
☐ Other

If you selected Other, please specify:

Q16 Please explain your answer to question 18.

Q17 How confident are you about using technology?

	Very confident	Quite confident	Not very confident	Not at all confident
How confident are you about using technology for your personal use e.g. shopping, social media, communicating with friends and relations…				
How confident are you about using technology to support your teaching e.g. admin, assessment and record keeping, finding resources...				
How confident are you about using technology with pupils to support their learning e.g. children taking photos, using computer programs, watching? YouTube videos...				

Page 7: Training and support

Q18 Have you have had any professional development/training in the use of educational technologies?
☐ Yes - I had enough training to support my needs
☐ Yes - I had some training but not enough to support my needs
☐ No - I have not had any training

Q19 What sort of training have you had? Tick all that apply.
☐ Help to use technology in specific subject areas
☐ Training on basic user skills (e.g. turning devices on/off, how to use a word processor...)
☐ Help with uploading/downloading pictures and/or videos
☐ Training on basic technical skills
☐ Time to explore new technologies
☐ Access to examples of how other settings are using technology
☐ Help with using technology to communicate with parents and other caregivers
☐ Help with finding resources and content (e.g. videos, activities, games, apps)
☐ Other

If you selected Other, please specify:

Q20 Would you like to have access to training to support the use of educational technologies in the future?

☐ Yes
☐ No

Q21 If yes, what sort of training would you find useful? Tick all that apply.

☐ Help to use technology in specific subject areas
☐ Training on basic user skills (e.g. turning devices on/off, how to use a word processor...)
☐ Help with uploading/downloading pictures and/or videos
☐ Training on basic technical skills
☐ Time to explore new technologies
☐ Access to examples of how other settings are using technology
☐ Help with using technology to communicate with parents and other caregivers
☐ Help with finding resources and content (e.g. videos, activities, games, apps)
☐ Other

If you selected Other, please specify:

Q22 What sort of delivery would you find useful? Tick all that apply.

☐ In-person workshops/training
☐ Online workshops/training
☐ Support from colleagues within your setting
☐ Support from online blogs or forums
☐ Other (please explain):

If you selected Other, please specify:

Q23 Does your setting have access to technical support?

☐ Yes - we have a school technician
☐ Yes - we have a member of teaching/admin staff that provides technical support
☐ Yes - we have access to external technical support
☐ No
☐ Other

If you selected Other, please specify:

Page 8: Teaching and Learning – Beliefs

This section is about your beliefs about teaching and learning. The first set of questions ask about your personal philosophies; what is your ideal approach to teaching and learning?

Q24 Recognising that some things in educational settings are required by external sources, what are YOUR OWN PERSONAL BELIEFS about early years education?

Please select the option that most closely represents YOUR BELIEFS about each item's importance for early years education.

	1. Extremely important	2. Very important	3. Quite important	4. Not very important	5. Not at all important
1. It is _____ for teacher child interactions to help develop children's self-esteem.					
2. Formal tests are ______ as a tool for evaluating children's progress or achievement.					
3. Observation is ______ evaluation tool.					
4. It is _____ for activities to be responsive to individual children's interests.					
5. It is _____ for activities to be responsive to individual differences in children's levels of development.					
6. It is _____ for activities to be responsive to the cultural diversity of students.					
7. It is _____ that each curriculum area is taught as a separate subject at separate times.					
8. It is _____ for teacher child interactions to help develop children's positive feelings toward learning.					
9. It is _____ for teachers to provide opportunities for children to select many of their own activities.					
10. It is _____ to use a single approach for reading and writing instruction.					
11. Instruction in letter and word recognition is _____ in preschool.					
12. It is ____ for the teacher to provide a					

variety of learning areas with concrete materials (writing centre, science centre, maths centre etc).					
13. It is _____ for children to spend extended time working individually at desks or tables.					
14. Workbooks and/or worksheets sheets are _____ in my classroom.					
15. A structured reading or pre-reading program is _____ for all children.					
16. It is _____ for the teacher to talk to the whole group and for the children to do the same things at the same time.					
17. It is _____ for the teacher to move among groups and individuals, offering suggestions, asking questions, and facilitating children's involvement with materials, activities, and peers.					
18. It is _____ for teachers to use treats, stickers, and/or stars to get children to do activities that they don't really want to do.					
19. It is _____ for teachers to regularly use punishments and/or reprimands when children aren't participating.					
20. It is ____ to have personalised plans in place to support individual learning or behavioural problems.					
21. It is ____ for teachers to allocate extended periods of time for children to engage in play and projects.					
22. It is _____ for children to write by inventing their own spelling.					

23. It is _____ for children to colour within pre-drawn forms.					
24. It is _____ to read stories daily to children, individually and/or on a group basis.					
25. It is _____ for children to dictate stories to the teacher.					
26. It is _____ that teachers engage in ongoing professional development in early childhood (e.g. attend professional conferences, read professional literature).					
27. It is _____ for children to see and use functional print (leaflets, magazines etc.) and environmental print (food packaging etc.).					
28. It is _____ to provide many daily opportunities for developing social skills (i.e., cooperating, helping, talking) with peers in the classroom.					
29. It is _____ that books, pictures, and materials in the classroom include people of different races, ages, and abilities and both genders in various roles.					
30. It is _____ that outdoor time has planned activities.					
31. It is _____ for parents/carers to be involved in ways that are comfortable for them.					
32. It is _____ for strategies like setting limits, problem solving, and redirection to be used to help guide children's behaviour.					
33. It is _____ for teachers to integrate each child's home culture and language into the curriculum throughout the year.					

34. It is _____ for teachers to solicit and incorporate parents' knowledge about their children for assessment, evaluation, placement, and planning.					
35. It is _____ to establish a collaborative partnership/relationship with parents of all children, including parents of children with special needs and from different cultural groups.					
36. It is _____ for the classroom teacher to modify, adapt, and accommodate specific indoor and outdoor learning experiences for the child with special needs as appropriate.					
37. It is _____ that teachers maintain a quiet environment.					
38. It is _____ to provide the same curriculum and environment for each group of children that comes through the program.					
39. It is _____ to focus on teaching children isolated skills by using repetition and recitation (e.g., reciting ABCs).					
40. It is _____ to follow a prescribed curriculum plan without being distracted by children's interests or current circumstances.					
41. It is ___ to plan activities that are primarily just for fun without connection to program goals.					

Page 9: Teaching and Learning – Practice

Q25 Please rank the following by the amount of influence you believe each has on the way you plan or implement teaching and learning in your setting

	1 – most influence	2	3	4	5	6	7 – least influence

Children							
Head teacher/senior leadership							
National regulations							
Other teachers							
Parents							
School policy							
Teacher (yourself)							

The remaining questions ask about what happens in practice; what actually happens in your setting.

Q26 How often do children in your setting do the following activities.

	Very Often (daily)	Regularly (2-4 times a week)	Sometimes (weekly)	Occasionally (monthly)	Almost never (less than monthly)
1. Build with blocks					
2. Select from a variety of learning areas and projects (i.e., dramatic play, construction, art, music, science experiences, etc.)					
3. Have their work displayed in the classroom					
4. Experiment with writing by drawing, copying, and using their own invented spelling					
5. Play with games, puzzles, and construction materials (e.g., Tinker Toys, Bristle Blocks)					
6. Explore science materials (e.g., animals, plants, wheels, gears, etc.)					
7. Sing, listen, and/or move to music					
8. Do planned movement activities using large muscles					

(e.g., balancing, running, jumping)					
9. Use manipulatives (e.g., pegboards, Lego and Unifix Cubes)					
10. Use commercially prepared phonics activities					
11. Work in assigned ability-level groups					
12. Circle, underline, and/or mark items on worksheets					
13. Use flashcards with ABCs, sight words, and/or maths facts					
14. Participate in rote Counting					
15. Practice handwriting on lines					
16. Colour, cut, and paste pre-drawn forms					
17. Participate in whole class, teacher-directed instruction					
18. Sit and listen for long periods of time until they become restless and fidgety					
19. Have the opportunity to learn about people with special needs (e.g. a speaker or a character in a book)					
20. Receive rewards as incentives to participate in classroom activities in which they are reluctant participants					
21. See their own race, culture, language reflected in the classroom					
22. Get placed in timeout (i.e., isolation, sitting on a chair, in a corner, or being sent outside of the room)					
23. Experience parents reading stories or sharing a skill or hobby with the class					

24. Engage in child chosen, teacher supported play activities					
25. Draw, paint, work with clay and use other art media					
26. Solve real maths problems using real objects in the classroom environment that are incorporated into other subject areas					
27. Get separated from their friends to maintain classroom order					
28. Engage in experiences that demonstrate the explicit valuing of each other (e.g., sending a card to a sick classmate)					
29. Work with materials that have been adapted or modified to meet their needs					
30. Participate in adult directed activities					
31. Reflect on work they did earlier in the day/week/term					
32. Take work home to share with family and friends					
33. Plan their own activities					
34. Do activities that integrate multiple subjects (reading, math, science, social studies, etc.)					

The next two pages will allow you to add any further comments and be entered in to a prize draw. You do not need to complete any of the questions but need to click on the Next Buttons to take you to the final page and the Finish Button.

Page 10: Any other comments

Q27 Please use this page to add any other comments you have. For example, any comments about how technology is being used in your setting or how you would like to see it being used in the future.

I am very interested in finding out how technology is being used and would like to visit some early years settings to talk to staff and observe the children. All visits will be arranged in advance and all data that I gather will be confidential. If your setting is in the North East of England (Northumberland, North Tyneside, South Tyneside, Newcastle, Gateshead, Durham, Hartlepool, Stockton, Middlesbrough, Darlington or Redcar and Cleveland) and this is something you might be interested in, please enter your details below or email me at c.l.jack@durham.ac.uk and I will send you more information

Appendix C. Cycle Two: Questionnaire Findings

A. Questionnaire Findings

An analysis of the questionnaire is provided in Chapter 6. However, the questionnaire provided more information than it is possible to examine in this thesis. An overview of all the results are included here. The analysis of the questionnaire formed the basis of an article submitted for publication which is also included see Appendix B, section B.

Methodology

A convenience sampling method was used to identify participants. I have worked closely with staff in Local Authorities in the North East of England for many years and I have good contacts within the Regional Broadband Consortia across the UK. Information about the survey was shared with these contacts. Information about the survey was also distributed by social media and email. My existing contacts were mainly ICT advisors and initial response to the survey was low. I used internet searches to identify early years advisors and groups.

Initial contacts included:

- Regional Broadband Consortia content managers
- Local Authority Advisors
- Early Years Advisory Teachers
- Early Years organisations
- Facebook and Linked In technology and early years groups
- Online forums e.g. Times Educational Supplement

Using the above methods meant there was no direct contact with the people who were the desired respondents. The initial contacts provided useful feedback on the survey, with many responding to say this was a useful area to study. While many people were helpful and shared the information, this was done at a time that was convenient for them. They sometimes shared information in the early afternoon when most people the survey was targeted at were at work. However, other people I contacted offered to share the information at meetings or events that were already planned with the settings they supported.

To directly target the desired audience, local authority portals were searched and, where contact details were available, emails were sent directly to early years settings and primary/infant schools. I posted to Facebook groups and Twitter several times during the time the survey was open.

In total 2055 people visited the introduction page for the questionnaire, 1251 (61%) went no further. 804 (39%) started completing the questionnaire and 302 (38%) of these people completed the questionnaire, this means 14% of people who visited the introduction page completed the survey.

Figure 41 shows which page each respondent reached. This information was reviewed regularly while the survey was live. It was noted that some people were getting very close to the end of the survey but were not completing it. Additional information was added to the final pages to remind people that they needed to click on the final 'Finish' button for the responses to be saved.

Completed responses 302 (302% response rate)

Respondent progress

p.1	p.2	p.3	p.4	p.5	p.6	p.7	p.8	p.9	p.10	p.11	p.12
1251	134	79	68	81	19	7	50	53	5	6	302

Figure 41: Respondents progress through the questionnaire, from BOS Online Surveys

There was an option for people to save the survey part of the way through and it is possible that some people did this but did not return to complete it. Unless they clicked the submit button at the end of the survey, their answers were not available to be analysed.

Some settings requested paper copies of the survey, these were sent out and 33 of these were returned. This means that there was a total of 335 responses.

It was quite a long survey, took about 25 minutes to complete so an incentive was offered, respondents were able to ask to be entered into a prize draw for a £30 voucher.

Question 1: Where do you work?

Table 25: Where do you work?

Where do you work?	Frequency	Percent
Early years setting within a school	170	50.7
A stand-alone local authority nursery	12	3.6
A private nursery	91	27.2
A children's centre	3	0.9
Childminder	35	10.4
Other	4	1.2
Preschool / playgroup	14	4.2
Other nursery	6	1.8
Total	335	100.0

Responses came from a range of settings, early years settings within schools were the most frequent at 50.7%, see Table 25.

Question 1a: If you work in a school, what type of school is it?

If you work in an early years setting within a school, what type of school is it?

Table 26: What type of school?

If within a school, what type of school is it?	Frequency	Percent
Local Authority	127	37.9
Academy	31	9.3
Free	1	0.3
Independent	9	2.7
Total	168	50.1
Missing	167	49.9
Total	335	100.0

Respondents who worked in schools were asked what type of school they worked in. Most were from local authority schools, see Table 26.

Question 2: Where is your setting?

Respondents came from across the UK, though the vast majority, 96.5%, came from England. Most of the English respondents came from either the South East or North

East. I have lots of contacts in the North East and some of the South East local authorities were very active in promoting the survey. 2 respondents, 0.6% came from outside of the UK and they were from the United Arab Emirates (see Figure 42).

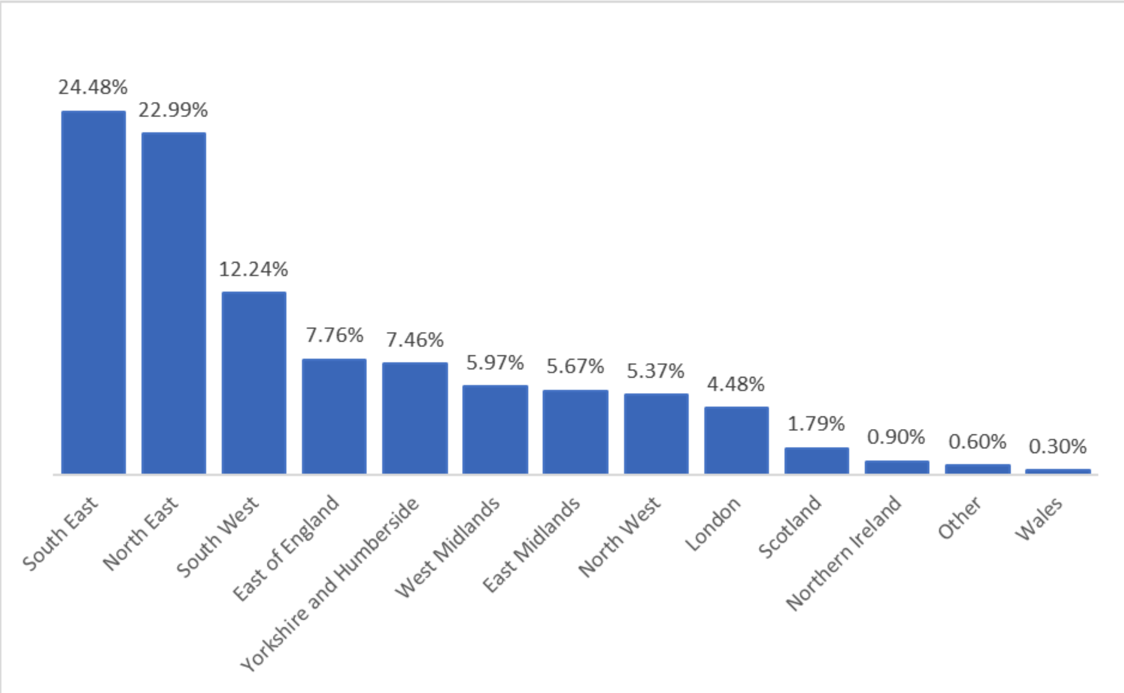

Figure 42: Where is your setting?

Question 3: How old are the children you work with?

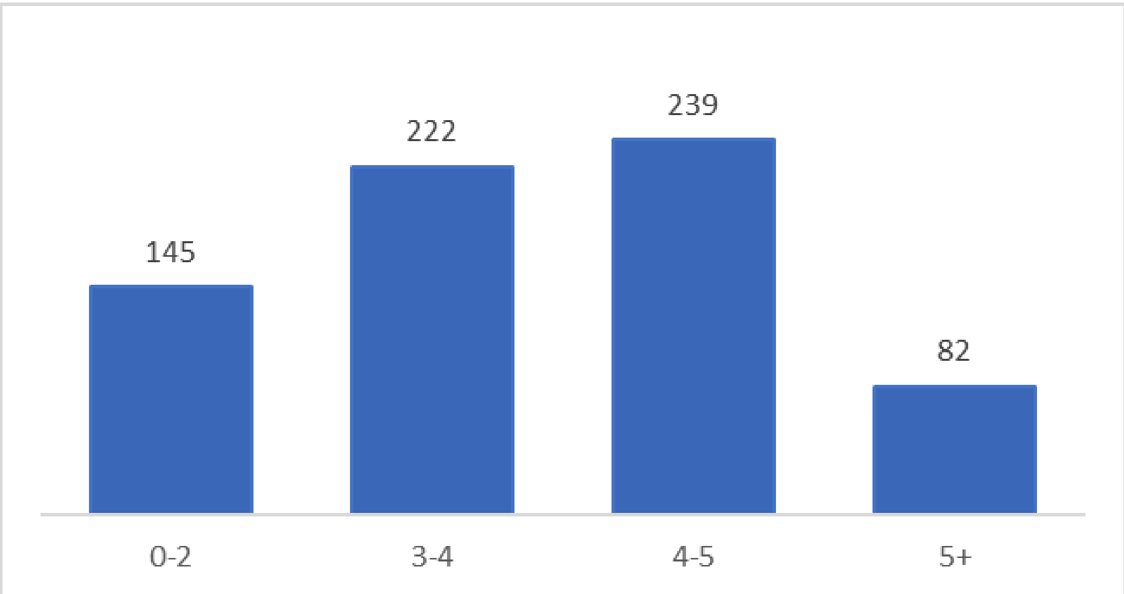

Figure 43: How old are the children you work with?

Respondents were asked about the age of the children they worked with. Most respondents worked with children of different ages, so their answers did not fall neatly into the bands shown in Figure 43. Some respondents were not classroom teachers, so their answers refer to a whole setting, most of which catered for a range of ages. Some classroom teachers also appear to have given the ages of children across their setting. Childminders regularly take children of different ages. This means that most respondents appear more than once in the above graph.

Two respondents worked with children who were over 5 years old, eight worked only with children aged 0 to 2 years old.

Question 4: What is your role within the setting?

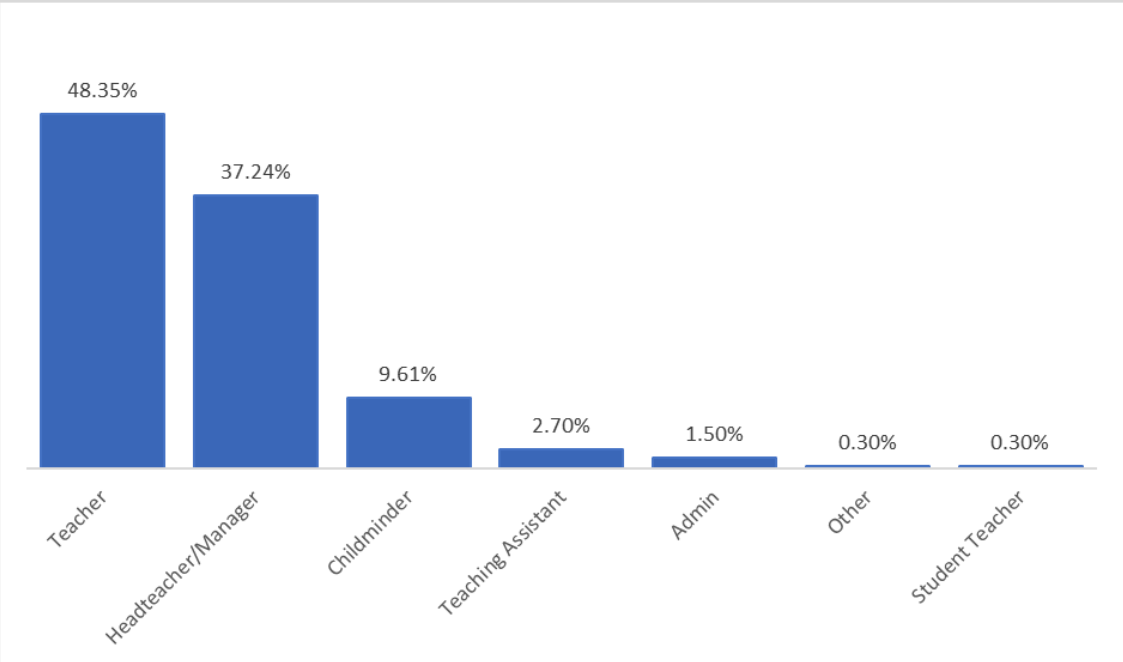

Figure 44: What is your role?

Most respondents were either teachers 48.4% or head teachers/managers 37.2%, see Figure 44.

Question 5: Which technologies do you have in your setting?

Which of the following technologies do you have in your setting?

In the study conducted by Blackwell et al. (2013) technology was described as universal if 75% of respondents could access it, and non-universal if fewer than 30% had access to it. This definition was used to analyse the responses to this survey, as shown in Table 27. Not all devices or resources in this study directly match those in the Blackwell study but some comparisons can be made.

Table 27: Percentages of Universal and Non-Universal Technology

		All	Childminder	Setting	*Blackwell (2013)*
Universal - over 75%	Internet access	96.3	97.0	96.3	-
	Role play	92.5	91.4	92.6	-
	Digital camera	91.0	94.1	90.6	*92*
	Audio player	82.9	77.4	83.5	*21 (iPods / MP3)*
	Laptops	82.3	90.9	81.3	*See desktops*
	Programmable toys	81.5	62.5	83.6	-
	Tablets	79.3	78.8	79.3	*28*
	Desktops	78.0	48.3	81.1	*83 (laptop / desktop)*
	Remote control cars	64.6	68.8	64.1	-
	Audio recorder	62.6	44.8	64.5	-
	IWB	62.4	3.8	67.9	-
	Music	61.1	82.4	58.5	-
	Video camera	60.1	66.7	59.4	-
	Radio	50.6	78.1	47.6	-
	Mobile Phone	45.9	97.1	39.9	-
	Walkie talkie	39.3	45.5	38.6	-
	Video player	37.9	53.6	36.3	*79 (TV/DVD)*
	TV	37.0	88.2	30.9	*See video player*
	Microscope	33.0	40.6	32.1	-
	Gaming devices	30.6	71.0	25.9	*15 (iPod Touch)*
Non-universal - less than 30%	Visualiser	24.7	3.3	27.1	-
	Metal detector	18.5	16.1	18.8	-
	eReader	13.1	35.5	10.6	*15*

Eight technologies can be classified as universal: Internet access, Role play, Digital camera, Audio player, Laptops, Programmable toys, Tablets and Desktops.

The availability of desktops, laptops, and digital cameras is similar to the Blackwell study, but the number of televisions is very different, 79% in 2013 and only 37% in this study. Similarly, there is a significant difference when it comes to tablets. In the 2013 study, only 28% had access to tablets, in this study, there is universal access, with 79.3% having access.

Table 27 shows that while both settings and childminders have access to a range of technologies, there are differences between the two. For childminders, there is more universal technology. They also have Music, Radio, Mobile Phones and TV on their list. They are also much more likely to have and use gaming devices. They are much less likely to have Interactive Whiteboards. Most of these technologies could be described as home technology, apart from IWBs.

I used the method described by Blackwell et al. (2013) to measure frequency of use; a dichotomous variable was created indicating (1) access and (0) no access. A second variable was created for respondents who had access to the technology. This was converted to a continuous variable using a six-point scale for frequency. As this research had a six-point scale rather than the seven-point scale used by Blackwell et al. (2013) it was adjusted accordingly. Never was converted to (0), occasionally (0.5), monthly (1), weekly (4), 2-4 times a week (14) and daily (30).

Figure 45 shows how often devices are being used and used the scaling described above. Perhaps not surprisingly, universal technology tends to be used most often, though this is not always the case. Programmable toys are universal but are used less often than some devices accessible by fewer respondents, for example, music and radio. Where there is access to IWBs they are used more often than some universal devices.

Only 3% of respondents have no access to computers (defined as laptops, desktops or tablets). Of those that do have access, they all use them at least occasionally. This could indicate a significant increase. In the 2013 study, 55% of in-home care providers and 59% of classroom teachers reported access to computers. However, 34% and 35% of practitioners, respectively, reported never using a computer with their children (Blackwell et al., 2013).

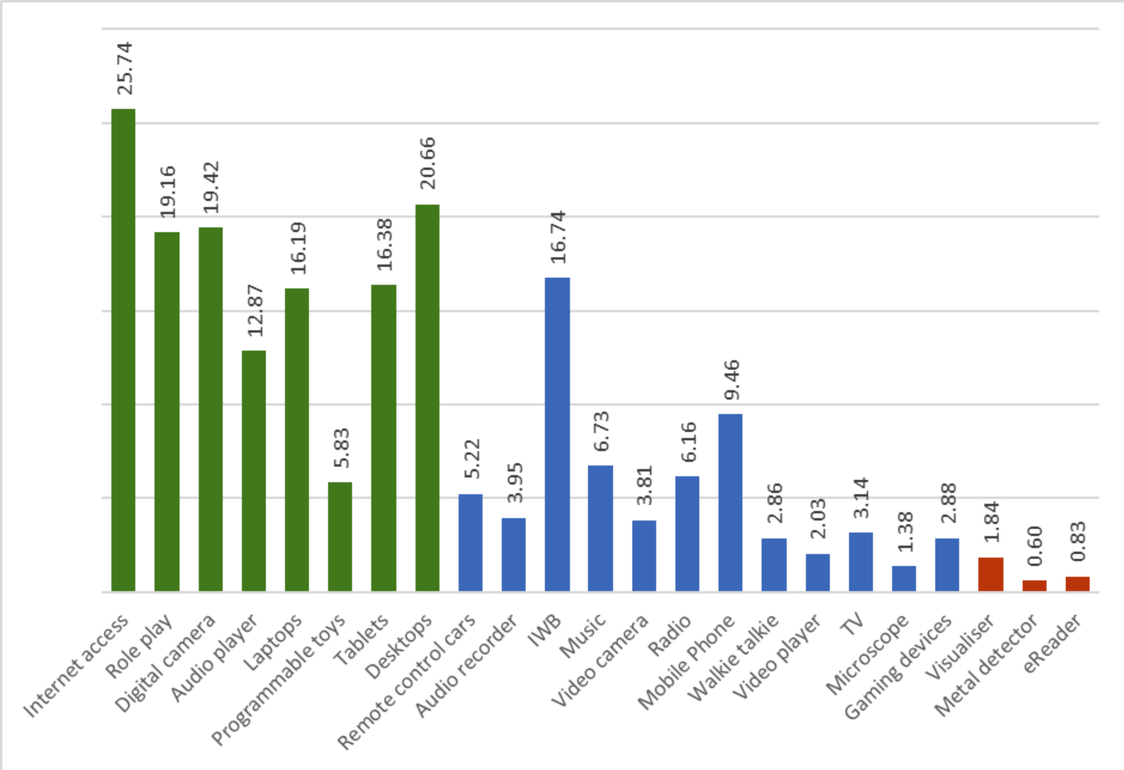

Figure 45: How often is each device being used?
(green = universal, red = non-universal)

There are still some technologies, particularly non-universal technologies, where nearly a third of practitioners (over 30%) did not use them even when they had access to them. This was the case for visualisers, metal detectors and eReaders. However, this does not necessarily mean that they were not considered valuable. For example, 46.1% of settings that did not have metal detectors said that they would like to have them, for eReaders it was 30% and visualisers 29.4%.

Some people who did not have access to a resource may have wanted to acquire one, others may have thought that the device was not appropriate for their children. Respondents who did not have access to a particular resource were able to indicate if they thought it was 'not appropriate' for their children. Not everyone agreed about the appropriateness of some devices. For example, nearly three-quarters (71%) of respondents who did not have a TV in their setting thought it would not be appropriate to have one, however, a small number (5%) indicated they wanted a TV. For gaming devices, 74% of respondents without them thought they were inappropriate, but 9% wanted one. For microscopes, 38% thought they were not appropriate but 48% wanted them. For metal detectors it was 39% and 44% respectively. Of those respondents who did have these devices, some were using them every day. These differences may indicate different understandings of how these devices can support learning.

Again, there was a difference between settings and childminders, with childminders identifying more technology as ‘not appropriate’. The most striking difference is with mobile phones. 87% of practitioners working in settings identified these as not appropriate, compared with none of the childminders. 97% of childminders have mobile phones, compared to 46% of settings.

There were some technologies where even if practitioners had access to them, a significant number (over 30%) did not use them. Other people, who did not have these devices, wanted to acquire them.

37% of settings that did not have metal detectors said that they would like to have them. Over a third of settings also said they would like Walkie Talkies (35.1%) and Microscopes (33.2%).

How often are they using technology?

A number of technologies are being used every day by more than 50% of the respondents. Again, there is a difference between settings and childminders, see Table 28.

Table 28: EdTech - used daily

Device	All	Childminder	Setting
Internet	83.5	69.7	85
Desktop	66.2	31	69.8
Digital Camera	58.4	41.2	60.4
Role Play	56.6	62.9	55.9
IWB	53.9	0	58.9
Laptop	47.6	24.2	50.4
Mobile phone	30	88.2	23.1

All respondents had access to at least one device, with some having twenty or more, as shown in Figure 46.

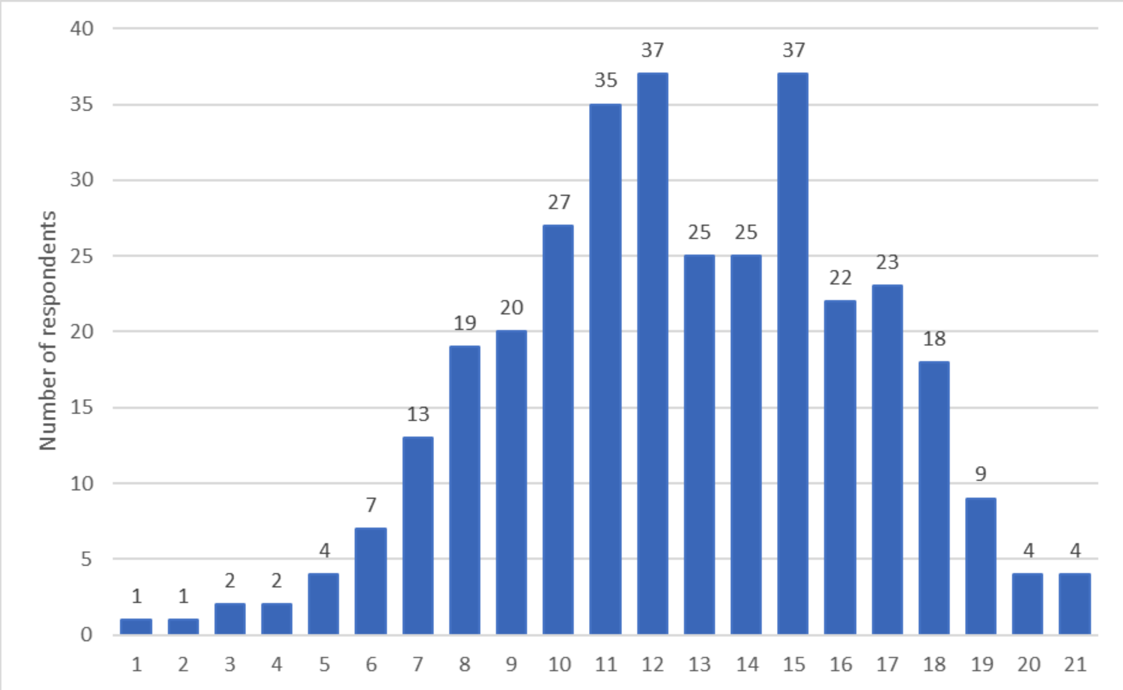

Figure 46: Number of devices

Just having a device does not necessarily mean it is usable. Respondents were able to say whether a particular device was broken and, if so, whether they wanted it to be repaired or had decided they did not need it. The percentage of devices that were broken was low, less than 5%, for most types of devices. Those that were over 5% are shown in Table 29. The most common broken devices were metal detectors (14.29%) and walkie talkies (18.40%). In most cases respondents wanted broken devices to be fixed.

Table 29: What percentage of each type of device was broken?

Devices	Broken - needs fixing	Broken - not needed	Total broken
Visualiser	2.70%	2.70%	5.41%
Music	4.59%	1.53%	6.12%
Audio Recorder	5.98%	0.54%	6.52%
TV	2.56%	5.13%	7.69%
Remote Controlled Car	7.77%	0.97%	8.74%
Video Player	3.64%	5.45%	9.09%
Metal Detector	7.14%	7.14%	14.29%
Walkie Talkie	16.00%	2.40%	18.40%

If a respondent owns 5 devices or fewer, what do they own?

In the Cycle One interviews all participants had access to five or more devices. Ten respondents to the questionnaire had five or fewer devices. Table 30 shows what devices these respondents owned.

Table 30: Respondents owning five or fewer devices

1 device	1	Digital Camera				
2 devices	1	Music	Role Play			
3 devices	2	Digital Camera	Role play	Remote Controlled Car		
		Video Camera	Internet	eReader		
4 devices	2	Programmable Toy	Role play	Remote Controlled Car	TV	
		Music	Role play	Audio Player	Radio	
5 devices	4	Digital Camera	Role play	Desktop	Radio	Internet Access
		Digital Camera	Tablet	Audio Player	Radio	Internet Access
		Digital Camera	Role play	Audio Player	Audio Recorder	Video Player
		Digital Camera	Role play	Audio Player	Radio	Desktop

Only one of these respondents was a childminder (2nd row) the others all worked in settings.

How many of these people own each identified device?

Table 31 shows which devices are owned by the people who have five or fewer devices. This list was compared to the list of universal technologies. Role play and digital cameras, which are most likely to be owned by these people, are 2nd and 3rd on the universal list.

Table 31: Which devices are owned by respondents with fewer than five devices?

	How many of each device?	
	Role play	7
	Digital Camera	6
	Audio Player	4
	Radio	4
	Internet Access	3
	Remote Controlled Car	2
	Music	2
	Desktop	2
	Programmable Toy	1
	Tablet	1
	Audio Recorder	1
	Video Player	1
	TV	1
	Video Camera	1
	Laptop	0
	eReader	1
	IWB	0
	Mobile phone	0
	Walkie talkie	0
	Microscope	0
	Gaming devices	0
	Visualiser	0
	Metal detector	0

Universal
Not universal

Other than internet connection, all the top 7 are ‘not computers’, or in other words, not laptops, desktops, IWBs or tablets.

Question 6: Are children more or less likely to select EdTech?

Are children more or less likely to select activities that involve educational technology than activities using other types of activities?

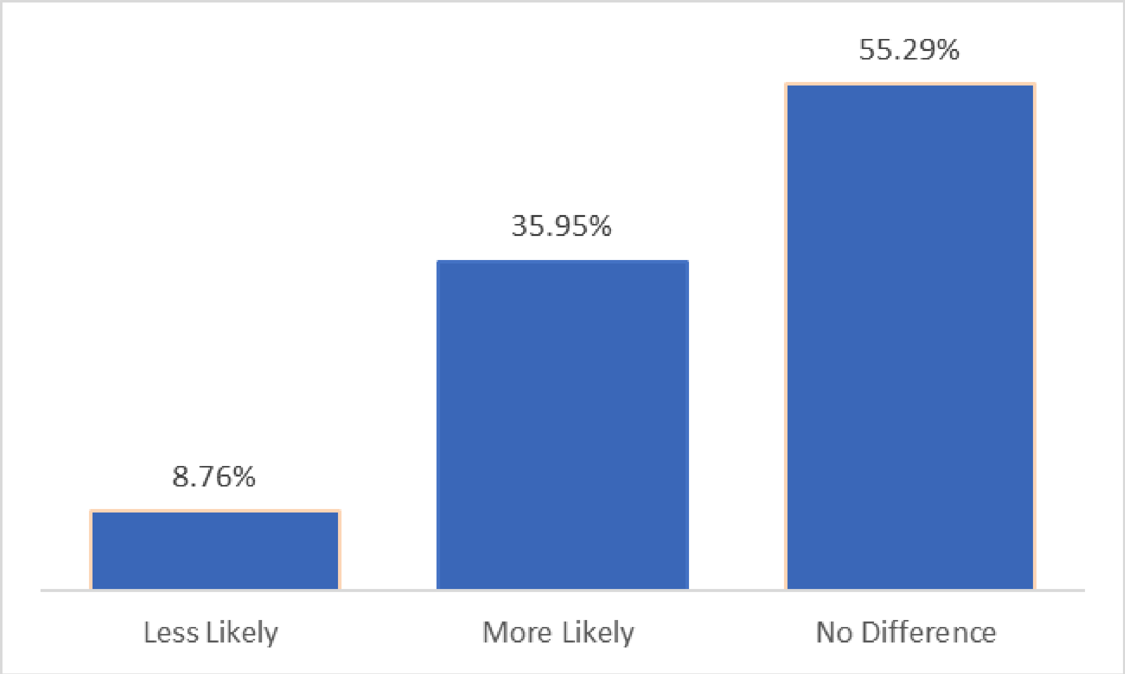

Figure 47: Are children more or less likely to select EdTech?

When asked if children are more or less likely to select activities that involve educational technology, most practitioners (55%) said there would be no difference. Of those that thought there would be a difference, over four times as many (36%) thought children would be more likely to choose technology, compared to those who thought they would be less likely to do so (9%) (see Figure 47)

Question 7: Do children spend more or less time on using EdTech?

When children choose to use educational technologies, do they spend more or less time on task than when they choose activities using other types of resources?

When asked if children spend more time on activities using technology, rather than activities involving other resources, most practitioners (50%) said there was no difference. Of those that thought there would be a difference, over four times as many (41%) thought children spend more time on activities using technology, compared to those that thought they would spend less time on them (9%) (see Figure 48).

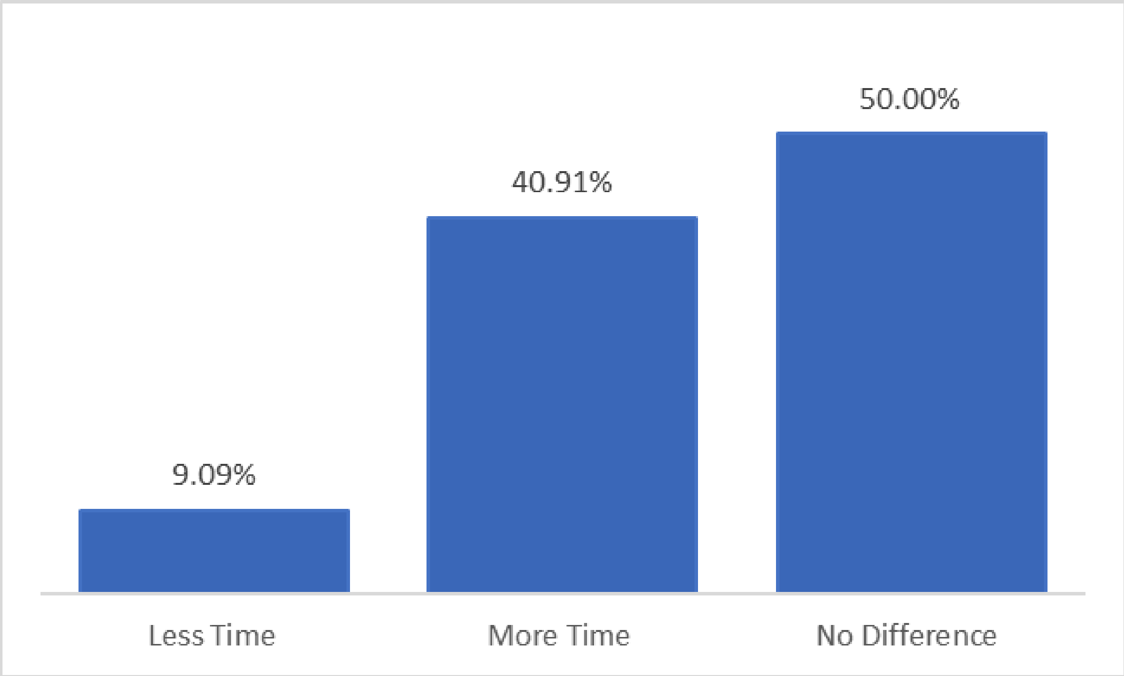

Figure 48: Do children spend more or less time on EdTech?

Question 8: How are children using EdTech?

How are children using technology in your setting?

Table 32: How EdTech is being used by children

Activity	N	Mean	Mode
Listen to stories / music	319	2.06	1
Practice literacy or numeracy	283	2.17	1
Stimulus material	287	2.29	1
Open ended programs	274	2.56	1
Celebrate achievements	245	2.67	1
Taking Photos	301	2.85	5
Search for information	243	3.04	5
Support SEN	229	3.05	5
Supporting Reflection	225	3.12	5
Show how to use	251	3.58	5
Take videos	207	3.77	5

1= daily, 2= 2-4 x a week, 3= weekly, 4 = monthly, 5 = occasionally

Table 32 shows how often children are using technology for different activities. When analysed, the modes indicate that one group of activities are happening much more often than another. Listen to stories/music, Practice literacy or numeracy, Stimulus material, Open ended programs, and Celebrate achievements all have a mode of 1. This suggests that they are being used daily. The other activities all have a mode of 5, suggesting that they are used only occasionally. However, the Means suggest that there may be less of a difference, with all activities happening regularly.

Table 33: If a respondent does not use EdTech in this way, would they want to or is it 'not appropriate' (NA)?

Activity	N	N Do not use	% Do not use	N Would like to	% Would like to	NA	% NA
Listen to stories / music	319	11	3.3	7	63.6	4	36.4
Practice literacy or numeracy	283	45	13.7	19	42.2	26	57.8
Stimulus material	287	37	11.4	12	32.4	25	67.6
Open ended programs	274	52	19.0	22	42.3	30	57.7
Celebrate achievements	245	74	23.2	38	51.4	36	48.6
Taking Photos	301	29	8.79	17	58.6	12	41.4
Search for information	243	82	25.2	13	15.9	69	84.1
Support SEN	229	82	26.4	29	35.4	53	64.6
Supporting Reflection	225	94	29.5	38	40.4	56	59.6
Show how to use	251	69	21.6	28	40.6	41	59.4
Take videos	207	110	34.7	51	46.	59	53.6

Respondents who were not using technology in a particular way were able to indicate whether they thought it was 'not appropriate', or something they may want to do in future, this is shown in Table 33. Again, there is a lack of consistency for some devices. For example, most users of technology said that they used it to support pupils to search for information at least occasionally, but 84% of those who were not using it to do this, said they thought it was an inappropriate thing to do. 65% of those who were not using technology to support SEN thought this was inappropriate.

Question 9: How are staff using EdTech?

How are staff using technology in your setting?

Table 34: How are staff using EdTech?

Activity	N	Mean	Mode
Finding resources	330	2.0	1
Recording Observations	325	2.0	1
Planning	329	2.1	1
Assessment	319	2.2	1
Communication with colleagues	322	2.3	1
Displays	323	2.6	1
Professional development	323	2.8	1
Communication with multiple parents	324	3.0	1
Communication with individual parents	321	3.1	1
Publishing children's work	320	3.3	1
Communication with children	314	5.0	6

1= daily, 2= 2-4 x a week, 3= weekly, 4 = monthly, 5 = occasionally, 6= never

All activities are happening regularly, except communicating with children. Childminders do more communication with parents, either in groups or individually. Settings use EdTech more to communicate with colleagues, for displays and to publish children's work.

Table 35 shows how adults are using technology in early years settings.

Table 35: How often are staff using EdTech?

Activity	% Daily	% Never	% do at some time
Communication with children	9.6	60.3	39.7
Publishing children's work	27.2	16.4	83.6
Professional development	29.6	3.0	97
Displays	32.5	6.3	93.7
Communication with multiple parents	34.6	16.4	83.6
Communication with individual parents	36.4	16.4	83.6

Find	48.4	2.1	97.9
Communication with colleagues	52.2	11.3	88.7
Assessment	53.7	7.8	92.2
Planning	57.0	8.4	91.6
Recording Observations	68.1	9.0	91

Figure 49 shows how many practitioners are doing each type of activity every day. Apart from Communicating with children, most activities seem to be happening regularly. An 'Other' category was used to describe the use of electronic learning journals for assessment, recording achievements and parental engagement.

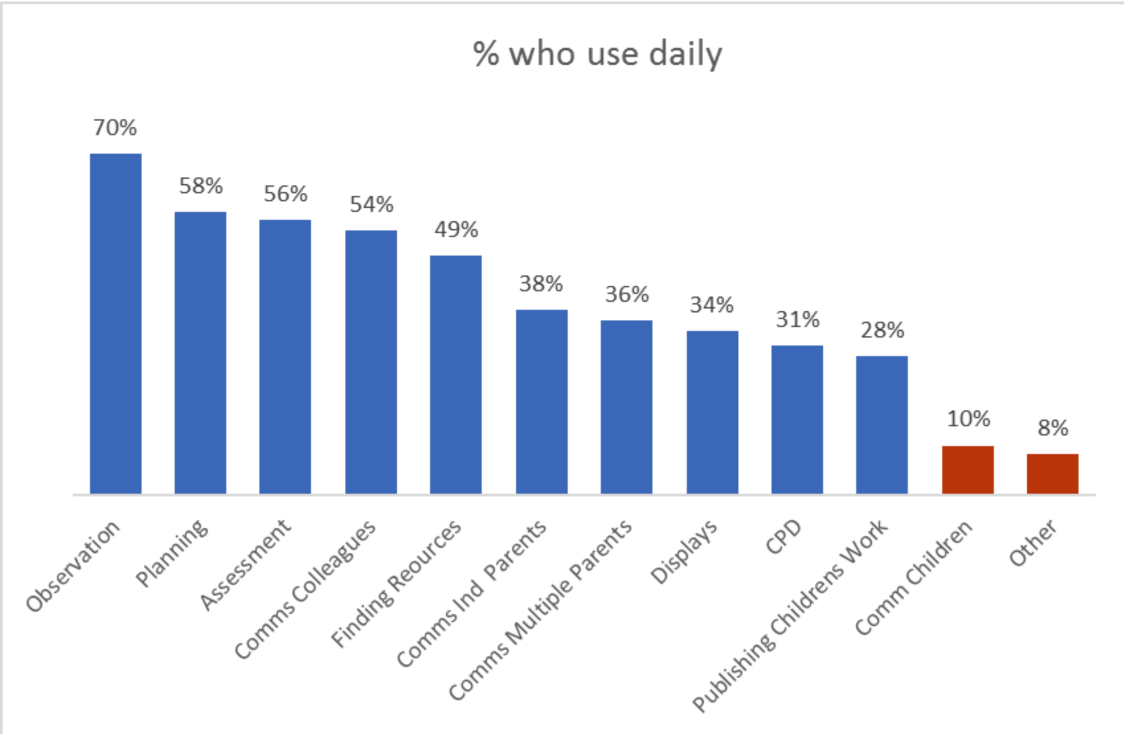

Figure 49: What EdTech are staff using every day?

Question 10: Which areas of the curriculum are being supported by EdTech?

Which areas of the curriculum are being supported by the use of educational technologies?

Table 36: Which areas of the curriculum are supported by EdTech - Characteristics of effective teaching and learning

Characteristics of effective teaching and learning	N	Mean	Mode
Active Learning	325	2.2	2
Playing and Exploring	328	2.3	2

Creating and Thinking Creatively	322	2.3	2

1 = extensively, 2 = regularly, 3 = occasionally, 4 = not used

Table 37: Which areas of the curriculum are supported by EdTech - Areas of learning and development

Areas of learning and development	N	Mean	Mode
Literacy	328	2.1	2
Mathematics	329	2.1	2
Understanding the World	330	2.2	2
Communication and Language	325	2.2	2
Expressive Arts and Design	326	2.6	3
Personal, Social, Emotional	325	2.6	3
Physical Development	323	2.8	3

black = prime area, red = specific area

Table 36 and Table 37 show that EdTech is being used across the whole of the EYFS curriculum, it is being used to support some areas more than others. It is used less often to support the areas of Expressive arts and design, Personal, social and emotional, and Physical development. EdTech is used to support all areas of learning and development, it is being used most often to support Literacy, Mathematics, Communication and language and, unsurprisingly, Understanding the World.

Question 11: What is the adult's role when children use EdTech?

How is technology used with children in your setting? How often is it used in this way?

Table 38: Adult role in the use of EdTech

Adult role	N	Mean	Mode	SD	Range
Adult initiated – large groups / whole class	323	2.3	2	1.02	3
Child initiated – no adult support	330	2.3	2	0.87	3
Child initiated – with adult support	323	2.3	2	0.76	3
Adult initiated – 1 or 2 children	330	2.4	3	0.73	3
Adult initiated – small groups	331	2.5	3	0.74	3

1 = extensively, 2 = regularly, 3 = occasionally, 4 = not used

Table 38 shows that adults are regularly working alongside children who are using technology. The findings suggest that adults regularly provide support to children using technology, but it is not possible to say what this support consists of. It appears that adults are more likely to support child-initiated activities than those they have initiated themselves.

Question 12: Which factors influence how you use EdTech?

Which of the following factors influence how you use technology in your setting? Do they encourage you to use technology, discourage you, or make no difference?

Table 39: Influencers of use

Influencers	N	Mean	Mode
Curriculum requirements	331	1.53	1.00
Children’s ability to use educational technologies	329	1.55	1.00
Personal ability to use educational technologies	330	1.61	1.00
Personal confidence	331	1.63	1.00
Attitudes of senior leaders	330	1.67	2.00
The amount of equipment available	331	1.71	1.00
Personal teaching and learning philosophies	330	1.71	2.00
Attitudes of colleagues	330	1.75	2.00
The amount of time available	332	1.83	2.00
Parental attitudes to technology	329	1.86	2.00
Children’s age(s)	330	1.86	2.00
eSafety Issues	331	1.88	2.00
Training and support available	331	1.88	2.00
Technical support	330	2.03	2.00
Finance available	330	2.16	3.00

1 = encourages, 2 = no difference, 3 = discourages

Respondents were given a list of factors and asked whether these would influence how they would use technology. From analysing the Modes, most factors made no difference: attitudes of senior leaders, personal teaching and learning philosophies, attitudes of colleagues, the amount of time available, parental attitudes to technology, the children's ages, eSafety issues, training and technical support. Five were seen to encourage practitioners to use technology: curriculum requirements, children's ability to use educational technologies, personal ability to use educational technologies, personal confidence and the amount of equipment available. Only one factor appeared to discourage the use of technology, this was the amount of finance available (see Table 39).

Question 13: How much should children use EdTech?

Do you think children in your setting should use technology more, less or is the amount of use about right?

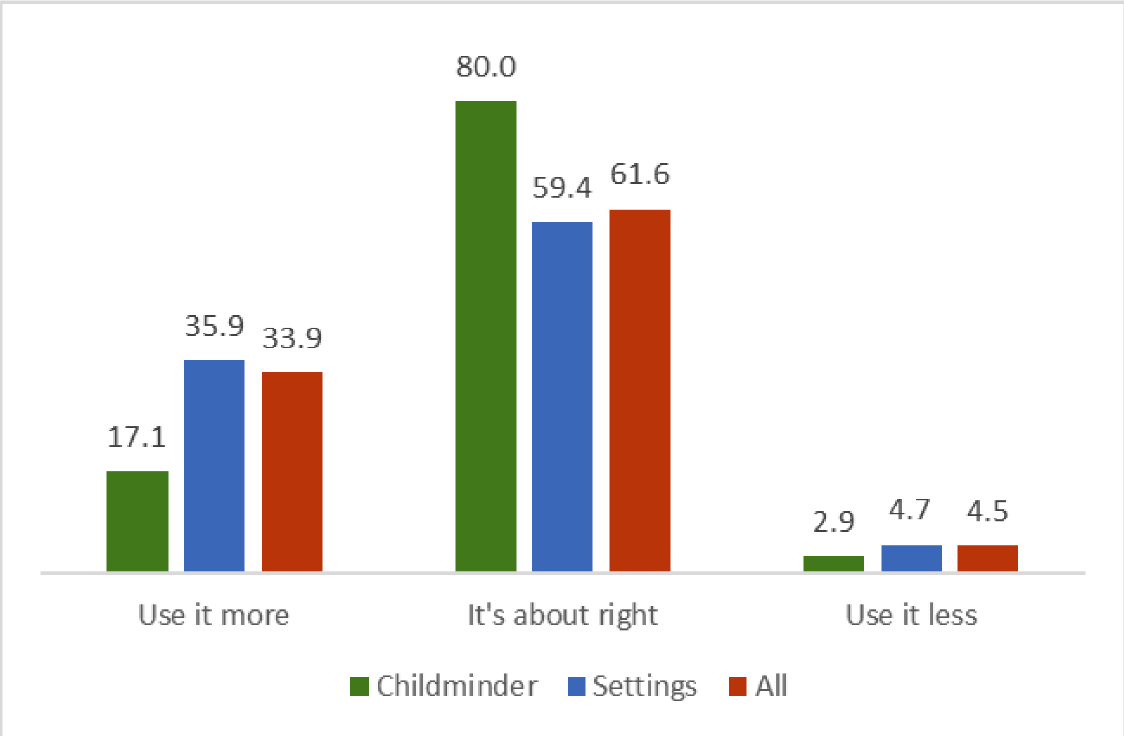

Figure 50: How much EdTech should children access?

The majority (61.6%) of respondents felt that the amount of technology their children had access to was about right, see Figure 50. Of those that felt the amount should be changed, 33.9% thought their children needed more access, with 4.5% thinking they needed less.

Question 14: At what age should children use EdTech?

At what age do you think it is appropriate to introduce children to technology?

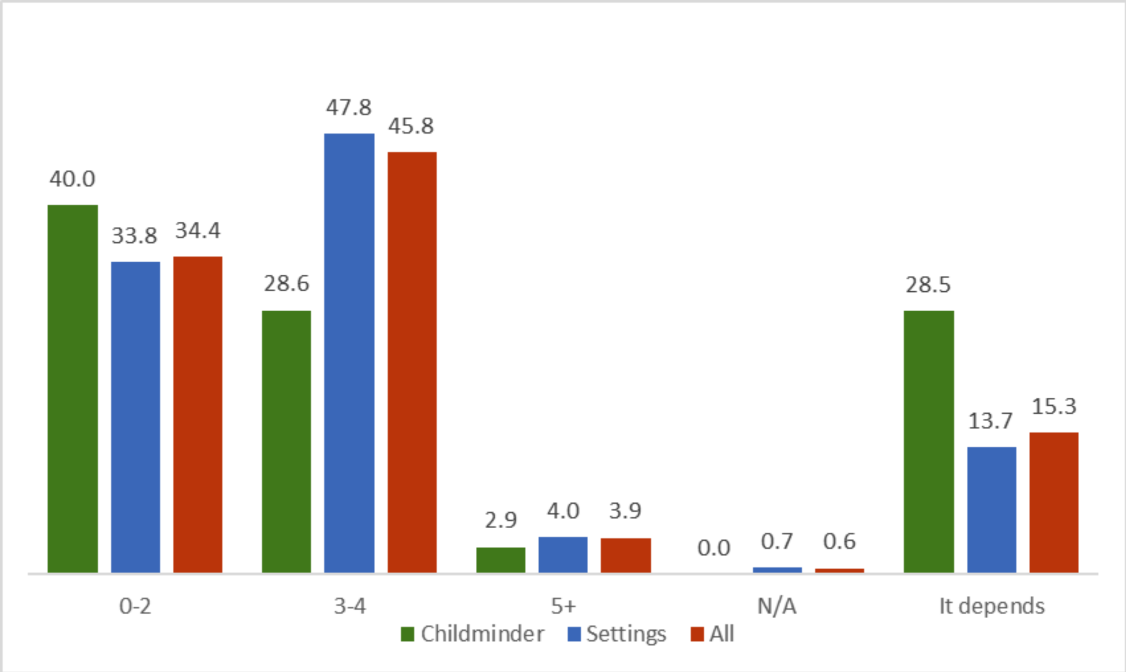

Figure 51: At what age should children have access to EdTech?

Most respondents (45.8%) thought that children should be introduced to technology when they were 3 or 4 years old. 34.4% thought younger children, 0 to 2 years old, should have access. 3.9% felt the children should be 5 or older, with 0.6% thinking it was not appropriate to use technology in the early years, see Figure 51. Not everyone felt this was an easy question to answer, with 15.3% of respondents feeling that the answer would depend on the circumstances.

Question 15: What is your attitude towards using EdTech with children?

Which of the following statements most closely reflects your attitude towards using technology with children in early years settings?

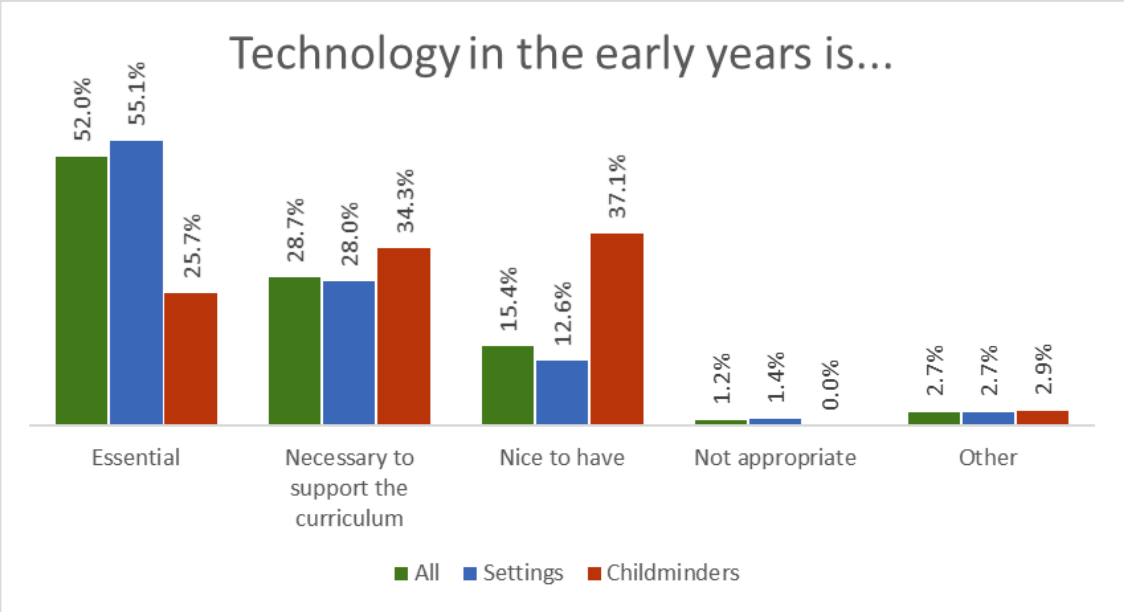

Figure 52: Attitudes towards EdTech

Respondents were asked about their attitude towards technology in the early years: 52% thought it was essential, 28.7% that it was necessary to support the curriculum, 15.4% that it was nice to have and 1.2% that it was not appropriate (see Figure 52).

It might have been expected that respondents who describe technology in the early years as ‘not appropriate’ would use technology less often than other groups. However, for most devices, it was the group that describes technology as ‘nice to have’ that use it least often. An example of this is shown in Figure 53.

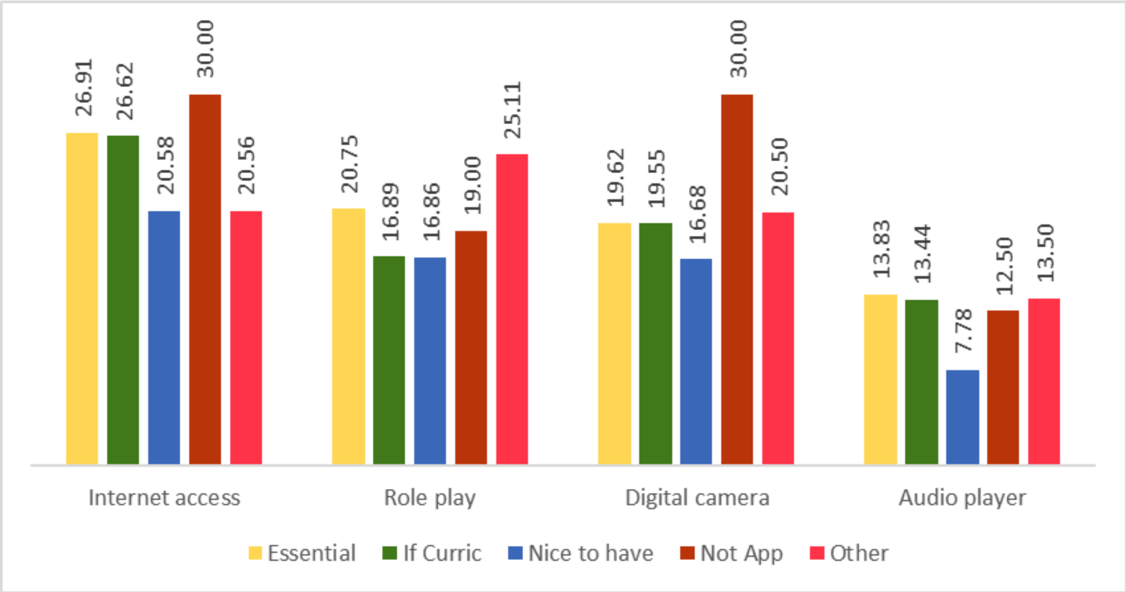

Figure 53: How often is a device used (depending on attitude)?

Question 16: Please explain your answer to question 15.

Respondents were able to explain their attitude towards educational technologies. Some provided answers that fit in to more than one theme.

The themes are shown in Table 40.

Table 40: Most common attitudes

Themes emerging from practitioners attitudes towards EdTech	N = 401
Technology is everywhere – children are surrounded by technology so need to use it from an early age. Most respondents made no value judgement about this, but some did e.g. we should embrace it. • *We live in an age of technology, so children must be introduced to simple technologies from an early age* • *We live in a world where technology underpins many aspects of life. Children need to feel confident to use technology and learn how it can enhance life skills from an early age* • *Technology is the way of the world now, nearly everything can be done by technology and I think it should be introduced from an early age* • *We live in a technical world surrounded by technology and the sooner children are exposed to it, the less intimidating it should be* • *the children live and will grow up in an increasing connected world, we should embrace that* • *Technology is in our world in a big way and I'm sure is not about to go away, we can play our part in having it available and introducing it in nursery.*	72

• *it's part of their everyday life, so why not part of education* • *Technology is 'the world' that we now live in and I believe that it is an essential and almost natural part of our provision, as it reflects the day to day lives of almost everyone. The struggle isn't whether or not to include it, nor whether or not to include it, but instead in keeping up with developments in technology.* • *Technology is part of modern life. We cannot ignore it.* • *Technology is used in the wider world in every walk of life, so children need to feel comfortable with it and accept it as a normal part of life* • *Technology provides so many opportunities. We are part of a technological world and therefore need to provide these opportunities for our children.* • *Babies press function buttons on play toys, ICT is all around us in everyday routines-tv buttons, crossing the road etc* • *We are now in an environment of digital natives, where technology will be integrated into all aspects of their lives.* • *technology is everywhere in the world around us and is often imposed on children by parents, family members, friends, society or the media (through advertising) even if the child is not interested. Technology is a fundamental part of the world we live in, but should not be used in isolation, without understanding or, without context*	
Technology has a positive impact on learning – range of different types of learning are supported (speech and language, deeper learning, fine motor skills, logic, problem solving, joy of learning, curiosity, social interactions). Technology is motivating and engaging, it enables them to do things they would not otherwise be able to do (learning dispositions). • *Technology is all around us and can be used as a vehicle for learning. We would be foolish not to make use of it.* • *Many technological items encourage huge amounts of problem solving for children and provide opportunities to develop speech and language skills.* • *Gives a lot of confidence to children with English as a second language, e.g. learning letters and sounds.* • *Using technology within the setting enables learning to be explored at a deeper level.* • *Nice to have if a child asks about something and you don't know the answer.* • *The use of technology also develops fine motor point skills, logical thinking and problem solving.* • *experience says having photos and videos is a great way to share the joy of learning.* • *It is part of life and can support all areas of the curriculum.* • *It is a useful tool to have and helps children extend on their learning and builds on their curiosity from an early age, just*	50

the excitement and curiosity on the face of a 1year old when you take their photo with a camera or iPad and they see it, fills them with the wonder of 'how did that happen'. • *For some children with SEN, technology has been one of the few ways to gain interest and further learning.* • *Children are confident and exploratory. Technology is quick and interactive, usually giving immediate gratification. It enables concepts to be developed and extended without the limiting factor of the children's physical development.* • *It can be motivating, stimulating and allow children to do things that they would otherwise not be able to do.* • *Technology is a very powerful and useful tool that can enhance children's learning, if used in the right way. Children are competent when it comes to using technology and this should be celebrated and used to promote other learning. It can be a very powerful means of engaging pupils.* • *It is part of real adult life and lends itself to positive role play and social interactions.* • *I believe that younger children should be exploring PSED and sometimes it is appropriate for technologies to support this.*	
There is a need for balance – EdTech is just as important as other types of resources, it is one tool among many. • *ICT is part of the EYFS, and it is important that we support our pupils to meet ICT standards expected, however it needs to be within reason, for example not just being used for the sake of it.* • *Children should learn about technology, but also needs old school play and interaction too.* • *There has to be a moderation, as with everything. Children can have time using ICT and time exploring.* • *Children need a balance of experiences, a curriculum that complements and promotes all learning styles.* • *Not too much, limit use as some children would use tablets for hours solid.* • *Children should use all different resources to learn, technology has its place, as does a child's imagination and use of everyday objects.* • *There needs to be a good balance when it comes to technology as it can isolate children and does not always encourage good language development and social skills.* • *In this day and age, we cannot ignore technology and children need to learn when and how to use it effectively. However, it should be a balanced part of learning and not used constantly.* • *I don't believe it is essential but should be offered on a par with other types of resources.* • *Children need to have as wide an experience of what the world offers as possible. Technology is a significant part of life, but it is not everything.*	40

• *Good to use, but never at the expense of essential skills.* • *Many children already have a lot of screen time and we need to balance this with exploring the natural world and building relationships.*	
It depends on the activity or device – some activities or devices are good, others are not. Comments suggest which uses are more/less appropriate. Most focus on benefits of technology, some talk about how students interact with it e.g. touch screen is better than others e.g. a mouse. How activities are supported is also mentioned as being important. • *Interactive whiteboards are brilliant stimulus - music, songs, pictures. Don't agree children should be on computers, laptops all that often in early years as they get loads at home, but appropriate technology resources, e.g. toys with moving parts etc are great fun.* • *Children need to understand how to work knob/switches etc to get a result and know information and answers are available on computers. I do not think under 5s should spend much time on computers, but it is useful to find out about the bugs you have found playing outside.* • *It is nice for children to have access to remote control toys etc.* • *I don't feel specific technology is essential to the early years, but if it is to help with a specific area, then I feel it's fine, e.g. learning to switch on and use simple apps, control toys but not just to sit and play games.* • *Push button toys used in educational and role play are acceptable.* • *Children should be made aware that there is a variety of technology available to capture their experiences. It should be beyond the computer.* • *I find that when it (and I mean tablet/gaming technology) is not available, children are more creative and energetic. When it is available, there is a tipping point past which children lose their energy and become entranced by repetitive behaviours. However, I have seen may examples of cooperative and creative work with tablets and gaming that I do think they have a place in their education and development, however one which must be monitored closely.* • *I currently have 2 PCs that are old technology - children come in and touch the screen hoping that they will react! We are teaching them retro skills using a mouse. However, some technology (remote control toys, cameras, video, play microphones etc) that are robust enough for children to use alone would be a great asset.* • *Buy one or two tablets. I feel these will be very beneficial to the children, all of whom come into contact with these devices on a daily basis. They are also more child friendly as they do not require the use of a mouse (which is quite a tricky concept for a*	37

child to master), whereas touch screen technology is so much more intuitive. • *I work with two-year olds who have impressive technological skills already. I think technology can support children's learning very well if used with adult support and with purpose.* • *Technology can and is used from birth, such as toys that play a tune, remote control cars, tablets etc . . . You would not give a baby a laptop and equally would not give a 7-year-old child a light up block sorter activity.* • *I find it a support to adults' offerings to children in the setting, it is FAR less appropriate to children to engage with directly*	
Children need technological knowledge for the future – when referring to the future respondents mention school or careers or everyday life. • *The era in which the children are growing up is an era of technology and teaching them to use it from a young age will provide them with the fundamental knowledge necessary for their generation.* • *I believe technology is essential for children because of how widely used it is in adult life, but also wish it wasn't as important as it is.* • *Technology is a pivotal part of everyday life and so many people use it daily that children should be using it and be exposed to it will be a key basic skill they will need for the future.* • *EYFS is essentially about preparing children for life and education - ICT is central to this and should be integrated appropriately, so children are prepared for this.* • *Our future generations will be required to have confidence and skills using technology as much as they will be expected to have maths and literacy skills. It is paramount we prepare them effectively for this.* • *Technology needs to available from an early age, in order for children to use as part of development/preparation for school.* • *Children's technological knowledge develops gradually and is a great advantage for them in today's world.* • *We need to get the children ready for the future and jobs in ICT that don't even exist yet!* • *It is a skill required in KS1 and earlier experiences is a help as long as not over used.*	36
Technology can have a negative impact - technology can have a negative impact on other areas of learning, or on behaviour, empathy and communication. • *The children behave better without technology in the setting.* • *They don't know how to play or socialise! The suffer from too much screen use and lack of imaginative play.*	35

• *It is often unnecessary as these skills are extremely good on entering nursery, to the detriment of other areas of the EYFS curriculum.* • *We have found we are having to refer more children to SALT as a result of less conversations and adult interaction.* • *Does not encourage empathy, language development, physical development etc., all of which are key to future success, learning and achievement.* • *I feel it can cause isolation, short attention span, be over stimulating, and encourage passive learning...* • *Technology isolates them from others and they become reliant on it and are unable to play independently and creatively.* • *I wonder if putting too much emphasis on technology at such a young age discourages mark making and fine motor skills.* • *Overreliance on tech limits development in other areas HUGELY.* • *Too much technology can skew grip, can lead to memory loss as you become reliant on Google, and can promote a sedentary lifestyle if over used* • *I believe that children should not always have access to technology such as iPad or tablets in the setting, as they become reliant on them.* • *Can be abused. E.g. I have worked in settings where Peppa Pig, YouTube music videos etc. have been on the interactive board extensively. This has put me off having one.*	
Other things are more important than technology – respondents refer to creativity, imagination, language, playing outdoors. Or they give some indication of what people think is wrong with technology – isolating, abstract sedentary. This can be seen as an indication of what they think technology is – educational programs, screen based. Some mention the importance of a particular priority linked to the children they work with e.g. speech and language problems. • *In Nursery settings, more importance needs to be placed on speech and language development before children are encouraged to reinforce skills using technology.* • *Too much emphasis is put on technology sometimes, when children should be out having fun climbing trees, playing with conkers, tree rubbings, making fires etc these do not require technology.* • *I think young children are exposed to iPads at too young an age. I would not see iPads as appropriate technology for ages of children we teach. I see our job as mainly developing their personal, social and emotional development and getting them ready for school. Being able to put on their own coat or take themselves to the toilet. In that respect, technology would have no benefit.*	33

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We use the outdoors more than inside. We go on daily walks, often two hours, have an allotment nearby and think a healthy relationship with the environment and local community, learning life skills is more useful than a load of techno stuff!
Children need to learn to communicate with each other and socialise before learning to be unsociable and individuals.
Emphasis should be on concrete experiences in all areas of learning.
I think screen time should be limited, as children need to move and do things for brain growth!
Children are generally used to technology at home etc and we encourage them to play and use their imagination in our settings. When we used a computer in our playgroup, the children found our educational programmes boring.
I think that nursery age children have little or no need for what technology involving screens offers; they're far better off having real experiences with actual people and resources.
Their language, communication, physical and social development is well below national average. Therefore, we have made the decision to limit the role of technology

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Home access – some people say that children already have access at home, so they should focus on things they do not have, some said they could not compete with what is at home. However, others said that their setting should reflect what children see at home. Some responses said the opposite, that not all children have access, so they need to address the gap. Some said children have too much technology at home.

Children in our setting respond better to experiences that are not readily available in the home e.g. messy play, climbing, risk and challenge, creative and outside learning
Children are now surrounded by technology in the home and community, therefore for EYFS settings to offer an extensive range of technology for children we are bridging the gap between the adversities that children may be faced with; providing equal opportunity for learning for all.
I think lots of young children are exposed to too much technology in the home. E.g. iPads, gaming consoles etc.
Many children have access to technology at home and we could support that use. For those who don't, we need to build skills.
They come to nursery school to play and learn without technology.... they can do that at home if their parents are happy for them to do it.
All children should have the opportunity to access IT from a young age. Some children don't have the importunity to do this at home so we as a setting should provide these opportunities.
Most of our children have access to a range of technology at home. We aim to use our kit to support the activities that we

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plan to meet the needs of individual children - for some it means "weaning" them off screen time! • *Virtually all are bombarded with tech at home... And generally better tech than what we can provide at school!* • *Children have a lot of screens at home! Better to play in other ways at Nursery.* • *I would say that most children find the technology in my classroom inferior to that which they find at home.*	
Need to focus on the purpose – technology needs to be used for a purpose, not just because it is there. • *We advocate technology being used for a purpose rather than keeping people occupied.* • *Technology should be used when it is going to support and enhance the children making progress in their learning.* • *It should not just be freely available, or children will become too passive and forget to use their brains and go find the answer on a tablet. There should be an educational link.* • *It should reflect the "ideal" that we want for our children, i.e. not glued to a screen, but if we need to find something out we know how to access the information through technology.* • *Technology in early years must be used for a purpose and not just a time filler or to occupy a child by giving them an iPad.*	18
Technology is needed to support the curriculum – most refer to EYFS goals, but some refer to Montessori principles. • *If it is an aspect of the EYFS, then we should be using it as effectively as we do paint, play dough and role play etc.* • *As technology is one of the areas on the EYFS Profile it is essential that children have access to it.* • *Technology is a useful tool. I don't think it is essential within an EY setting APART from to achieve the Technology statements.* • *What I have tended to find is that the children in my setting are very savvy. Also, the ELGs for technology have remained unchanged, even though the curriculum beyond Foundation is much more demanding...they are not really difficult to achieve.* • *We are a Montessori setting. We have made a decision for children not to access a computer and to use the internet to extend their learning only with an adult. We are not against children using other technology, but find it very difficult to source equipment that is not noisy/plastic or disruptive to our calm learning environment.* • *As a Montessori practitioner I feel that children are best engaged in "real life" activities in the EY.*	11
Reference to their personal feeling – respondents say what they think but give no indication of why they think this.	10

• *My gut feeling is we don't need it so young, but experience says having photos and videos is a great way to share the joy of learning.* • *I don't think screen-based technology is suitable for young children 0-6.* • *I would like to integrate more technology into the Early Years environment.*	
Children need to learn how to be safe – without mentioning specific dangers. • *It's important that we teach children from an early age how to be responsible when using different types of technology.* • *Technology literate, confident in using technology and aware of how to stay safe.* • *Technology is important in many ways, but children are taught the safe and correct way to use the internet*	10
Technology is not necessary • *I am quite happy that children can learn well without it.* • *There are ways of stimulating children's imagination, creativity, and developing learning without using technology.* • *Technology is a useful tool. I don't think it is essential within an EY setting APART from to achieve the Technology statements.*	7
Rate of change - is seen both as a reason to teach technology and a reason not to. • *Most tech will be obsolete by the time they are ready to engage it appropriately...so not teaching them anything that valuable.* • *Technology is constantly developing we need to prepare children from an early age, so they are confident users.*	4
Focus on the child – activities should follow child's interests, these may include technology. • *Early years should follow children's interests and not adults, children are increasingly interested and capable of using many forms of technology and this interest should be supported and encouraged, as should any other.* • *I believe that we, as early years professionals should be giving the children in our care NEW experiences; this could be using a tablet, listening to a CD or using a mouse to paint on a P.C. But more often than not our children need to experience and feel the natural world.*	4
Children can learn to use technology later • *Technology is important, but I think that children have plenty of time when older to learn how to use it*	3

• *Many of us adults are very good with technology despite not having much access in our youth*	

Many respondents answers could be related to one of Hawkridge's (1990) rationales (Table 41). Of the 194 respondents whose answers could be categorised in this way, the majority (56.7%) gave answers that suggested the social rationale, around two fifths (41.2%) made comments that could be aligned with the pedagogical rationale and a small number (2.1%) to the vocational rationale. None of them referred to the catalytic rationale. The question did not specifically refer to these rationales and an alternative approach, including having the choices as multiple-choice options, may have resulted in a different outcome.

Table 41: Rationales for using EdTech

Rationale	N	%
Social	110	56.70%
Vocational	4	2.06%
Pedagogical	80	41.24%
Catalytic	0	0.00%
	194	100.00%

In 1998 (Drenoyianni & Selwood) most (89.1%) primary teachers indicated that their main rationale for using computers were social and vocational but pedagogical was mentioned by a significant number (up to 72.9%).

Question 17: How confident are you about using technology?

Table 42: How confident are practitioners?

Confidence	N	Mean	Mode
How confident are you about using technology for your personal use	332	1.3	1.0
How confident are you about using technology to support your teaching	332	1.4	1.0
How confident are you about using technology	332	1.5	1.0

with pupils to support their learning			

1 = very confident, 2 = quite, 3 = not very, 4 = not at all

All practitioners were confident about using technology for personal use (97.9%), to support their role as a practitioner (96.4%) and to support children's learning (94.5%), all of the answers to these questions had a mode of 1 which equates to 'very confident' see Table 42.

Question 18: Professional development/training for EdTech

Have you had any professional development/training in the use of educational technologies?

Table 43: Access to training / CPD

Training	Childminder	Setting	All
Enough	25.71%	46.28%	44.11%
Some	20.00%	27.03%	26.28%
None	54.29%	26.69%	29.61%

Only 46.3% of practitioners in settings reported that they had accessed enough training, this dropped to 25.7% for childminders. 26.7% of practitioners in settings had not accessed any training (see Table 43).

75.9% of practitioners in settings wanted more training in future, 54.3% of childminders also wanted training in future.

Question 19: What sort of training have you had?

Figure 54 shows what training they had accessed in the past and what training they would like in the future. Training they would like most included:

- Time to explore new and different technologies
- Access to information about how other settings were using technology successfully
- Support with using technology in specific areas of the curriculum

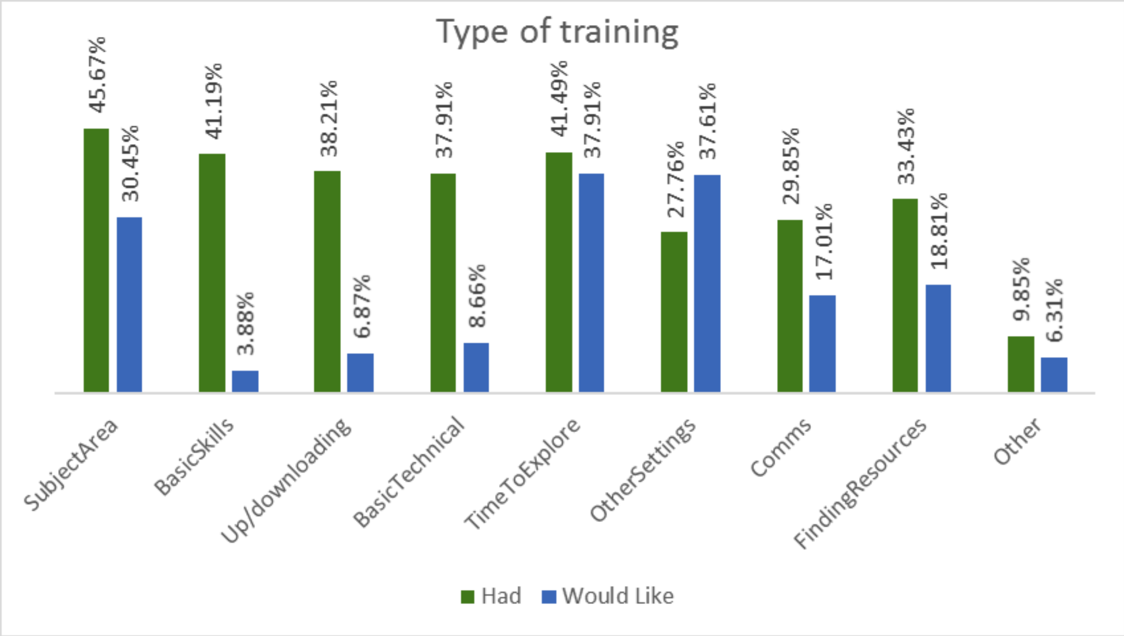

Figure 54: Type of training accessed/Type of training wanted

Question 20: Future EdTech training?

Would you like to have access to training to support the use of educational technologies in the future?

Table 44: Is more training wanted?

Training	N	Percent
Yes	243	73.6
No	87	26.4
	330	100.0

75.9% of practitioners in settings and 54.3% of childminders wanted more training (see Table 44).

Question 21: What future training would you find useful?

If yes (you would like access to training in the future) what sort of training would you find useful?

Figure 54 shows the type of training respondents had previously had access to, and what they would like to have in the future. Responses suggest that access to information about how other settings used technology and time to explore EdTech would be the most useful form of training. Training in basic skills and technical skills appears to be less desirable than other training.

See question 19 and Figure 54

Question 22: What sort of delivery would you find useful?

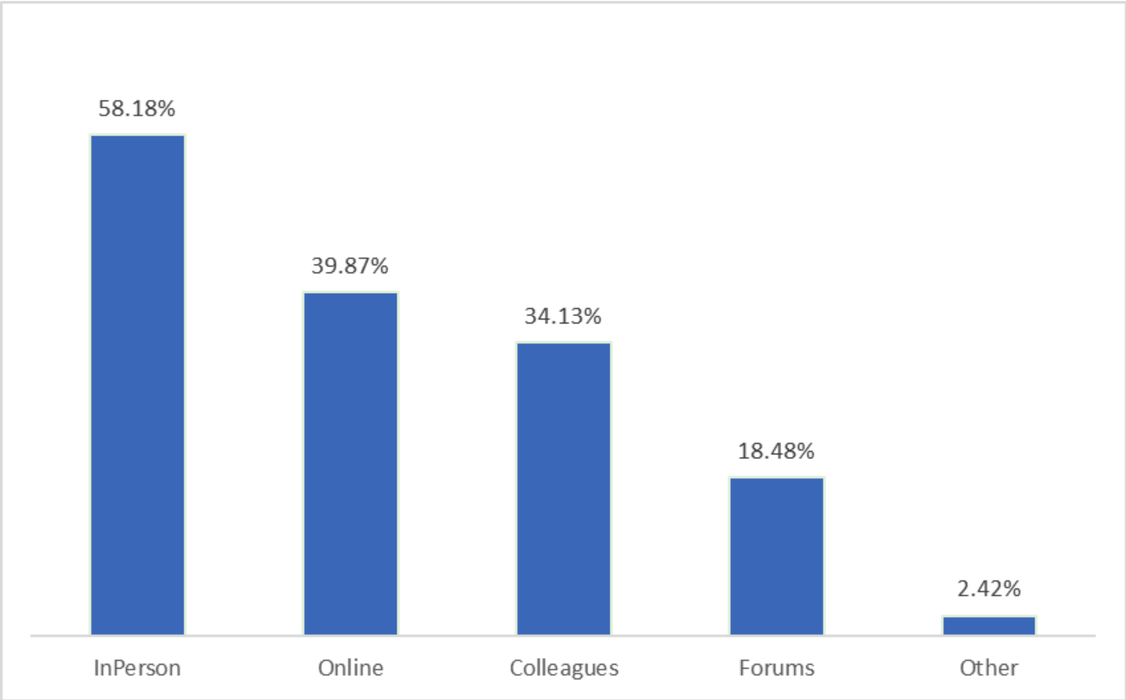

Figure 55: Preferred delivery method

Figure 55 shows that respondents would prefer to access face to face training though other delivery methods are also seen as useful.

Question 23: Does your setting have access to technical support?

Table 45: Type of technical support available

	Childminder	Setting	All (N=332)
Technician	0.00%	31.65%	28.31%
Other Staff	0.00%	11.11%	9.94%
External	5.71%	35.02%	31.93%
None	85.71%	21.21%	28.01%
Other	8.57%	1.01%	1.81%

21% of practitioners in settings had no access to support, this was true for 85.7% of the childminders (see Table 45).

Question 24: Personal beliefs about early years education?

Recognising that some things in educational settings are required by external sources, what are YOUR OWN PERSONAL BELIEFS about early years education? Please select the option that most closely represents YOUR BELIEFS about each item's importance for early years education.

Table 46: Factor analysis on questions about beliefs

Pattern Matrix[a]		
	Factor	
	1	2
35. It is _____ to establish a collaborative partnership/relationship with parents of all children, including parents of children with special needs and from different cultural groups.	.746	
36. It is _____ for the classroom teacher to modify, adapt, and accommodate specific indoor and outdoor learning experiences for the child with special needs as appropriate	.653	
29. It is _____ that books, pictures, and materials in the classroom include people of different races, ages, and abilities and both genders in various roles.	.644	
27. It is _____ for children to see and use functional print (leaflets, magazines etc.) and environmental print (food packaging etc.)	.642	
28. It is _____ to provide many daily opportunities for developing social skills (i.e., cooperating, helping, talking) with peers in the classroom	.603	
5. It is _____ for activities to be responsive to individual differences in children's levels of development	.598	
4. It is _____ for activities to be responsive to individual children's interests	.581	
26. It is _____ that teachers engage in on-going professional development in early childhood (e.g. attend professional conferences, read professional literature)	.565	
6. It is _____ for activities to be responsive to the cultural diversity of students	.558	
34. It is _____ for teachers to solicit and incorporate parents' knowledge about their children for assessment, evaluation, placement, and planning	.529	
3. Observation is ______ evaluation tool	.519	
24. It is _____ to read stories daily to children, individually and/or on a group basis	.513	
31. It is _____ for parents/carers to be involved in ways that are comfortable for them	.510	
8. It is _____ for teacher-child interactions to help develop children's positive feelings toward learning	.490	
20. It is ____ to have personalised plans in place to support individual learning or behavioural problems.	.490	
33. It is _____ for teachers to integrate each child's home culture and language into the curriculum throughout the year.	.477	
32. It is _____ for strategies like setting limits, problem solving, and redirection to be used to help guide children's behaviour	.473	
21. It is ____ for teachers to allocate extended periods of time for children to engage in play and projects	.452	
12. It is ____ for the teacher to provide a variety of learning areas with concrete materials (writing centre, science centre, maths centre etc.)	.397	

9. It is _____ for teachers to provide opportunities for children to select many of their own activities	.396	
17. It is _____ for the teacher to move among groups and individuals, offering suggestions, asking questions, and facilitating children's involvement with materials, activities, and peers	.363	
30. It is _____ that outdoor time has planned activities.	.348	
22. It is _____ for children to write by inventing their own spelling		
1. It is _____ for teacher-child interactions to help develop children’s self-esteem		
13. It is _____ for children to spend extended time working individually at desks or tables		.724
14. Workbooks and/or worksheets sheets are _____ in my classroom		.707
39. It is _____ to focus on teaching children isolated skills by using repetition and recitation (e.g., reciting ABCs)		.672
2. Formal tests are ______ as a tool for evaluating children’s progress or achievement		.629
40. It is _____ to follow a prescribed curriculum plan without being distracted by children’s interests or current circumstances		.603
38. It is _____ to provide the same curriculum and environment for each group of children that comes through the program		.603
16. It is _____ for the teacher to talk to the whole group and for the children to do the same things at the same time		.599
7. It is _____ that each curriculum area is taught as a separate subject at separate times		.586
10. It is _____ to use a single approach for reading and writing instruction		.559
23. It is _____ for children to colour within pre-drawn forms.		.535
18. It is _____ for teachers to use treats, stickers, and/or stars to get children to do activities that they don’t really want to do		.506
37. It is _____ that teachers maintain a quiet environment		.504
11. Instruction in letter and word recognition is _____ in preschool		.493
19. It is _____ for teachers to regularly use punishments and/or reprimands when children aren’t participating		.482
15. A structured reading or pre-reading program is _____ for all children		.478
25. It is _____ for children to dictate stories to the teacher		
41. It is ___ to plan activities that are primarily just for fun without connection to program goals		
Extraction Method: Principal Axis Factoring. Rotation Method: Promax with Kaiser Normalization.		
a. Rotation converged in 3 iterations.		

Information about Table 46 is in section 6.5.1.

Question 25: Influencers on teaching and learning

Please rank the following by the amount of influence you believe each has on the way you plan or implement teaching and learning in your setting.

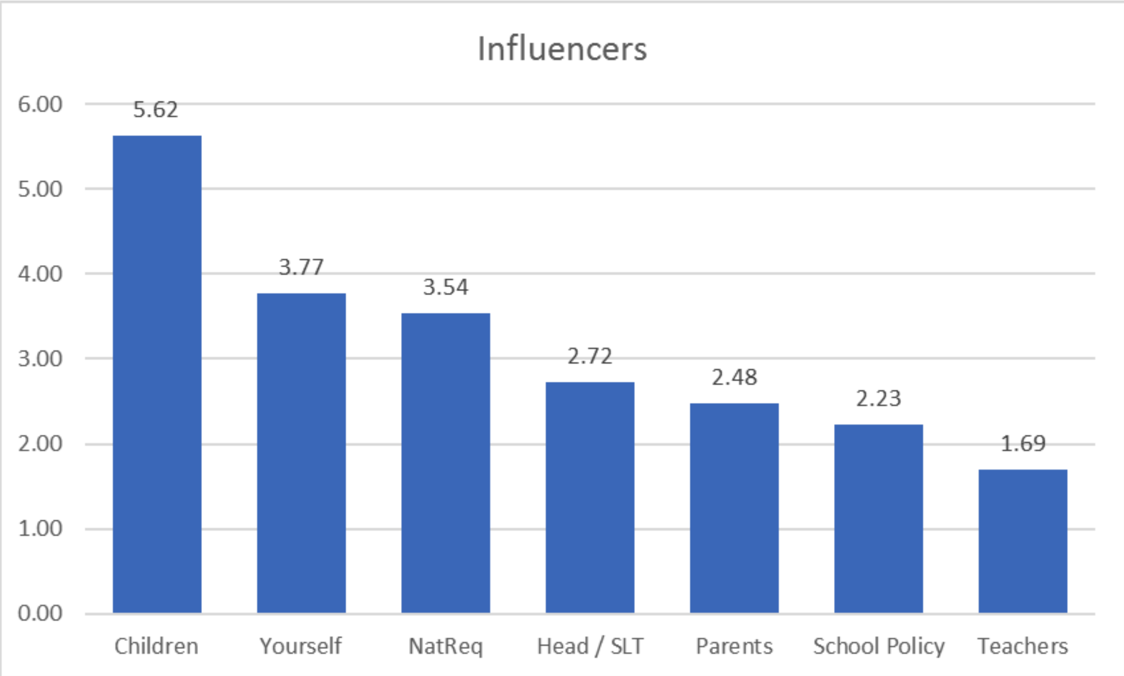

Figure 56: Influencers on the teaching and learning

7 = most influence, 1 = least influence

Question 25 asked about the factors that influenced the respondents practice. The most important factors were the children they worked with and themselves (Figure 56).

Question 26: Classroom practice

How often do children in your setting do the following activities?

Table 47: Factor analysis on questions about practice

Pattern Matrix[a]			
	Factor		
	1	2	3
13. Use flashcards with ABCs, sight words, and/or maths facts	.655		
15. Practice handwriting on lines	.643		
17. Participate in whole-class, teacher-directed instruction	.633		
16. Colour, cut, and paste pre-drawn forms	.618		

12. Circle, underline, and/or mark items on worksheets	.603		
10. Use commercially-prepared phonics activities	.554		
20. Receive rewards as incentives to participate in classroom activities in which they are reluctant participants	.496		
11. Work in assigned ability-level groups	.490		
14. Participate in rote counting	.483		
18. Sit and listen for long periods of time until they become restless and fidgety	.438		
27. Get separated from their friends to maintain classroom order	.357		
30. Participate in adult directed activities	.340		
22. Get placed in time-out	.316		
5. Play with games, puzzles, and construction materials		.704	
9. Use manipulatives		.629	
7. Sing, listen, and/or move to music		.613	
1. Build with blocks		.597	
6. Explore science materials		.530	
2. Select from a variety of learning areas and projects		.462	
4. Experiment with writing by drawing, copying, and using their own invented spelling		.423	
8. Do planned movement activities using large muscles		.388	
25. Draw, paint, work with clay and use other art media		.330	
3. Have their work displayed in the classroom			
26. Solve real maths problems using real objects in the classroom environment that are incorporated into other subject areas			.702
34. Do activities that integrate multiple subjects (reading, math, science, social studies, etc.)			.585
33. Plan their own activities			.539
29. Work with materials that have been adapted or modified to meet their needs			.531
28. Engage in experiences that demonstrate the explicit valuing of each other			.511
31. Reflect on work they did earlier in the day/ week/term			.448
24. Engage in child-chosen, teacher-supported play activities			.442
21. See their own race, culture, language reflected in the classroom			.359
23. Experience parents reading stories or sharing a skill or hobby with the class			.315
32. Take work home to share with family and friends			
19. Have the opportunity to learn about people with special needs			

Extraction Method: Principal Axis Factoring. Rotation Method: Promax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

Information about Table 47 is in section 6.5.1.

Question 27: Any other comments

Please use this page to add any other comments you have

B. Cycle Two: Article

An account of Cycle Two was been submitted for publication to Research in Learning Technology. A copy of this article is included here.

Jack, C., & Higgins, S. (2019). Embedding educational technologies in early years education. Research in learning technology. doi:10.25304/rlt.v27.2033

Embedding educational technologies in early years education

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Embedding educational technologies in early years education

This survey of 335 practitioners builds on research which challenged the view that educational technologies are rarely used in early years settings. Previous research tends to focus on individual devices. This research looks at the range of devices being used and, instead of investigating how often they are used, considers how they support pedagogical practice. Findings support the view that early years practitioners are accessing a wider range of technologies and that these technologies are being used in more pedagogically appropriate ways than has previously been reported.

Educational technologies appear to be increasingly embedded within early years education. Overall, attitudes towards educational technology are positive. Beliefs, however, are more likely to be linked to the social rationale, that children need access to technology because they are surrounded by it in everyday life, than the pedagogical rationale, that technology enhances learning. It may be necessary to review documentation to ensure policy and practice focuses more specifically on learning and teaching.

Keywords: early years education, educational technology, ICT, practitioner attitudes

Introduction

Although technology is seen to have a positive impact on learning in the early years (Vaughan & Beers, 2017), research typically suggests that many settings rarely use it (Blackwell, Lauricella, & Wartella, 2014). An earlier study (authors, 2018) challenged this view, suggesting that while barriers to the use of educational technology still exist, digital devices are being used for a range of activities that is much broader than some earlier literature suggests.

The term educational technology is being defined more broadly than previously, referring to more than just computers, interactive whiteboards (IWBs) and tablets with a more inclusive view of digital devices.

This research builds on a small scale, exploratory study involving interviews with twenty early years practitioners who work in the Early Years Foundation Stage (EYFS) (authors, 2018) which in England refers to the stage between birth to five years old (Standards and Testing Agency, 2017). The phase of the research described here aims to show whether these findings could be replicated on a larger scale.

A questionnaire asked: what technology is available in early years settings; how often is it being used and what is it being used for? It explored how extrinsic and intrinsic barriers are influencing practitioners' use of technology.

Sections of the questionnaire draw on recent studies in the United States (Blackwell et al., 2014; Blackwell, Lauricella, Wartella, Robb, & Schomburg, 2013; Blackwell, Wartella, Lauricella, & Robb, 2015; Wartella, Blackwell, Lauricella, & Robb, 2013; Wartella, Schomburg, Lauricella, Robb, & Flynn, 2010). While direct comparisons of all the data are not possible, some useful conclusions can be drawn.

Blackwell et al. (2013) identified a number of limitations with their research. Some, such as the use of self-reports, are shared by this study. One, the need to consider how the technology is being used, is addressed here. As well as finding out what technology is available, this research looks at how practitioners are using the technology they have. Rather than simply asking which areas of the curriculum are being supported, respondents were also asked about the types of activities children were experiencing and whether adults were working with them to extend their experience beyond basic exploration.

What is educational technology?

There is limited information about what educational technology early years practitioners have access to, as research is often limited to small scale, qualitative studies (Plowman, 2016). Whilst these studies are often essential to understand the use of technology in context, it is difficult to get an accurate picture of what is happening more widely.

Technology is defined differently by different authors (Ekici, 2016). A small-scale review of the literature (authors, 2018), showed that the usual focus is computers, interactive whiteboards (IWBs) and/or tablets. Authors (2018) found that most of the interviewees had a much broader view of technology. Most commonly they talked about computers, cameras, IWBs, tablets, recording devices, programmable toys, remote control toys, metal detectors, musical instruments, phones, walkie talkies, the Internet and microscopes. All settings had at least five different types of devices.

Why is technology being used?

While educational technology is often described as a ‘game changer’, likely to result in a new approach to teaching and learning (Selwyn, 2016), this is not the only way of viewing technology in education. An in-depth review of this area is beyond the scope of this article but it is useful to consider four rationales identified by Hawkridge (1990):

- Social – computers are everywhere in society, schools need to prepare children for this life
- Vocational - children need to learn about computers as they need them for their future careers
- Pedagogic – computers support teaching and learning
- Catalytic – computers are catalysts enabling change in education

If, as previously mentioned, technology can have a positive impact on learning in the early years (Vaughan & Beers, 2017), simply having technology is not enough. Practitioners need to consider how the technology is used (Higgins, Xiao, & Katsipataki, 2012). A practitioner who has a social rationale will have a reason to have technology in their setting, but a pedagogical rationale may be needed for the technology to support teaching and learning.

What is technology being used for?

Much of the reviewed research consisted of evaluations of the efficacy of a specific resource or device, it rarely considered a range of technologies. Where this did happen, it looked at the type of technology settings have, the amount of time spent using the different devices, or the area of the curriculum which is being supported. There is little evidence of how educational technologies are being used to support teaching and learning (Aldhafeeri, Palaiologou, & Folorunsho, 2016; Kerckaert, Vanderlinde, & van Braak, 2015).

The interviewees reported that their technology was being used across the curriculum and supported child-led, active, exploratory approaches to learning (Authors, 2018). Again, this is different to previous work which suggested a more restricted use of technology, often limited to the use of computers during free play time, or a focus on operational skills or turn taking (Plowman & McPake, 2013; Plowman & Stephen, 2005; Plowman & Stephen, 2013; Plowman, Stephen, & McPake, 2008; Stephen, 2014).

Barriers

The literature highlights a range of barriers that can limit the use of technology in schools. These can be divided into extrinsic (lack of equipment, training and technical support) and intrinsic barriers (attitudes and beliefs) (Ertmer, 1999). Research suggests that most extrinsic barriers have been tackled in schools (Ertmer, 2005), however, technology use is still not as widespread as some would like. Intrinsic beliefs are described by Ertmer as the 'final frontier' (2005). The interviews (authors, 2018) suggest that, for the interviewees, attitudes are not a barrier to the use of technology. The survey was used to find out if this was true for a larger sample.

Early years pedagogy and the role of the adult

Ertmer identified the need to examine the relationship between teachers' pedagogical beliefs and their use of technology (2005). Early years education is different to other phases of education, with a stronger focus on socio-emotional skills alongside academic skills. Good learning is seen as active and independent (Mertala, 2017). This is not always seen to be conducive to working with technology which some people see as a potential threat, taking time away from other, more important, activities and disrupting learning (Ljung-Djärf, Åberg-Bengtsson, & Ottosson, 2005).

Research suggests that technology is more likely to have a positive effect when children use it alongside adults or more experienced peers (McCarrick & Li, 2007). If children use technology on their own, they may not use it in the most efficient way (Preradović, Lešin, & Boras, 2017). There is a need for adults to scaffold and model appropriate use (Neumann & Neumann, 2014). The survey aimed to find out whether this kind of support was being given.

Methodology

The research questions addressed by this study are:

- What educational technologies are available in early years settings and how are they being used?
- What barriers influence the implementation of technology in early years settings?
- What are early years practitioners' attitudes toward educational technology?

Data Collection

Two surveys were adapted for this study, the survey described by Blackwell et al (2013), which was also referred to in other studies (Blackwell et al., 2014; Blackwell et al., 2015; Wartella et al., 2013; Wartella et al., 2010) focused on technology. Kim's survey (2005) focused on pedagogical beliefs and practices. Given the rapidly changing technological landscape, changes were made to ensure the final survey included up-to-date devices and questions were added to ask how technologies were used. The adapted survey was shared with seven experts from local authorities and schools who provided feedback on the items and functionality. The research was reviewed and approved by the Ethics Sub-Committee at XXX.

A convenience sampling method was used to identify participants. The survey was sent to existing contacts, early years advisors and schools identified through Internet searches. Most communication was through email or social media and the survey was available online. This may have created a bias in the sample, resulting in more responses from people who are comfortable using technology (Tymms, 2012). Paper versions were available on request and posted to a small number of settings. As completion required a significant time commitment, an incentive of entry into a draw for a £30 voucher was offered.

Sample / Respondents

50.7% of the 335 responses came from early years settings within schools, 27.2% from private nurseries, 10.4% were childminders. The rest were from preschools or playgroups (4.2%), Local Authority nursery schools (3.6%), other nurseries (1.8%) and children's centres (0.9%). 1.2% did not say where they were from.

Of the respondents who came from schools, 75.6%, worked in Local Authority (LA) schools, 18.5% in academies which are publicly funded independent schools, 5.4% in independent schools which charge fees and 0.6% in free schools which are funded by the government but are not run by the local council, giving them more control than LA schools (Gov.uk, 2018). This is representative of the types of schools in the UK.

The vast majority of respondents, 96.4%, came from England. 1.8% from Scotland, 0.9% Northern Ireland, 0.3% Wales and 2 respondents, 0.6%, came from outside of the UK. Most respondents were teachers (48.3%) or head teachers/managers (37.2%).

Findings

What technology do they have and how often is it used?

Figure 1 shows all respondents had access to at least one device, with some having twenty or more.

[Insert Figure 1 near here]

Not all devices were working, though less than 5% of most types of devices were broken. Those that were over 5% are shown in Table 1. The most common broken devices were metal detectors (14.29%) and walkie talkies (18.40%). In most cases respondents wanted broken devices to be fixed.

[Insert Table 1 near here]

Blackwell et al. (2013), described technology as universal if 75% of respondents could access it and non-universal if fewer than 30% had access to it. This definition was used to analyse the responses to this survey, as shown in Table 2, and some comparisons can be made.

[Insert Table 2 near here]

Eight technologies can be classified as universal: Internet access, Role play, Digital cameras, Audio players, Laptops, Programmable toys, Tablets and Desktops.

The availability of desktops, laptops, and digital cameras is similar to the Blackwell study, but the number of televisions is very different, 79% in 2013 and only 37% in this study. Similarly, there is a significant difference when it comes to tablets. In the 2013 study, only 28% had access, in this study, there is universal access, with 79% having access.

Table 2 shows that there are important differences between settings and childminders. For childminders, there are additonal universal technologies: Music, Radio, Mobile Phones and TV. They are also much more likely to have gaming devices. Most of these technologies could be described as ‘home technology’. Childminders are, understandably, much less likely to have IWBs.

Frequency of use was measured in a similar way to Blackwell et al. (2013): a dichotomous variable was created indicating (1) access and (0) no access. A second variable was created for respondents who had access to the technology. This was converted to a continuous variable using a six-point scale for frequency. As this research had a six-point scale rather than the seven-point scale used by Blackwell et al. (2013), it was adjusted accordingly. Never was converted to (0), occasionally (0.5), monthly (1), weekly (4), 2-4 times a week (14) and daily (30).

Figure 2 shows how often devices are being used. Perhaps not surprisingly, universal technology tends to be used most often, though this is not always the case. Programmable toys are universal but are used less often than some devices accessible by fewer respondents, for example, music and radio. Where there is access to IWBs they are used more often than some universal devices.

[Insert Figure 2 near here]

Only 3% of respondents have no access to computers (defined as laptops, desktops or tablets). Of those that have access, they all use them at least occasionally. This could indicate a significant increase. In the 2013 study, 55% of in-home care providers and 59% of classroom teachers reported having access to computers. 34% and 35% of practitioners, respectively, reported never using a computer with young children (Blackwell et al., 2013).

Over 30% of practitioners did not use certain technologies even when they were accessible. This was the case for visualisers, metal detectors and eReaders. However, this does not necessarily mean that they were not considered valuable. 46.1% of settings that did not have metal detectors said that they would like to have them, for eReaders it was 30.0% and visualisers 29.4%.

Respondents who did not have access to a resource were able to indicate if they thought it was ‘not appropriate’ for their children. Not everyone agreed about appropriateness. 71% of respondents who did not have a TV in their setting thought it would not be appropriate to have one, however, a small number (5%) indicated they wanted a TV. For gaming devices, 74% of respondents without them thought they were inappropriate, but 9% wanted one. For microscopes, 38% thought they were not appropriate but 48% wanted them, for metal detectors it was 39% and 44% respectively. Of those respondents who had these devices, some were using them every day. These differences may indicate different understandings of how these devices can support learning.

Childminders identified more technology as being ‘not appropriate’. The most striking difference is with mobile phones. 87% of practitioners working in settings identified these as not appropriate, no childminders thought this. 97% of childminders mentioned having mobile phones, compared to 46% of practitioners in early years settings.

How is technology being used?

How are children using technology?

When asked if children are more likely to select activities that involve educational technology, most respondents (55%) said there would be no difference. Of those that thought there would be a difference, over four times as many (36%) thought children would be more likely to choose technology, compared to those who thought they would be less likely to do so (8%).

When asked if children spend more time on activities using technology, rather than activities involving other resources, most respondents (50%) said there was no difference. Of those that thought there would be a difference over four times as many

(41%) thought children spend more time on activities using technology compared to those that thought they would spend less time on them (9%).

[Insert Table 3 near here]

Table 3 shows how often children are reported as using technology for different activities. Listen to stories/music, Practice literacy or numeracy, Stimulus material, Open ended programs, Celebrate achievements all have a modal value of 1: they are being used daily. Other activities have a mode of 5 and are used only occasionally. However, the means suggest that there may be less of a difference overall, with all activities happening regularly.

[Insert Table 4 near here]

Respondents who were not using technology in a particular way were able to indicate whether they thought it was 'not appropriate', or something they may want to do in future, see Table 4. Again, there is a lack of consistency for some devices. For example, most users of technology said that they used it to support pupils to search for information at least occasionally, but 84% of those who were not doing this, thought it was an inappropriate thing to do. 65% of those who were not using technology to support children with special educational needs thought this was inappropriate.

How are adults using technology?

[Insert Table 5 near here]

Table 5 shows how adults are using technology, with all activities except communicating with children happening at least weekly. Childminders tend to spend more time communicating with parents, either in groups or individually, while practitioners in settings spend more time on communicating with colleagues, using technology to create displays and for digital publishing of children's work.

Other uses of technology identified by respondents included using electronic learning journals for assessment, recording achievements and parental engagement.

Which areas of the curriculum are being supported by educational technologies?

In England, early years provision has to follow the Statutory Framework for the Early

Years Foundation Stage (Department for Education, 2014). This document identifies three characteristics of effective teaching and learning:

- Playing and exploring
- Active learning
- Creating and thinking critically

There are three prime areas:

- Communication and language
- Physical development
- Personal, social and emotional development

And four specific areas:

- Literacy
- Mathematics
- Understanding the world
- Expressive arts and design

In the most recent curriculum documentation for England, educational technology is mentioned only in the Understanding the World section. The Early Learning Goal states: ‘children recognise that a range of technology is used in places such as homes and schools. They select and use technology for particular purposes’ (Department for Education, 2012).

There is no mention of technology supporting teaching and learning across the curriculum, though the exemplification materials contain an explanatory note: ‘The child chooses the technological opportunities around him or herself as a tool to enhance and extend his or her learning’ (Standards and Testing Agency, 2012).

In previous curriculum documentation, the role of technology to support learning across the curriculum was more explicit. For example, the Desirable Learning Outcomes (School Curriculum and Assessment Authority & Department for Education and

Employment, 1996), stated that children should ‘use technology, where appropriate, to support their learning’.

Although the curriculum handbook does not mention the use of technology to support learning, respondents indicated that technologies are regularly being used to support all three characteristics of effective teaching and learning. It is used regularly across the areas of learning and development, though slightly less in Expressive arts and design, Personal, social and emotional, and Physical development.

Adult role

[Insert Table 6 near here]

Table 6 shows that adults are regularly working alongside children and providing them with support when using technology, though it is not possible to say what this consists of. It appears that adults are more likely to support child-initiated activities than those the adult initiated themselves.

Barriers

46.3% of practitioners in settings reported having had enough training, this dropped to 25.7% for childminders. 26.7% of practitioners in settings and 54.3% of childminders had not had any training. 75.9% of practitioners in settings and 54.3% of childminders wanted more training.

[Insert Figure 3 near here]

75.9% of practitioners in settings and 54.3% of childminders wanted more training (see Table 44).

shows the type of training respondents had previously accessed, and what they would like in the future. Responses suggest that access to information about how other settings use technology, and time to explore, would be the most useful form of future training. Training in basic skills and technical skills appears to be the least desirable.

Practitioner confidence was high, with 97.9% reporting confidence in using technology for personal use, and 94.5% were confident in using it to support children’s learning.

Factors that were identified as encouraging practitioners to use technology were curriculum requirements, children's ability to use educational technologies, personal ability to use educational technologies, personal confidence and the amount of equipment available. Only one factor appeared to discourage the use of technology, this was the amount of finance available.

What are their attitudes towards technology?

The majority (61.6%) of respondents felt that the amount of technology their children had access to was about right. Of those that felt the amount should be changed 33.9% thought their children needed more access, with 4.5% thinking they needed less.

Most respondents (45.8%) thought that children should be introduced to technology when they were 3 or 4 years old. 34.4% thought it should be younger, 3.9% felt the children should be 5 or older, with 0.6% thinking it was not appropriate to use technology in the early years. Not everyone felt this was an easy question to answer, with 15.3% of respondents suggesting that the answer would depend on the circumstances.

52.0% thought technology was essential in the early years, 28.7% that it was necessary to support the curriculum, 15.4% that it was nice to have and 1.2% that it was not appropriate. It might have been expected that respondents who describe technology in the early years as 'not appropriate' would use it less often than other groups. However, for most devices, it was the group that describes technology as 'nice to have' that use it least often. An example of this is shown in Figure 4.

[Insert Figure 4 near here]

Respondents were asked to explain their attitude towards educational technologies. Most of this data will be reviewed in a future paper, but an initial analysis showed that many respondents referred to one of Hawkridge's (1990) rationales in their explanations. Of the 194 respondents who did this, the majority of comments (56.7%) referred to the social rationale, 41.2% referred to the pedagogical rationale and 2.1% to the vocational rationale. No one referred to the catalytic rationale.

Discussion

These findings support the view that early years practitioners are accessing a wider range of technologies than has previously been reported. However, while respondents were reminded that a device may have more than one function, they did not always appear to understand the range of functions some devices have. For example, of the 256 respondents who said they had access to one or more tablets, 10.6% said they did not have a digital camera, 43.4% said they had no video camera and 38.7% had no access to an audio recorder, yet all of these are standard functions of most tablets. This may indicate a limited use of multifunctional devices. For some devices, there were differing views about whether they are appropriate to use in the early years. This could be because of a lack of knowledge about what is possible.

The biggest difference between childminders and settings when looking at whether devices were appropriate or not concerned mobile phones. This is likely to be a result of systems and resources that are available in the different kinds of settings. In more formal settings, other staff may be responsible for contacting parents while childminders are more likely to need the immediate communication that mobile phones offer. A second reason is likely to be eSafety. Schools tend to have policies in place restricting the use of mobile phones on school premises.

Technology is being used across the curriculum and responses suggest that children are using it in open and exploratory ways, supporting the usual pedagogical approach found in early years. This indicates that there has been a move away from simply using technology in free play, or to teach children how to operate devices. It is worth noting that while a significant proportion of respondents had received training on how to operate devices in the past, few wanted such training in the future. Plowman (2016) suggests that operational approaches are the least appropriate way to use technology, this research indicates that there appears to be a shift away from this approach for both children and practitioners.

Adults appear to be working alongside children and scaffolding their use of technology, suggesting that it is used in more interesting and appropriate ways than the drill and practice of the past (Wang, Kinzie, McGuire, & Pan, 2010). Given the self-reported nature of the study, it is not possible to know if what is being reported is happening in practice, as is the case in the original study (Blackwell et al., 2013). It is possible that respondents could have misinterpreted some questions. One respondent who indicated they used technology across the curriculum added a note saying, ‘we use technology to support them, rather than them using it individually’. In some settings, the adults may be using the technology more than the children and the survey may not fully capture this distinction.

Respondents were asked if they would be willing for the researcher to visit them to see what was happening in practice. Due to the scope of the research, it was only possible to visit a small number of local practitioners. All those visited were using technology in age appropriate ways that supported the early years curriculum. As this group was self-selecting it is possible that there was a bias towards practitioners with a more positive approach to using technology.

Implications for research and practice

It is important to recognise that comparisons are being made between research conducted in the UK and earlier research in the US. The international picture is diverse. Research conducted in Kuwait, for example, found that digital cameras were not being used (Aldhafeeri et al., 2016). For the mainly English respondents in this research, they are one of the most common devices. Comparisons should be treated with caution and it would be useful to repeat the study across the UK to see if the findings are replicated. Follow up research with a larger random or representative sample and supported by observations would be valuable.

The findings suggest that technology is physically embedded in early years education and being used in more pedagogically appropriate ways than in the past. Attitudes towards technology are generally positive and it is being used even when practitioners’ own beliefs may be more negative. A range of educational technologies are physically embedded across the respondents’ settings and there are indications that they are becoming culturally embedded too.

This raises an interesting question of which comes first, the technology or the belief? Has the physical presence of the technology resulted in practitioners’ beliefs, and the ways that they use the technology, becoming more positive? Or are beliefs leading to an increased physical embedding of educational technologies?

While attitudes appear to be more positive, and educational technologies are being used in more educationally appropriate ways this does not necessarily mean they are having a positive impact on learning. Most respondents indicated that they believed it was important to use technology because children were surrounded by it in society. Fewer suggested it was because was of its pedagogical value. Future research could address this issue more explicitly and explore whether the embedding of educational technologies in the early years results in a move towards a more pedagogical rationale.

This paper refers to the second phase of a longer study, phase three examines how technology is being used in practice. This is linked to a more in-depth evaluation of the pedagogical rationale and other key theoretical frameworks that look at how practitioners can implement technology within their setting. TPACK is used to examine how the use of technology can be integrated with the practitioners' pedagogical beliefs (Voogt, Fisser, Pareja Roblin, Tondeur, & van Braak, 2013). SAMR is a hierarchical model that suggests that there are different levels of technology use (Puentedura, 2006). Technology can be used as an alternative way of doing existing activities, or it can be used to redefine activities, it can allow children to access activities that would previously have been impossible (Hockly, 2012). These frameworks will allow practitioners' practice to be examined more critically.

The pedagogical rationale is not explicit in the Statutory Framework handbook in England. It is possible that for educational technologies to have more of an impact on teaching and learning, curriculum documentation should address this. However, recently proposed changes to the early years curriculum appear to be going in the other direction, with references to technology being removed (Department for Education, 2018a, 2018b).

Conclusion

This paper has challenged the view that technology is being used in very limited ways in early childhood education. Technology appears to be more physically and culturally embedded than it was previously, but the self-reporting nature of this research means further research is needed into how it is being used in practice.

The final phase of the research described in this paper examined how technology is being used to enhance teaching and learning. It looked at the pedagogical rationale in more detail and used key theoretical frameworks, including SAMR and TPACK, to critique how technology is being implemented in early years settings. Findings from this phase will be published in a later paper (Authors, forthcoming).

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Tables and Figures

Tables

Figures

Tables

Table 1: What percentage of each device were broken?

	Broken - needs fixing	Broken - not needed	Total broken
Visualiser	2.70%	2.70%	5.41%
Music	4.59%	1.53%	6.12%
Audio Recorder	5.98%	0.54%	6.52%
TV	2.56%	5.13%	7.69%
Remote Controlled Car	7.77%	0.97%	8.74%
Video Player	3.64%	5.45%	9.09%
Metal Detector	7.14%	7.14%	14.29%
Walkie Talkie	16.00%	2.40%	18.40%

Table 2 Percentages of Universal and Non-Universal Technology

		All	Childminder	Setting	*Blackwell*
Universal - over 75%	Internet access	96.3	97.0	96.3	-
	Role play	92.5	91.4	92.6	-
	Digital camera	91.0	94.1	90.6	*92*
	Audio player	82.9	77.4	83.5	*21 (iPods / MP3)*
	Laptops	82.3	90.9	81.3	*See desktops*
	Programmable toys	81.5	62.5	83.6	-
	Tablets	79.3	78.8	79.3	*28*
	Desktops	78.0	48.3	81.1	*83 (laptop / desktop)*
	Remote control cars	64.6	68.8	64.1	-
	Audio recorder	62.6	44.8	64.5	-
	IWB	62.4	3.8	67.9	-
	Music	61.1	82.4	58.5	-
	Video camera	60.1	66.7	59.4	-
	Radio	50.6	78.1	47.6	-
	Mobile Phone	45.9	97.1	39.9	-
	Walkie talkie	39.3	45.5	38.6	-
	Video player	37.9	53.6	36.3	*79 (TV/DVD)*
	TV	37.0	88.2	30.9	*See video player*
	Microscope	33.0	40.6	32.1	-
	Gaming devices	30.6	71.0	25.9	*15 (iPod Touch)*
Non-universal - less than 30%	Visualiser	24.7	3.3	27.1	-
	Metal detector	18.5	16.1	18.8	-
	eReader	13.1	35.5	10.6	*15*

Table 3 How technology is being used by children?
1= daily, 2= 2-4 x a week, 3= weekly, 4 = monthly, 5 = occasionally

	N	Mean	Mode
Listen to stories / music	319	2.06	1
Practice literacy or numeracy	283	2.17	1
Stimulus material	287	2.29	1
Open ended programs	274	2.56	1
Celebrate achievements	245	2.67	1
Taking Photos	301	2.85	5
Search for information	243	3.04	5
Support SEN	229	3.05	5
Supporting Reflection	225	3.12	5
Show how to use	251	3.58	5
Take videos	207	3.77	5

Table 4 If a respondent does not use technology in this way, would they want to or is it 'not appropriate' (NA)?

	N	N Do not use	% Do not use	N Would like to	% Would like to	NA	% NA
Listen to stories / music	319	11	3.3	7	63.6	4	36.4
Practice literacy or numeracy	283	45	13.7	19	42.2	26	57.8
Stimulus material	287	37	11.4	12	32.4	25	67.6
Open ended programs	274	52	19.0	22	42.3	30	57.7
Celebrate achievements	245	74	23.2	38	51.4	36	48.6
Taking Photos	301	29	8.79	17	58.6	12	41.4
Search for information	243	82	25.2	13	15.9	69	84.1
Support SEN	229	82	26.4	29	35.4	53	64.6
Supporting Reflection	225	94	29.5	38	40.4	56	59.6
Show how to use	251	69	21.6	28	40.6	41	59.4
Take videos	207	110	34.7	51	46.	59	53.6

Table 5 How technology is being used by adults?
1 = daily, 2 = 2-4x a week, 3 = weekly, 4 = monthly, 5 = occasionally, 6 = never

	N	Mean	Mode
Recording Observations	325	1.92	1
Find	330	2.02	1
Planning	329	2.07	1
Assessment	319	2.23	1
Communication with colleagues	322	2.31	1
Displays	323	2.56	1
Professional development	323	2.86	1
Communication with multiple parents	324	3.01	1
Communication with individual parents	321	3.11	1
Publishing children’s work	320	3.32	1
Communication with children	314	5.01	6

Table 6 How is technology being used with children in your setting? How often is it used in this way?

1 = extensively, 2 = regularly, 3 = occasionally, 4 = not used

	N	Mean	Mode
Child initiated – with adult support	333	2.31	2
Child initiated – no adult support	330	2.32	2
Adult initiated – large groups / whole class	323	2.34	2
Adult initiated – 1 or 2 children	330	2.43	3
Adult initiated – small groups	331	2.49	3

Figures

Figure 1 How many devices do respondents have access to?

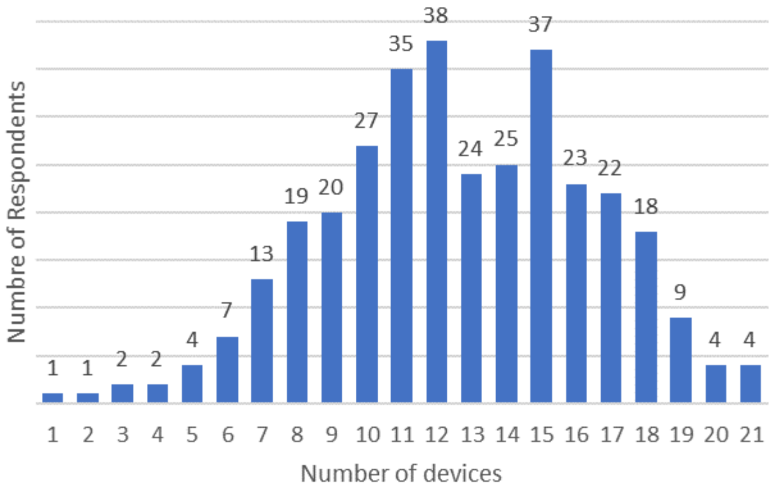


Figure 2: How often is each device being used?

(green = universal, red = non-universal)

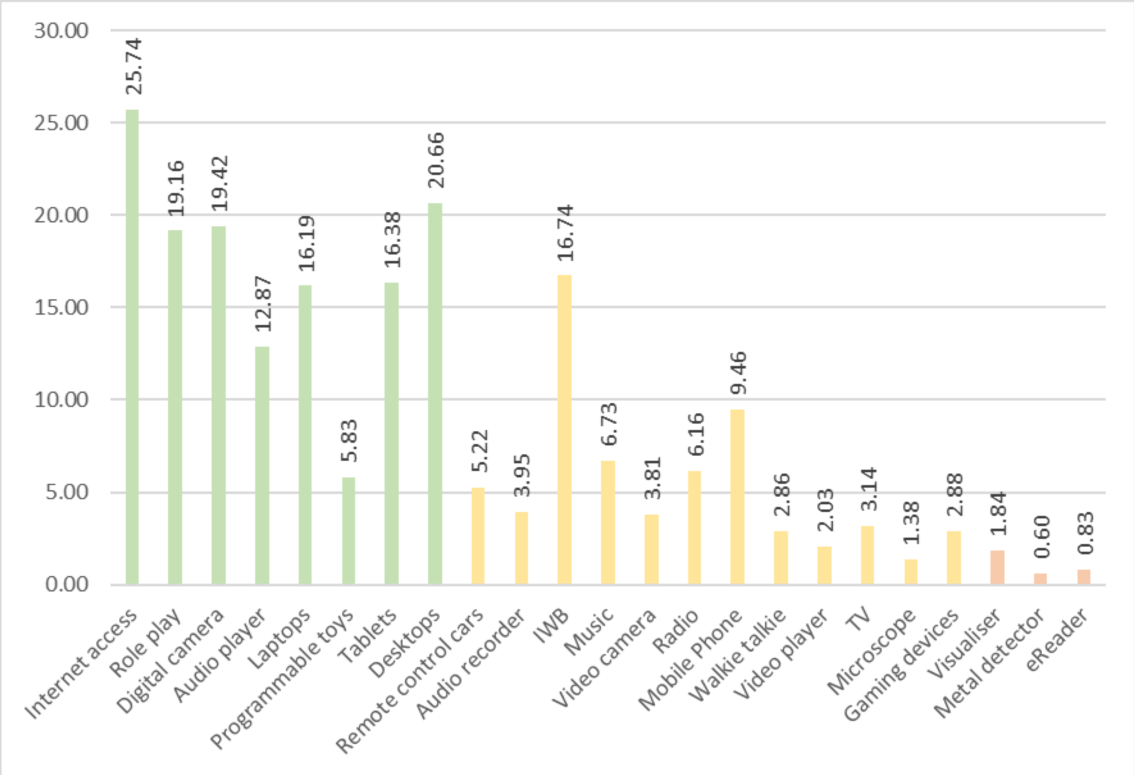


Figure 3 What sort of training have you had?

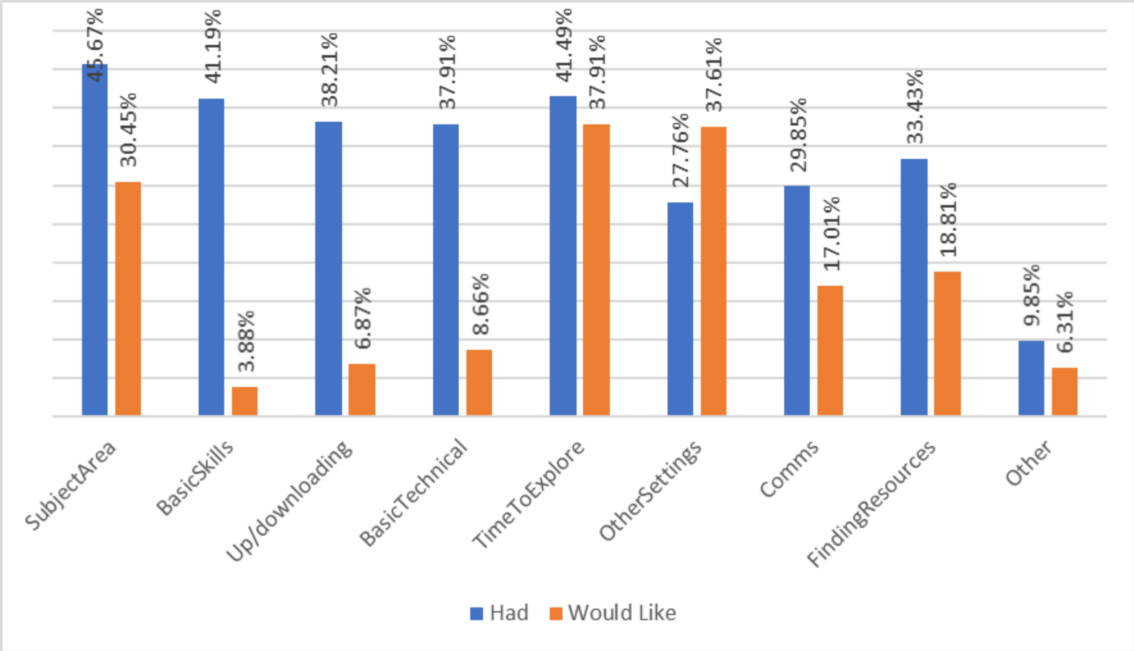
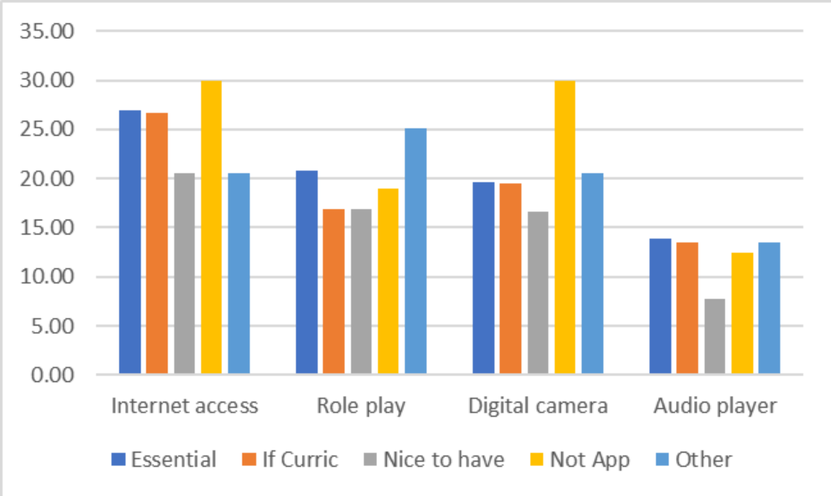


Figure 4 How often is a device used (depending on attitude)?



Appendix D. Cycle Three: Action Research

A. Invitation to participate

(email sent to LA advisors and individuals from previous stages of the research)

Dear

I am writing to invite your school to be part of a research project I am working on as part of my doctoral studies at Durham University.
I am putting together a group of practitioners to look at the use of educational technologies in the early years. The aim is for participants to share ideas whilst working on mini projects in their own settings. Any involvement should build on the work that is already happening in your setting and would not require much additional work.

I have a lot of experience of supporting the use of technology in schools, having worked as a consultant for many years. I will provide relevant training and support as part of the project. I am also expecting participating schools to benefit from the opportunity to share best practice with each other. I have attached some more information about what would be involved, please let me know if you have any questions.

I hope this project sounds like something you would like your school to be involved in, please let me know if you will be able to take part. I am expecting to hold the initial meeting of the group during this half term.

Best regards

Christine Jack

[redacted]

B. The use of Educational Technologies in Early Years Settings

(sent with invitation to participate)

My doctoral research is looking at how educational technologies are being used in early years settings and whether their use supports practitioners' philosophies of teaching and learning.

In the first part of the research, I am using a questionnaire to find out what is happening in early years settings: what technology do they have and what are they using it for (https://durham.onlinesurveys.ac.uk/edtechinearlyyears). The second stage will involve a small group of early years practitioners working together to conduct some action research.

These practitioners will be interested in how they can develop their use of technology to support teaching and learning. It is expected that the group will be made up of teachers with varying levels of skill and experience in the use of technology. Together we will identify a theme for the research, which may be different for each participant.

Possible themes include:

- Using technology to support parental engagement
- Using technology for assessment
- Using technology to support creativity

The group will meet to share ideas and plan a project that individual participants will implement in their own settings. I would expect these projects to match your setting's priorities and be linked to work you are already doing.

I will be able to provide support in identifying appropriate technology and training in how it can be used. After running the project for a while, we will come back together to evaluate the impact and share experiences. It is expected that the project will last for at least a year with a minimum of three group meetings. Details of these meetings will be agreed with you at the beginning of the project.

As well as group meetings, I would like to visit you to interview you about your current practice and observe the use of technology in your setting.

All data will be kept confidential. A report will be published, and I am planning to use my blog to share findings and information about the use of technology with other settings. Any reports or articles will not identify you or your setting.

If you are interested in participating in this research, I will ask you and your head teacher to sign a form to say you consent to take part in the project. If you decide to participate you will be free to withdraw at any time without any negative consequences.

If you would like to participate in the project or would like more information, please contact me at c.l.jack@durham.ac.uk or [redacted].

C Jack

The study is conducted by Christine Jack as part of her Doctoral (EdD) studies at Durham University. This research project is supervised by Professor Steven Higgins s.e.higgins@durham.ac.uk from the School of Education at Durham University.

C. What is Action Research?

(Information shared with group at the first meeting)

In schools, **action research** refers to a wide variety of evaluative, investigative, and analytical research methods designed to diagnose problems or weaknesses – whether organisational, academic, or instructional – and help educators develop practical solutions to address them quickly and efficiently. Action research may also be applied to programs or educational techniques that are not necessarily experiencing any problems, but where educators simply want to learn more about and improve. The general goal is to create a simple, practical, repeatable process of iterative learning, evaluation, and improvement that leads to increasingly better results for schools, teachers, or programs.

Action research may also be called a *cycle of action* or *cycle of inquiry* since it typically follows a predefined process that is repeated over time. A simple illustrative example:

- Identify a problem to be studied
- Collect data on the problem
- Organize, analyse, and interpret the data
- Develop a plan to address the problem
- Implement the plan
- Evaluate the results of the actions taken
- Identify a new problem
- Repeat the process

Unlike more formal research studies, such as those conducted by universities and published in peer-reviewed scholarly journals, action research is typically conducted by the educators working in the district or school being studied – the participants – rather than by independent, impartial observers from outside organizations.

http://edglossary.org/action-research/

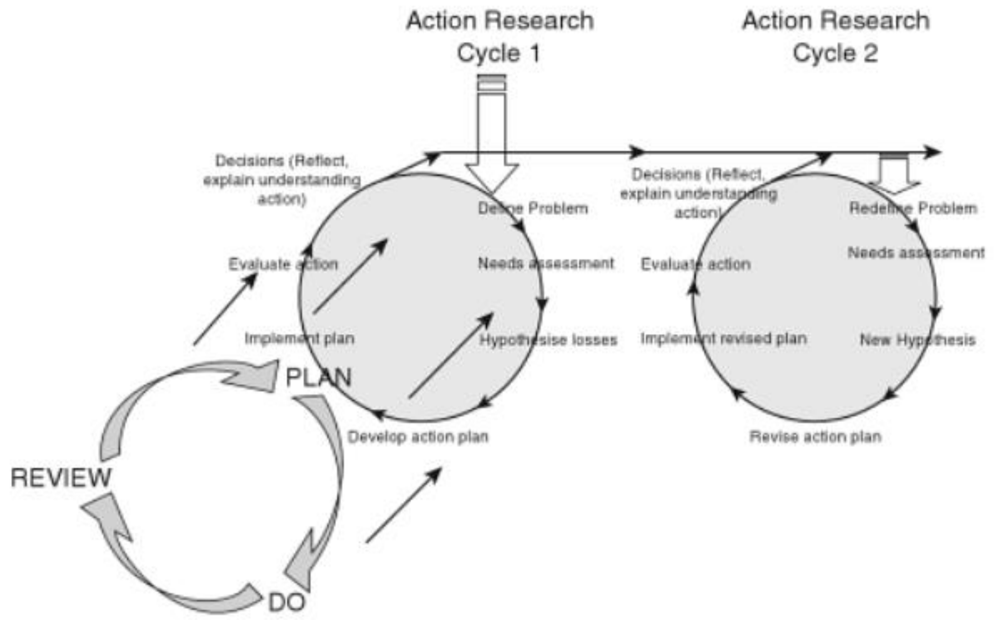


Figure 1.2 Action research cycles adapted from Kemmis and McTaggart (1988) as complementary to plan–do–review

Table 2.5 **Aligning Research Questions with a Range of Methods**

Question	Traditional research method	Data collected normally in schools	Data arising from teaching and learning	Data that can be incorporated into school routine
Will boys' attainment in writing (as assessed using teacher assessments) improve after using peer assessment?	Questionnaire to pupils to explore their perceptions of their learning and improvement in writing before and after peer assessment	SATs and complementary teacher assessments collected over the year and then compared to a mean achieved by previous year groups	Work samples from the group of target boys collected on a termly basis to look at the improvement over the year. Both teacher and pupil give comment as to how this improvement manifests	SMT observations of peer-assessment lessons focusing on target pupils and their approaches to writing-based tasks
Does the use of visual cues support the improvement of behaviour for pupils with ASD disorders in whole class sessions?	Interviews with the pupils' teacher and support staff exploring any perceived changes in behaviour and improvements in attention related to the use of cues	Individual pupil observations, an element of each individual pupil's IEP, which look at different behaviours and how often they occur – do lessons where visual cues are used reveal different/ improved behaviour?	Using a sorting activity based on a favourite book: can the pupils complete the task better when visual cues are added? Look at the pupil outcomes as well as the teacher perceptions	Incorporating the capture and analysis of video footage of pupils in whole class situations into support assistants' routine for monitoring individual pupil behaviours and for logging in/appropriate behaviours
Will using more open questions in class discussions improve the on-task behaviour of all pupils?	Structured observations of the pupils' contributions and behaviour in lessons where open questions are used and one not (could be based on video footage). Looking at on-task/off-task behaviour and length of utterance from pupils	Logs of negative and positive behaviour, e.g. how many merits achieved or how many sanctions administered, within each lesson. Does it improve when open questioning approaches are in use?	Using a thinking skills activity, e.g. a mystery, investigate whether the pupil–pupil discussion and the outcome is different in a class where open questions are used when compared to when where not. Look for pupil use of open questions	School-wide system of pupil observations exploring what makes a good lesson and what makes pupils engage with the curriculum content and with discussions. Findings fed back to whole school, teaching staff and pupils

Box 2.2

Starting points for enquiry

- I would like to improve …
- I want to change … because
- I am perplexed by …
- Some people are unhappy about …
- I'm really curious about …
- I want to learn more about …
- An idea I would like to try out in my class is …
- I think … would really make a difference to …
- Something I would like to do is to change …
- I'm particularly interested in …

Box 2.3

Examples of hunches moving to questions

Hunch	Change	Measure	Question
I'm interested in whether boys' writing will improve after peer assessment	Boys' attainment in writing	Through teacher assessment of writing samples taken through the school year	Will boys' attainment in writing (as assessed using teacher assessments) improve after using peer assessment?
I am thinking about using increased visual cues with pupils on the Autistic Spectrum	Improved behaviour from target pupils in whole class sessions	Use existing behaviour monitoring sheets as stipulated in Individual Education Plans	Does the use of visual cues support the improvement of behaviour for pupils with ASD disorders in whole class sessions?
I want to change the questions that I use in class as I feel that I am not meeting the needs of all pupils	Increased alertness and motivation in class discussions	Observations of on-task/ off-task behaviours	Will using more open questions in class discussions improve the on-task behaviour of all pupils?

Diagrams taken from:

Baumfield, V., Hall, E., & Wall, K. (2008). *Action Research in the Classroom*. London: Sage.

D. Action Research Project Planning Sheet

<table>
<tr><td colspan="3">Name:</td><td colspan="3">Setting:</td><td colspan="3">Class:</td><td colspan="3">Date:</td></tr>
<tr><td colspan="6">Focus (What problem are you trying to solve?):</td><td colspan="6">Outcome (What is your aim?):</td></tr>
<tr><td colspan="4">Action 1:</td><td colspan="4">Action 2:</td><td colspan="4">Action 3:</td></tr>
<tr><td colspan="4">Success Criteria:</td><td colspan="4">Success Criteria:</td><td colspan="4">Success Criteria:</td></tr>
<tr><td colspan="4">Timescale:</td><td colspan="4">Timescale:</td><td colspan="4">Timescale:</td></tr>
<tr><td colspan="4">Evaluation:</td><td colspan="4">Evaluation:</td><td colspan="4">Evaluation:</td></tr>
</table>

E. Participant Information Sheet

(shared with participants and head teachers at start of project)

Exploring early years practitioners' understanding of how educational technologies can be used to support teaching and learning

You are invited to take part in a research study into the use of educational technologies to support teaching and learning in early years settings. Please read this form carefully and ask any questions you may have before agreeing to be in the study.

The study is conducted by Christine Jack as part of her Doctoral (EdD) studies at Durham University. This research project is supervised by Professor Steven Higgins s.e.higgins@durham.ac.uk from the School of Education at Durham University.

The purpose of this study is to identify how educational technologies are currently being used in early years settings and whether current usage supports practitioners' general approaches to teaching and learning.

If you agree to be in this study, you will work with the researcher and other participants to plan, implement and evaluate the use of educational technologies in your setting. During the research, you will meet with the researcher and other participants and participate in interviews and observations. Details of these meetings and interviews will be agreed with you in advance. During interviews, audio recordings will be made to allow the interview to be transcribed for analysis. The researcher will take notes during the observations.

You are free to decide whether or not to participate. If you decide to participate, you are free to withdraw at any time without any negative consequences for you.

All responses you give or other data collected will be kept confidential. The records of this study will be kept secure and private. All files containing any information you give are password protected. In any research report that may be published, no information will be included that will make it possible to identify you individually. There will be no way to connect your name to your responses at any time during or after the study.

If you have any questions, requests or concerns regarding this research, please contact me via email at c.l.jack@durham.ac.uk or by telephone at [redacted]

This study has been reviewed and approved by the School of Education Ethics Sub-Committee at Durham University (date of approval: 27/5/15)

C Jack

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Telephone +44 (0)191 334 2000 Fax +44 (0)191 334 8311
www.durham.ac.uk
Durham University is the trading name of the University of Durham

Declaration of Informed Consent

- I agree to participate in this study, the purpose of which is to identify how educational technology is currently being used in early years settings and whether current usage supports practitioners general approaches to teaching and learning.
- I have read the participant information sheet and understand the information provided.
- I have been informed that I may decline to answer any questions or withdraw from the study without penalty of any kind.
- I have been informed that all of my responses will be kept confidential and secure and that I will not be identified in any report or other publication resulting from this research.
- I have been informed that the investigator will answer any questions regarding the study and its procedures. Christine Jack, School of Education, Durham University can be contacted via email: c.l.jack@durham.ac.uk or telephone: [redacted]
- I will be provided with a copy of this form for my records.

Any concerns about this study should be addressed to the Ethics Sub-Committee of the School of Education, Durham University via email (Sheena Smith, School of Education, tel. (0191) 334 8403, e-mail: Sheena.Smith@Durham.ac.uk).

Date Participant Name (please print) Participant Signature

I certify that I am the participant's head teacher/manager and that I have been informed about the participants' involvement in this study.

Date Name (please print) Signature

I certify that I have presented the above information to the participant and secured his or her consent.

Date Signature of Investigator

F. Settings

Table 48: Overview of Action Research settings

	Setting	Class:	Role/area of responsibility:	Age range in whole setting:	No. of children in whole setting[8]:	No. of children in EYFS:	No. of children in class:	No. of adults in class:	Catchment area: e.g. FSM, ethnic background	Deprivation Index [9]
1	Pre-school	Preschool	Preschool Leader / Manager	2 years 0 months - 4 years 10 months	30	30	30 - max 25 at any one time	2-5 depending on number of children	Rural village	50% least deprived
2	Nursery	Nursery	Teaching Assistant	2- 4 years	100	100	100	8	Mixed. 1 EAL, 5 FSM, 17 EY PP	20% least deprived
3	Primary School	Nursery	Class Teacher	3-11 years	125	55	30	2	Deprived	20% least deprived

[8] Rounded to nearest five

[9] http://dclgapps.communities.gov.uk/imd/idmap.html

4	Primary School	Reception	Class Teacher / ICT Coordinator	3-11 years	110	55	30	2	High FSM and PP, mostly white British	30% most deprived
5	Primary School	Nursery / Reception	Year 1 Teacher / EY Lead	3-11 years	430	140	Nursery 80/ Reception 60	Nursery 3 / Reception 4	90% white British less than 10% pupil premium	50% least deprived
6	Primary School	Nursery / Reception	EYFS Lead / Reception teacher	3-11 years	250	55	Nursery 25 / Reception 30	3 in reception 2 in Nursery	High FSM, EAL, high proportion of asylum seekers, 90% PP	10% most deprived
7	Primary School	Reception	Assistant Head / EYFS Lead	4-11 years	410	60	30	3	30% pupil premium	50% most deprived
8	Nursery	Preschool	Room Lead	12 weeks - 5 years	55	55	Average 35	ratio 1:8	Mixed	20% least deprived

G. Project plans

Setting 1

<table>
<tr><td colspan="3">Name: Setting 1</td><td colspan="3">Setting: Preschool</td><td colspan="3">Class: all – 2s-4s</td><td colspan="3">Date: 24 Jan 2016
Updated Feb 2017
Updated Oct 2017</td></tr>
<tr><td colspan="6">Focus (What problem are you trying to solve?):
Incorporating IT into everyday life of setting, to enhance whatever objectives are being focused on currently. In particular, to optimise use of android tablets with the children – which we already have, and to extend use of Tapestry, which staff and parents use, to include the children more – e.g. for reflection, recording</td><td colspan="6">Outcome (What is your aim?):
To have enhanced learning for children by:
• reflecting on their learning using Tapestry;
• increasing engagement by target children using variety of IT
• developing practitioner knowledge and confidence with identified apps and IT</td></tr>
<tr><td colspan="4">Action 1:
To learn more about apps/IT that could be used to enhance learning for focus areas during spring 2 of:
• communication and language – Speaking. Variety of levels, including SEND</td><td colspan="4">Action 2:
To use identified apps/IT to support some focus areas of learning in Spring 2 half term.
In particular:
• Use Tapestry with children to focus on both the visit by health visitors and Chinese New Year celebration.</td><td colspan="4">Action 3:
To form a list of apps/methods of using IT that can be used to enhance each area of learning, for use both by staff and by parents/carers where appropriate</td></tr>
</table>

• *Understanding world – People and communities* • *Maths – both number and shape, space measure*	• *Use tapestry with children in small groups/one: one to reflect on what have been doing and develop this into child-lead further planning* • *Use EasiSpeak microphone and Rainbow recordable pegs, and identified apps e.g. Quiver, to develop speaking skills in target children*	
Success Criteria: • *To have identified a list of apps/methods/products to try, and order products where necessary* • *For staff to be familiar with these*	**Success Criteria:** *To have observed and added to Tapestry observations and assessments of children:* • *using Tapestry on tablets to both reflect on learning and encourage speaking* • *using apps and IT resources to enhance focus areas of learning* *For staff to be confident in using identified apps and IT, and Tapestry with the children (feedback form) and leader review of staff observations on Tapestry plus discussion in staff meeting*	**Success Criteria:** *A resource produced as above for staff – keep in planning folder and on memory stick, as well as emailed to staff.* *For this to be used as part of brainstorming activity for medium term planning for summer 1 half term and ideas from it recorded on the medium-term planning* *Links to a variety of apps to be added to website, with information for parents/carers about how they can enhance children's learning.*

Timescale: *By end of half term break*	**Timescale:** *By Easter (end of March)*	**Timescale:** *By end of first week back after Easter hols*
Evaluation: TA has uploaded several apps onto androids Manager bought an easispeak microphone – not tried it yet	**Evaluation:** Have spoken to staff about using androids in small groups to look at Tapestry. Have done a bit. TA has uploaded Tapestry app on androids and has spoken at staff meeting about using tablets more. A little use of apps with children	**Evaluation:** Not yet done
Further evaluation: Oct 2016 **Continued learning:** extremely limited	**Further evaluation: Oct 2016** - have used Tapestry with children a little and have some observations of this. However, it has not generalised as I would have liked. a. all but 1 tablet is broken b. small group time was unsettled in summer term last year due to transition process and it being a particularly busy year with SEND	**Further evaluation: Oct 2016** No further forward.

	– and is still unsettled due to new starters c. It simply is not enough in staff minds as part of the process **d.** We have a high proportion of 2-3s as against 3-4s – it is harder to look at Tapestry in a small group, they need 1:1 or 2	
Action 2b - Christine has lent some items donated by TTS for us to experiment with – firstly some binoculars to record speech into as watch Secondly, a set of Talking Turtles, which record/play back a bit of speech plus are robust Option to borrow further items. - Manager asked Christine for advice on IT programmes for early mouse skills. Manager has now obtained a suggested programme. Christine also said she had links for free access online – although our connection on child computer is bad currently, could	**Action 2a** - Further staff discussion in staff meeting – add to agenda (19.10.16) - Better guidelines to small group times, including using easispeak microphone to pass around when sharing information/thoughts about day - Encourage Tapestry use during wraparound – this will hopefully increase staff confidence and awareness to spread use during busier times - TA to investigate mending the tablets with parent - husband's company donated them.	**Action 3a** - put request onto website for apps parent/carers like using with their children - add Christine's suggestions for links (get TA to try out first) to setting website. Ask parents carers to feedback if try them. (put on Tapestry!)

add these to website for parents/carers to use? - on googling about mouse skills, Manager came across LOGO – sounds interesting – try and find out more? - Make a graduated curriculum for introduction of/use of computer and programmes – will need much research and purchase of new computer – put to committee	- Manager plus other staff to think of specific activities to try with borrowed IT resources	
	Manager turtle activity 1– to encourage participation in action rhymes: adult to record action rhymes on to turtles. Take photos of the action rhyme stages. Put in drawstring washbag with number matching the turtle. Make ‘library’ chart listing which rhyme with which number by photo prompt. Child presses button to hear rhyme – hopefully joins in – can listen and repeat endlessly. Actions prompted by photos. More able children can arrange photos in order and select bag according to classification. Main	

	aim is to encourage speaking in 4 children who are behind/delayed, who are particularly drawn to action rhymes and/or buttons! **Manager activity 2 – to link visual number with auditory number word (1-5), and encourage counting, as well as listening and understanding at 2 WL:** Have a container of assorted items, 5 of each– e.g. 5 little cubes; 5 counting elephants; 5 pompoms; 5 cones; 5 conkers; 5 cars etc Have little drawers (I have 3 so far!) – put turtle in each draw (from 1 to 5). Child opens draw, takes out turtle and listens to message e.g. count 4 cars (if the 4 turtle) – then finds 4 cars in box and puts into drawer. More able children could record their own requests.	
Updating Feb 2017		
Evaluation		
(a) Some programmes bought to develop mouse skills as advised by Christine Jack. Children are enjoying them.	Made number drawstring bags to contain turtles with recorded number on to match	**No further forward. Will be in better position to act on this target area once have better equipment.**

TA has just bought a dongle to enhance internet with view to accessing online stuff (b) Haven't yet looked further into preschool programming skills curriculum much – though did see a course relating to this from googling around – didn't have time/money to attend now and will have to re-find! c) Still not fully explored resources lent	visual. Have tied Numicon piece to each. Have got no further yet. We are struggling with using Tapestry with children as our equipment not good enough to do effectively.	
Action	**Action**	**Action**
a) Refer TA to Kaleidoscope site for links to online resources as suggested (done 9.2.17) b) Look into again – probably not till after Easter due to backlog of things to do c) Get on with it! Get out binoculars and easispeak microphone at next staff meeting and re-acquaint explore and discuss use, plan in in relation to current targets	A parent (along with myself) is going to do sponsored coast to coast bike ride to raise money for: 2 iPads apple TV box TV screen and arm to mount it Speakers With view to • better use Tapestry in small groups • access good apps on iPads which can then make bigger for group use • better access music (Boogiemites) for use in phonological awareness groups	Realistically, no action until Sept/Oct 2017, when should re-evaluate in relation to new equipment.

	and other times One room to access through apple TV, other through speakers and 2nd iPad. We are using an old iPod shuffle of TA to access music tracks – this is a major step for manager! Much better quality and less likely to lose CDs.	

Updating Oct 2017

1. Successful sponsored bike ride in May raised enough funds for 2 second hand iPads, protectors, and 2 apple TV boxes. Also donated 2 flat screen TVs. These were bought over summer. Only just got screens mounted and apple TVs connected to screens.
2. Our Boogiemites programme music is now on iPads and successfully being used in one room – need to start in other too, so running 2 small groups simultaneously.
3. Have added some of apps that have been suggested in various courses and this group over last 2 years. Also, Tapestry app.
4. Staff starting to look at Tapestry on the big screens at various times. Not generalised yet – not really part of everyday routines
5. Younger staff are taking the iPads on board and using – "taking ownership" – lots potential – need to ensure used in right way, and that children not becoming obsessed
6. Other gadgets not really used at all. Still would like to explore easispeak microphone more.
7. Our new planning system uses a focus week for each child per term, with a follow up meeting with parents, and also parents encouraged to contribute photos from home to that process
8. Apps recommended by Portage worker have been added for targeted use

Next actions:

1. To promote using Tapestry more – both with individual children and in groups

In particular, to share a child's focus week obs and photos from home both with them individually and with group

Make children themselves much more aware they are 'focus' child, and that part of this process is to use Tapestry to share about themselves and their home life.

2. To re-visit easispeak microphone
3. To use Tapestry to link with home in more general communicating what we have done this week way.

Setting 2

Name: Setting 2	**Setting: Nursery**	**Class: nursery**	**Date: 25/1/16**

Focus (What problem are you trying to solve?)**:**	**Outcome** (What is your aim?)**:**
• To use ICT to support children’s role play and to get the children to document their own learning	• To further the children’s learning via ICT

Action 1:	**Action 2:**	**Action 3:**
• To use ICT to support children’s role play experience an	• To support the children in documenting their own learning	
Success Criteria: • Using interactive whiteboard to pretend to be on a plane and train	**Success Criteria:** • Providing iPads, children documented pictures of projects and themselves	**Success Criteria:**
Timescale: *5 months*	**Timescale:** *5 months*	**Timescale:**

Evaluation:	**Evaluation:**	**Evaluation:**

Setting 3

Name: Setting 3	Setting: primary school	Class: Nursery class	Date: 28/1/16

Focus (What problem are you trying to solve?)**:**	**Outcome** (What is your aim?)**:**
• We are trying to provide/increase our ‘two-way flow’ home – school links • To enable staff to use their time more effectively • To provide staff with the technology to create and develop a more accurate learning journey for individuals and whole class including video footage • To begin to use the Seesaw learning journeys as an assessment tool linked to Development Matters • To begin to use Seesaw to begin to analyse gaps in evidence	• To set up and create electronic learning journals using Seesaw. Providing a regular two-way flow between school and home.

Action 1:	**Action 2:**	**Action 3:**
• Increase knowledge of parent and staff friendly ICT. • Discover which programmes (apps) would be fit for purpose	• Entre class and set up children’s virtual learning logs • Start inputting evidence of learning (1st half term)	• Meeting with parents to discuss how to access and use Seesaw
Success Criteria: • School password to enable downloads • Meet with advisor to discuss possible apps (app training)	**Success Criteria:** • Meet with advisor 3rd Feb to discuss possible solutions to problems using Seesaw – iPad storage, ICT equipment	**Success Criteria:** • Letter to parents • Meeting to inform parents

	• Acquire appropriate ICT equipment for all staff to	
Timescale: *3 weeks*	**Timescale:** *Half a term – 6 weeks*	**Timescale:** *1st week after half term*
Evaluation:	**Evaluation:**	**Evaluation:**
Action 4 Download Seesaw a free app created to share students learning profiles on school iPad	**Action 5** To come up with solutions to identified challenges with using Seesaw not enough staff iPads. iPads need more memory	**Action 6** Work with advisor to create files linked to Development matters which I can place the children's work into
Work with Advisor to increase my confidence and knowledge of the possible uses of the app	Meet with head teacher to discuss purchasing on leading more iPads with greater storage	Meet with advisor in PPA time and create files for my electronic class
Timescale: Twilight session with year one staff	**Timescale:** January approx. 2 weeks	**Timescale:** PPA one to create files and the next four to file work
Evaluation: Advisor was able to demonstrate how to download the Seesaw app – and showed how other settings are using them to support teaching and learning in the class.	**Evaluation:** Using the technology of Seesaw has impacted hugely on how staff record the children's learning journeys. Advantages of using technology to support staff observations. As staff we would spend	**Evaluation:** I think this app has a lot of potential and I think it offers a whole new dimension to our setting and the documentation of our observations and record keeping. Potential challenges:

This session empowered me to create a class log in and begin to upload children's work electronically	hours cutting out photographs of the children engaged in learning and stick them into individual books. Seesaw means staff can use their time much more efficiently	• As the system is new, providing time for myself and staff to up skill is proving a little tricky • Backing up our evidence files how can we do this… if for some reason the school ICT failed and we had a visitor such as Ofsted can we still gain access to class evidence?
Action 7 Open Seesaw electronic class to parents and carers	**Action 8** Work with LA advisor to teach the nursery class in small groups and in small steps to use Seesaw to record their own work	
Parents meeting in new environment	Work with LA advisor	
Timescale: After Easter holiday 2nd half of Spring term – this would or could have been sooner but due to the staff work load and moving to new school it would be more appropriate after the move	**Timescale:** Sumer term – children to be taught how to use the iPad to take photographs and load them up to Seesaw	
Evaluation:	**Evaluation:**	**Evaluation:**

Setting 4

<table>
<tr><td colspan="3">Name: Setting 4</td><td colspan="3">Setting: Primary</td><td colspan="3">Class: Reception</td><td colspan="3">Date: 4/1/16</td></tr>
<tr><td colspan="6">Focus (What problem are you trying to solve?):
Lack of evidence of child-initiated learning</td><td colspan="6">Outcome (What is your aim?):
To have more examples of child-initiated learning.
To show ‘the children’s voice’</td></tr>
<tr><td colspan="4">Action 1:
Introduce children and parents to Seesaw app</td><td colspan="4">Action 2:
Teach children how to take photographs using the iPad and link to Seesaw account</td><td colspan="4">Action 3:
Allow children opportunities to use the iPads during Free flow sessions to record their own learning and attach it to their Seesaw account</td></tr>
<tr><td colspan="4">Success Criteria:
Show children their Seesaw accounts and explain what Seesaw is
Organise and run parent Seesaw sessions with support from Laura Dickinson
Monitor parent uptake and arrange subsequent sessions in order to gain as much parent access as possible</td><td colspan="4">Success Criteria:
Ensure all children know how to take a photograph using the iPads
Teach children how to access Seesaw using the class QR code
Use ICT lessons to teach children how to access Seesaw, take a photograph and attach it to their account</td><td colspan="4">Success Criteria:
Ensure children know how to access class Seesaw account and attach photograph to their own account
Encourage children to think about examples of learning which they would like to include on their accounts
Allow children opportunities to use the iPads to record examples of</td></tr>
</table>

		their own learning and attach to their accounts
Timescale: To review parent access at February half term and look at ways to engage more parents during Spring 2 if necessary	**Timescale:** All children to know how to access Seesaw and attach a photograph to their account by Easter	**Timescale:** All children to have attached at least 3 pieces of child-initiated learning to their accounts by the end of the year
Evaluation: All FS2 children know what Seesaw is. 12 out of 27 FS2 parents are connected to their children's accounts (33% of parents across school as a whole). Parents who are not yet connected will receive a handout explaining what Seesaw is along with their child's unique QR code and instructions on how to create an account at the Spring Term parents evening.	**Evaluation:**	**Evaluation:**

Setting 5

<table>
<tr><td colspan="3">Name: Setting 5</td><td colspan="3">Setting: Primary</td><td colspan="3">Class: Reception</td><td colspan="3">Date: Spring term 2016</td></tr>
<tr><td colspan="6">Focus (What problem are you trying to solve?):
Lack of evidence of pupil self-reflection in their learning</td><td colspan="6">Outcome (What is your aim?):
An evidence bank of independent, reflective learners</td></tr>
<tr><td colspan="4">Action 1:
Introduce iPads as a recording device of learning and not for solely app-based activities
Moe the effective and purposeful use of iPads as a recording device to evidence children’s learning from a child’s POV
Introduce the responsibility to one child/day over the term as a researcher
Embed the culture of reflection at the end of a session with the focus on reflections on learning</td><td colspan="4">Action 2:
Continue to model effective use of iPad as a recording device
Share evidence on the Apple TV wherever possible to raise engagement at carpet sessions
Include more video within focused evidence as opposed to photos in order to catch the child’s voice
Encourage the children to question their peers when videoing</td><td colspan="4">Action 3:</td></tr>
<tr><td colspan="4">Success Criteria:
iPads introduced as a reflective tool
teacher to model what is purposeful and effective recording</td><td colspan="4">Success Criteria:
Evidence of video on iPad during shared reflection time
Evidence of questioning in video</td><td colspan="4">Success Criteria:</td></tr>
</table>

• embed routine of one child a day as a researcher/recorder • Regularly reflect on learning that happened in session in plenary	• Increased % of children at expected or exceeding for Technology and C&L GLD at the end of the summer term	
Timescale: End of spring term	**Timescale:** End of summer term	**Timescale:** TBC
Evaluation: Children are now confident in using the iPad as a recording tool and have a growing understanding over what is ‘valuable’ evidence of learning. They are becoming more reflective in their plenary sessions and have a growing confidence in talking about their own learning and the learning of others. Children are becoming increasingly confident when talking in front of a group about their learning and have become more comfortable with sharing reflective ‘criticism’ from their peers and taking on board advice for improvements. Having a rota for one child/day proved problematic at times as they were getting a sense of only their learning and with the necessity of working in different groups and the willingness of the child to be the	**Evaluation:** TBC	**Evaluation:** TBC

‘researcher’ for the full day fluctuating greatly, we have moved towards it being a shared responsibility. This way children engage with the task for as long as they are motivated by it and the task then passes to another child equally motivated. Children share their reflections and we get a wide range of evidence.		

Setting 6

Name: Setting 6	**Setting: Primary**	**Class: Reception**	**Date: 26/01/2016**
Focus (What problem are you trying to solve?)**:** **Our children are reliant on tablets, phones and other instant technology. A lot children have little verbal interaction at home on an evening/weekend.**		**Outcome** (What is your aim?)**:** **To improve communication and language with ICT equipment**	

Action 1: Source and identify equipment needed to support our school ICT programme of study (Rising Stars)	**Action 2:** Identify opportunities where ICT equipment can be used between children to promote a communication/language opportunity.	**Action 3:** Identify and use equipment to enhance the indoor and outdoor environments.
Success Criteria: -Teachers and support staff can implement the new curriculum with ease. -There are a wide variety of resources which can be used. -The children can cooperatively use the resources within the environments.	**Success Criteria:** -The children support their work with the use of ICT. -The children support each other with their use of ICT and they collaboratively work together. -The children use ICT enhancements on interactive displays.	**Success Criteria:** -The children use appropriate equipment indoors and out. -They use ICT in addition to other resources.
Timescale: 1 year	**Timescale:** 1 year	**Timescale:** 1 year

Evaluation: <u>Term 1</u> KG has broken the computing curriculum into 2 separate programmes of study for Nursery and Reception. This has then been broken down further into medium term plans. We then audited the resources available and created boxes which could be used then be used for each year group. KG has then worked with the ICT lead and identified suitable resources which we need to complete the resources needed for the programme.	**Evaluation:** <u>Term 1</u> KG has tweaked weekly plans to identify opportunities for ICT enhancements. Enhancements are being introduced slowly to allow them to be embedded. KG has introduced the talking pegs, talking magnifying glasses have been introduced in Nursery. We have used them on displays and the children are enjoying being interactive with them.	**Evaluation:** <u>Term 1</u> KG has sourced robust outdoor area equipment for ICT. This will have to be purchased over a number of years. Initially robust outdoor remote-control cars have been purchased with traffic lights. We also have ‘tuff cams’ which can be used both indoors and out.

Setting 7

Name: Setting 7	**Setting: Primary**	**Class: Reception**	**Date: Jan 2016**

Focus (What problem are you trying to solve?)**:** Developing communication with LA children.	**Outcome** (What is your aim?)**:** To encourage LA (including those with specific SEN) children to talk about and reflect on their learning.

Action 1: Look at apps and resources available for age range designed to aid communication. (Keezy, Quiver, Puppet Pals)	**Action 2:** Train children to use cameras and microphones on iPad. Possibly use older children.	**Action 3:** Introduce apps to key group time to use as discussion point or writing prompt.
Success Criteria: To use one of the apps during literacy to support speaking for writing.	**Success Criteria:** Children to unlock device and use camera and video independently.	**Success Criteria:** Children to use their recordings as a prompt for reflecting on their activities.
Timescale: Apr 2016	**Timescale: Feb 2016**	**Timescale: Apr 2016**

Focus (What problem are you trying to solve?)**:**	**Outcome** (What is your aim?)**:**

Evaluation: MA children using Keezy to record sentence to support their writing. This has helped the children who are able to write but forget	**Evaluation:** Some issues with iPad availability meant we had limited iPads and time for children to	**Evaluation:** Children are keen to access the iPads and are beginning to negotiate taking turns. They are keen to support others but often

where they are in the sentence. It has also developed their confidence and independence when writing as they can access activity without adult support.	use. However, now they are all able to use the camera and video apps independently.	take over instead. Initially, children took lots of funny videos and selfies rather than 'learning.' Now children are beginning to think about when to use the iPad to share their work. **Next step: Evaluate pictures and videos. Discuss why they think this is good learning and what their next step could be.**

Setting 8

<table>
<tr><td colspan="3">Name: Setting 8</td><td colspan="3">Setting: Nursery</td><td colspan="3">Class: Preschool class</td><td colspan="3">Date: July 2016</td></tr>
<tr><td colspan="6">Focus (What problem are you trying to solve?):
• Incorporating technology into the pre-school room</td><td colspan="6">Outcome (What is your aim?):</td></tr>
<tr><td colspan="4">Action 1:
• Encouraging the children to use the ICT equipment
• Supporting the children’s learning</td><td colspan="4">Action 2:
• See how the children have developed when using the ICT equipment</td><td colspan="4">Action 3:
• Identify appropriate technology – see what equipment is out there</td></tr>
<tr><td colspan="4">Success Criteria:
• Support the children using ICT equipment such as Bee bots, cameras, videos</td><td colspan="4">Success Criteria:
• December cohort
• March cohort</td><td colspan="4">Success Criteria:</td></tr>
<tr><td colspan="4">Timescale:
3 months</td><td colspan="4">Timescale:
3 months</td><td colspan="4">Timescale:</td></tr>
<tr><td colspan="4">Evaluation:
Children enjoy using new ICT equipment especially the keyboard – recorder</td><td colspan="4">Evaluation:
Children have made progress in technology – as you can see from the data</td><td colspan="4">Evaluation:</td></tr>
</table>

H. Prompts for reviewing projects

- What did you do?
- What problem are you trying to solve?
- Why are you trying to solve this problem?
- Why did you do it the way you did?
- What worked – why?
- What didn’t work – why?
- Could it work elsewhere?
- What could stop it from working?
- What will you try next – why?
- How will you know if it works?
- What evidence do you need to continue?
- What evidence do you need to stop?
- Does it support your teaching and learning beliefs - how?
- Would you recommend it to others - why?
- What impact has it had – on you?
- What impact has it had – on the children?
- What impact has it had – on other staff?
- What impact has it had – on parents?
- What technology did you use?
- Would any other technology be useful?
- Could you do it without technology?
- What do the children do?
- What support do the children need?
- What support do the other staff need?
- How did you introduce the technology?
- What barriers/challenges have you faced?
- What do the adults do?
- Do you have concerns about the technology?
- How does it fit with your normal practice?
- Do you have any questions you want answers to?

- Do you need any training or support?
- What role does the technology play?
- Is the research project different to training?
- Have you introduced any rules for using technology?
- Would other people be interested in your research?
- What help would you like from the group?

I. Meeting Notes

After each meeting of the project group, the transcripts were written up for data analysis. A summary version was also shared with the group. Four anonymised examples are included here.

These were also shared through my blog.

Notes from Action Research Group meeting November 30th, 2015

This blog post is a summary of the first meeting of the Action Research Group. This was an opportunity for the participants to get to know each other and to discuss the project. The participants come from a range of early years settings and include a play group leader, nursery teachers from stand-alone nurseries and teachers from nursery classes, reception classes and a year 1 class in local authority schools.

Participants had been asked to share something from their class that they felt was a good indication of their approach to teaching and learning. While they were not restricted to discussing technology, a number of the participants chose to do so.

The group identified a number of key words and phrases that reflected their approaches:

- Child-centred
- Promoting independence
- Purposeful activities
- Challenging the children
- Supporting assessment
- Encouraging reflection and discussions about how they, the children, learn
- Creativity
- Giving children a voice

Examples of activities included:

- Using apps to get children enthusiastic and wanting to write – YAKit and Quiver
- Using apps and devices to support speech and communication – Dinosaurs, Keezy and Walkie Talkies
- Recording children's learning with Floorbooks, photographs and video
- Supporting children to reflect on what they have done and, on their learning,
- Using apps to support a learning challenge curriculum – Morpho

- Supporting learning outside the setting
- Using email to engage parents
- Children using broken technology, taking it apart, writing about what they would make with it

I will be writing about each of the apps mentioned in future blog articles.

Using technology in early years

In order to join the project, participants had to be interested in developing the use of technology in their setting, so it is not surprising that all of the participants felt that technology could support teaching and learning in their setting. They felt that it could be used anywhere and to support the whole curriculum, but they believed that the technology should not be the most important thing, it needed to support the learning objectives. While it was seen as a resource that could be integrated across the setting, there was also a view that sometimes it was necessary to have discrete ICT lessons, either to teach children how to work devices or software, or to teach them rules about how to look after them.

Barriers to using technology in early years

The group identified a number of barriers:

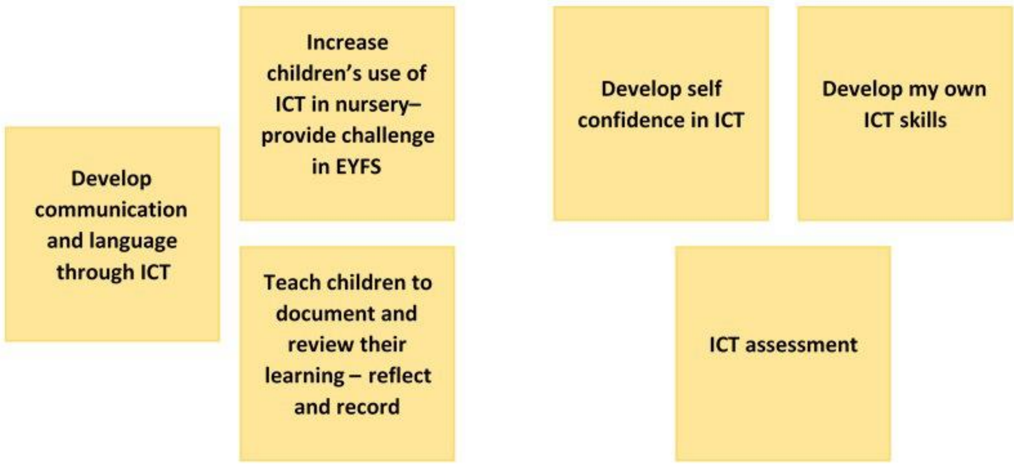
- Access to resources – participant come from different settings and not all of them had access to much technology
- The cost of resources
- Technology can be broken easily
- Technology can be seen as a novelty, it needs to become an everyday resource
- Lack of knowledge about what is available and how it can support teaching and learning
- Parents may be reluctant to engage with technology. In one setting they were reluctant to look at children's work on iPads, but enjoyed looking a Floorbooks
- Having time to train children and staff to use technology purposefully
- Managing resources that are not available all the time
- Technical problems e.g. problems with accessing Wi-Fi

In an ideal world, the practitioners would like:

- More equipment, especially iPads, so that it was available all of the time and not seen as a novelty or something to fight over
- Video cameras, or other devices that could record children's activities and support communication and language
- Access to an ICT expert who could help them develop their knowledge
- Tools to support parental engagement and communication to help practitioners know what children are doing at home, and to share information with parents about what children had done in the setting – e.g. Tapestry, Seesaw

Expectations about the project

After a short discussion about Action Research, the group discussed what they hoped to get from the project. Each participant talked about the aims they had for themselves, and for their setting.



Notes from Action Research Group meeting January 28th January

I am writing up notes from the meetings at https://kaleidoscopeforlearning.wordpress.com. these notes are a combination of the blog post and other notes of the discussions.

Recap on previous meeting:

- brief notes are available on the blog, these notes were shared and people were asked whether any corrections or additions were needed, there weren't any
- consent forms now received from everyone
- do settings want to be named? have links from my blog? I will discuss this with people individually
- participants completed a settings information sheet to ensure I had consistent information
- future emails to be sent a whole group and emails shared
- overview of previous research including initial visits, the group wanted to be sent a copy of this, and the survey.

All settings completed a form to ensure I have relevant information for each setting including websites/twitter

I have talked to a lot of early years practitioners as part of my research. They often say that they don't really know what resources are available or how they can be used in their setting. At the action research group meeting in January we went to a CLC. As well as being a great venue, they gave use access to their collection of resources. The group was able to play with the resources and share ideas for how they could be used.

We also had copies of a great little booklet produced by School Improvement Advisors. Produced for TTS this is more than the usual catalogue. Alongside each resource there are ideas and suggestions for how it could be used (you can see the sort of thing it contains on the TTS blog). The group used this as inspiration and tried to come up with suggestions for some of the resources they saw. I will be posting separately about the resources we discussed.

The resources the group especially liked included:

- **Bluebots** – can use these with a free app which allows the programming to be seen, app links to mats. Would need to replace existing bee bots. Problem with the youngest children who just want to push the bee bots around, which can damage them.
- **Bee-Bot apps**
- **Recordable Pegs** – useful for sequencing stories, hanging up pictures that were painted in response to music which is recorded on the peg, setting challenges in different areas
- **Dinosaur app** – discussed last time
- **Quiver app** – discussed last time
- **Easi-speak microphones**
- **Talking turtles**
- **Role play** resources e.g. Drs set, traffic lights
- **Big Track Supermouse** – a large mouse that would be easier for young children to manage than a traditional mouse.
- **Big buttons** – could be used outside

There were some resources that they did not think would be appropriate, reasons included:

- too easy to damage or chew
- too noisy for a busy classroom
- hidden charges e.g. having to buy recordings of stories on top of an audio device
- practical considerations e.g. how easy it was to charge devices and whether the children would be able to do this independently, audio devices which pick up

too much background noise, and how easily young children with small hands would find it use the device

The group agreed to share information about resources they had in their settings, this will be published on the blog. Things that were mentioned during the discussion were:

- **Easi torches** – though these can take a long time to charge, an alternative is squeezy torches that children can charge themselves, the more you squeeze it the more the light comes on would be good to talk to children about power and batteries and how much effort is needed
- **Hudl 2** was recommended but have been discontinued – some settings have got reconditioned ones from Tesco Direct
- **QR codes** – used for interactive displays
- Using **websites/ blogs/twitter/emails** to share resources and activities with parents Setting 3 described how she was using **Seesaw**, which was mentioned at the last meeting. She planned to use this as the focus for her project. Setting 4 and Setting 7 were also using it. Seesaw is a free digital portfolio – http://web.seesaw.me

I'll do some longer notes on Seesaw to capture the groups questions/discussion

Project Outlines

The group also discussed their plans for their individual projects

Setting	**Focus**	**Actions**
1 Preschool	Incorporating technology across the setting	Identify appropriate technology, including apps, to be used in different areas across the setting Linking technology to identified key areas of learning (linked to assessment) Use Tapestry to record and monitor the use of technology
2 Nursery	Incorporating technology in the two-year-old room	Get children using technology Identifying what the options are/what is appropriate Ensuring the use of technology with two-year olds is differentiated from that used with the three and four-year olds

3 Primary School (Nursery class)	Improving two-way flow between setting and parents. Giving children a voice in their own learning and being able to share this with parents.	Introduce Seesaw app to children and parents Using Seesaw as an assessment tool Reviewing practical implications of using the app and how it will impact on resourcing needs
4 Primary School (Reception Class)	Children recording and reflecting on their own learning. Giving children a voice in their own learning and being able to share this with parents	Introduce Seesaw app to children and parents Children using iPads to take photos/draw pictures and add them to their own account
5 Primary School (EYFS)	Not at meeting, have notes from email Using technology to improve communication and language	communication and language reflecting on learning
6 Primary School (Reception Class)	Using technology to improve communication and language	Review existing technology Reviewing scheme of work to identify activities for nursery and reception classes and appropriate resources (Not focusing on iPads, children are using them a lot at home)
7 Primary School (Reception Class)	Supporting children to document and reflect on their own learning	Using Seesaw and printed books, they can serve different purposes and have different benefits Using QR codes Taking photos and videos Pupils further up the school working with nursery children to train them in using the iPads

Next Meeting

Dates were arranged for individual visits – I will contact people individually to confirm.

The next meeting will be held at a **CLC on April 21st 2 – 4 pm**. There will be an opportunity to look at some of their resources including those suitable for SEN.

Actions

- CJ to send write up of initial visits to group – done
- CJ to continue to add information about resources to blog
- All to share information about good resources, websites and apps
- A to share list of apps from North Tyneside Learning Trust – done

- All to complete planning document and share by email or at visit
- CJ to contact settings to arrange individual visits

Notes from Action Research Group Meeting April 21st 2016

Present

Apologies

Input from LA

Squishy Circuits

The LA Advisor introduced the group to Squishy Circuits These are made from play dough and allow children to explore electronic circuits.

Information about the recipes and how they can be used are on the blog

https://kaleidoscopeforlearning.wordpress.com/2016/05/18/squishy-circuits/

The Mystery Machine

The advisor also described a project she had run across a primary school. She created a machine made up of a number of different switches, knobs and lights.

Children in early years ‘found’ the machine but didn’t know what it would do. After exploring the different elements, they decided what they thought the different buttons and switches might do and created an instruction manual.

The machine and manual were then passed up the school. Children in Year 1/2 wrote algorithms that would make the machine do what the early years children wanted. It was then sent up to year 3/4 who programmed the algorithms using Scratch. It then got passed on again to year 5/6 who used Raspberry Pis to make the machine work. It was then sent back to the early years for testing. This reflected the real-life circular project development process. The advisor explained it was ok to tell the early years class that what they wanted wasn’t possible and ask them to change their ideas.

Computational Thinking in Early Years

https://kaleidoscopeforlearning.wordpress.com/2016/05/18/computational-thinking/

The advisor explained the language that will be used in KS1 for computing and how this matches much of what happens in early years. Computational thinking is not about technology, but about problem solving. The above image comes from Barefoot Computing: http://barefootcas.org.uk/barefoot-primary-computing-resources/concepts/computational-thinking/

Concepts:

- Logic – building on what they know, what do you know, what can you tell me
- Algorithms – doing anything step by step to get to an end point, learning routines and systems, following instructions, creating a flow chart to follow
- Decomposition – big problem solving, break it down into little steps
- Pattern recognition – repeating patterns, spotting patterns
- Abstraction – getting rid of details that you don’t need, focus on what’s important
- Evaluation – reflect on what they have done, how to make it better, how to change it for some people to make sure they can do it too

She showed us the gestures she used to represent the concepts:

- Logic – tap top of the head
- Algorithms – use fists to go up steps
- Decomposition – break a stick
- Pattern recognition – fist over fist to show pattern
- Abstraction – like Dumbledore taking something out of their head
- Evaluation – tick on your hand

The group recognised that they were doing a lot of this already. They felt that these concepts could be useful when explaining to other staff, and especially those that were not early years specialists, what their children were learning.

Educational Technology Resources

A second advisor shared a number of different resources that could be used to support teaching and learning in the Early Years. Details are on the blog:

https://kaleidoscopeforlearning.wordpress.com/2016/05/19/more-edtech-resources-to-support-early-years/

There was a discussion about the value of children exploring how things work rather than being shown how to use them. This is supported by some research:

https://kaleidoscopeforlearning.wordpress.com/2016/05/12/exploration-versus-direct-teaching/

Setting 2 brought some Talking Turtles to share. Children can use these to record their voices and they can be used in the sand or water tray.

Using Social Media in Early Years settings

Setting 2 asked about setting up a Facebook account for her nursery.

2nd advisor talked about settings she had supported to do this. It is a very powerful tool and can help to engage hard to reach parents. There are a number of things to consider and the group thought it would be useful to get some advice on this.

It is important that social media is not managed by a single member of staff. It needs to be 4 people who are regular uses of social media, so they can respond quickly to new posts. There are a number of accounts that are worth looking at and organisations that provide advice links were shared:

Update on research project
LA Early Years Conference

I presented an overview of our research and shared some information about a range of resources. Information about these are on the blog. One resource that has proved very popular is Our Story. This was created by the Open University and is supported by research. Children, practitioners and parents can create a story by adding sound and text to digital pictures. The story can then be read, printed or shared with other people. The app is available free on iTunes and GooglePlay.

https://kaleidoscopeforlearning.wordpress.com/2016/03/09/our-story/

How is Educational Technology being used in Early Years settings?

The write up of my visits to 20 settings in the North East has been submitted to a journal. It has been updated in response to their feedback and resubmitted for publication.

Survey

After the initial visits I conducted an online survey which asked:

- How are early years settings using educational technologies?
- What are the advantages and disadvantages of using technology with young children?
- How does the use of educational technologies fit with practitioners' beliefs about teaching and learning?

I am currently analysing the responses. I would find it useful if members of the research group who have not previously filled it in could do so. There are some questions you can skip, and I have highlighted these.

I have given out paper copies or it can be accessed online at

https://durham.onlinesurveys.ac.uk/edtech-survey-action-research-group

Action Research

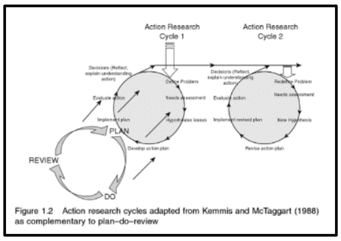
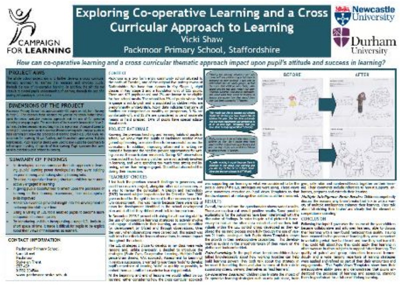


Figure 1.2 Action research cycles adapted from Kemmis and McTaggart (1988) as complementary to plan–do–review

Each setting is at a different stage of the research process.

Writing up action research



Later on in the project it would be useful to share outcomes of the research with other practitioners. This means we need to think about how we can write them up and what evidence we can gather to demonstrate the impact the projects have had on your settings. It is important that whatever method we choose to use is relatively quick and easy to do and will be of benefit to you and other practitioners. We need to be able to identify the value of our projects and enable people to decide about whether they are worth the time and resources involved.

I shared some examples from a previous research project that may be a useful starting point. These can be found online:

Does careful listening to peers impact positively on learning?

Can ICT be used as an effective tool for engaging pupils, in particular boys in literacy?

Developing a Language for Learning to Support Assessment for Learning

How can co-operative learning and a cross curricular thematic approach impact upon pupils' attitude and success in learning?

Update on projects

I have visited most settings now and some themes have emerged

- All projects have a clear focus on teaching and learning, technology is used to support this rather than being the focus

- All projects involve introducing children to technology rather than only the adults using the technology
- Most people have spoken about the importance of the adults' role in the project, all projects have adults supporting the children to use technology rather than simply providing technology and letting children use it independently
- All settings have spoken about the value of being part of the project and the positive impact it is having on their class or setting
- All participants have mentioned barriers or challenges they have had to overcome while working on the project

Updates on individual projects

Participants were asked to report on their project and consider:

- What are the successes you would like to share?
- How can you/ will you demonstrate impact?
- Have there been/are there any challenges?
- What evidence do you have/could you gather?
- How can we share our findings?
- What are you planning to do next?
- How would you convince a sceptical colleague of the value of your project?

Setting 4

Their project has introduced the Seesaw app to school and parents. All staff had training from the North Tyneside Learning Trust before Christmas. The staff discussed how they would use Seesaw and how to ensure it would not increase their workload. In January there was a meeting with parents to set out expectations about how Seesaw was going to be used.

Children are using it to reflect on child-initiated learning. Some children are now uploading photos and pictures of their work independently. They have been shown how to use the recording feature to record themselves talking about their work, but they do not always remember to do this.

33% of children had a parent linked to their account by the spring half term. At the spring parents evening letters were given out to other parents. They now have 58% of children with linked parents. Parents have been given questionnaires to get feedback on the different features

Feedback has been very positive as it provides a talking point at home and they can see what their children are doing and how engaged they are in their learning. There was one concern; some parents were concerned that there may be negative comments written by parents when more than one child is tagged in a post. Although no comments are posted without being approved by staff, this would require staff to follow up on any inappropriate posts.

Subject coordinators can use the app to see what the different classes are doing.

Setting 3

Their project is to use Seesaw for assessment. There is a 2-year plan to use it in nursery and reception. They have developed a profile and are collecting evidence for different subjects. Work can be linked to different curriculum areas and age bands. It works at a different level to tick boxes, it is much more valuable. It is quicker than a paper version, but still time consuming. When just adding photos, it is very quick and easy to do, but more work is needed when linking them with assessment. It is likely to take less time as staff get used to the process.

Some parents have concerns and have not given permission for their children's photographs to be added. The setting is looking at how they can manage this when children are taking photos. A parents' meeting is planned.

There were some questions that need to be asked:

- Where is information stored and what are the potential issues if personal details are included - there is nothing confidential, but you can identify the SEN children and see which age band we think they are working at and some comments relate to developmental stages
- Is the data backed up, what happens if you lose access, for example if the Internet goes down?
- Is the account archived and can accounts be transferred to the next class, and is this available in the free version?

- Can work be downloaded for the setting/family

General discussion learning journals

- There are alternative applications e.g. 2BuildAProfile, Tapestry, though these have costs associated with them
- There are savings to be made, using an electronic resource reduces printing costs and can reduce the time needed
- Value of talking to people already using applications about how they can be used and any potential problems
- Paper learning journeys are also valuable, if using both this can increase workload

Setting 1

- not ambitious
- no evidence of the moment
- want to incorporate it into focus areas
- IT skills aren't too bad because they get it at home
- when you see all the possibilities you realise how much it could enhance different areas of learning
- focus of project is to find out about what's possible
- challenge is working out how to put things into practice
- identify what funds are needed
- might be useful to go to other settings, to see what they are using
- using tapestry with parents trying to encourage children to access tapestry more to reflect on what staff put on rather than putting things on themselves, that might be a step later
- evidence would be observations on the session when they were reflecting on learning of things printed off from tapestry, the question is what you would find useful if someone was presenting information about tapestry
- have tablets but not very good, should have bought one iPad rather than for not good ones, has put
- looking to use tapestry more immediately on tablets, doesn't work for me not technical enough easier to take a photo

- main impact just see what exists it's like another world and hopefully it will spark something
- would like a list of how ICT could enhance each area of learning,
- problem is knowing where to start, need a half day someone to identify the gaps know what you've got how you using it identify the gaps
- there are routes to funding for everybody, may need to look for grants
- identify need first
- look for toy libraries - http://www.ntlrc.co.uk/toylibrary.html
- The LA early year teams have big boxes for loan
- special school in Hexham http://www.hexhamprioryschool.co.uk/
- Advisors' contact details
- Need to put ideas into practice

Setting 2

- new two-year-old room want to get to use to use more ICT activities
- now have twos mixed in with three roles
- introduced toys like talking Tom and ICT in the home corner for reflecting
- used iPads to take pictures and reflect on learning
- look to role-play, using actual keyboards big whiteboard as a background so the children can feel like they're in that area take them on aircraft flight and to train
- use the projector in the block area to scaffold their learning on how to build certain things, did a pyramid children working as a team
- children are very engaged with it
- parents are commenting on it
- capturing the comments
- next step depends on the route the children take
- help practitioners to reflect on how children are learning in different areas
- don't have anything like tapestry, have a lot of staff who don't like online things lacked confidence

Where next?

- going to see other people would be useful, what they are using and how they are using

- finding routes to try out resources
- making use of what already have
- bring resources to the nursery and see what children can do with it
- identify questions to think about and ideas about what evidence to gather
- setting 4 to write up - shared examples, doesn't have to be all tied up can identify what you would do next

Notes from Action Research Group Meeting October 16th 2016

Present

Apologies

Tour of setting

The meeting started with a tour of the setting, which gave us an opportunity to see how children and staff were using technology. Children were using computers and interactive whiteboards for a number of activities, including drawing, iPads being used to record what children were working on, small mobile phones were being used to communicate between children and classrooms. One group was working with a member of staff to use the green screen to record a version of I'm going on a Bear Hunt. It was really useful to be able to talk to the children and to staff about what they were doing, what worked well, what was more challenging.

Setting 5 explained how the setting was using Tapestry to collect evidence of children's achievements. Staff were aware of what evidence they were looking for and could collect this when working alongside children during free choice activities, as well as during teacher led activities. This approach also allows adults to be focused on providing the right experiences for children throughout the setting, teaching is not limited to teacher led activities.

Children were given opportunities to use the iPad to record their work. This supported their reflection and meant staff were able to see what children were doing while the adults were working elsewhere.

One common theme was that it was good to see technology integrated into the classroom but not being dominant. Children enjoyed using the technology, but also liked to use their imagination.

Projects

When discussing projects, it is important to do more than describing what a setting is doing, it is also important to explore why this is being done and what we are learning from the project. I shared some questions I had put together, which may be helpful prompts when people are reflecting on their projects. A copy of the questions is attached.

Setting 5

A key focus is pupils' progress. The school wanted to increase the number of pupils leaving the unit at the 'exceeding' level of development. Using technology to gather evidence is helping this to happen. The group discussed the targets for the technology strand and feel that it easier for pupils to achieve 'exceeding' in this area than some of the others, especially maths and writing. This was especially true now that they had added more technology to the setting. It would be useful to use technology across of the subject areas.

Setting 1

Using technology across the curriculum is one of the preschool goals. They see technology as underpinning other areas, not just a separate focus. They discussed what technology might be useful and what funds would be needed. They discussed some of the things they had seen during the visit and how they might be used in my setting. For example, recording videos to show to pupils and parents. This could also happen the other way around with parents sending things in from home.

The setting still has an old PC and so needs to develop the children's mouse skills. I have been identifying some applications that could be used. Some of these require the Internet, which doesn't always work within the setting, so the links could be added to the sites website

https://kaleidoscopeforlearning.wordpress.com/2016/11/20/mouse-skills-in-early-years/

They discussed how technology could be used to support children with poor language and communication skills. This is an example of where technology can allow things to happen that couldn't happen without it, for example getting the child to use the talking turtles to listen to different parts of the rhyme and match them to pictures. The child would be able to listen to it as many times as they wanted. The group felt that technology offers a way of getting lots of repetition. It can also allow pupils to record things which allow staff to go back and see things they wouldn't necessarily have seen at the time. Technologies also seem to be useful to support SEN.

Attitudes

I shared some responses to the question on the online questionnaire that asked about people's attitudes towards using technology in the early years. The group discussed whether they agree to these comments or not.

- There's too much reliance on technology, and other important skills have been lost
- If it's part of extending children's learning or well-being, that's fine but as a babysitter, no
- We have found we are having to refer more children to SALT (speech and language therapy) as a result of less conversations and adult interaction
- I don't think screen-based technology is suitable for young children of 0-6 years old
- I think young children are exposed to iPads at too young an age, I would not see iPads as appropriate technology for the ages of children we teach. I see our job is mainly developing their personal social and emotional development and getting them ready for school. Being able to put on their own coat or take them to the toilet, in that respect technology would have no benefit.
- Children are exposed to so much technology at home and we try to engage in messy play outdoors with nature. It's a choice for is not to have technology in our rooms.

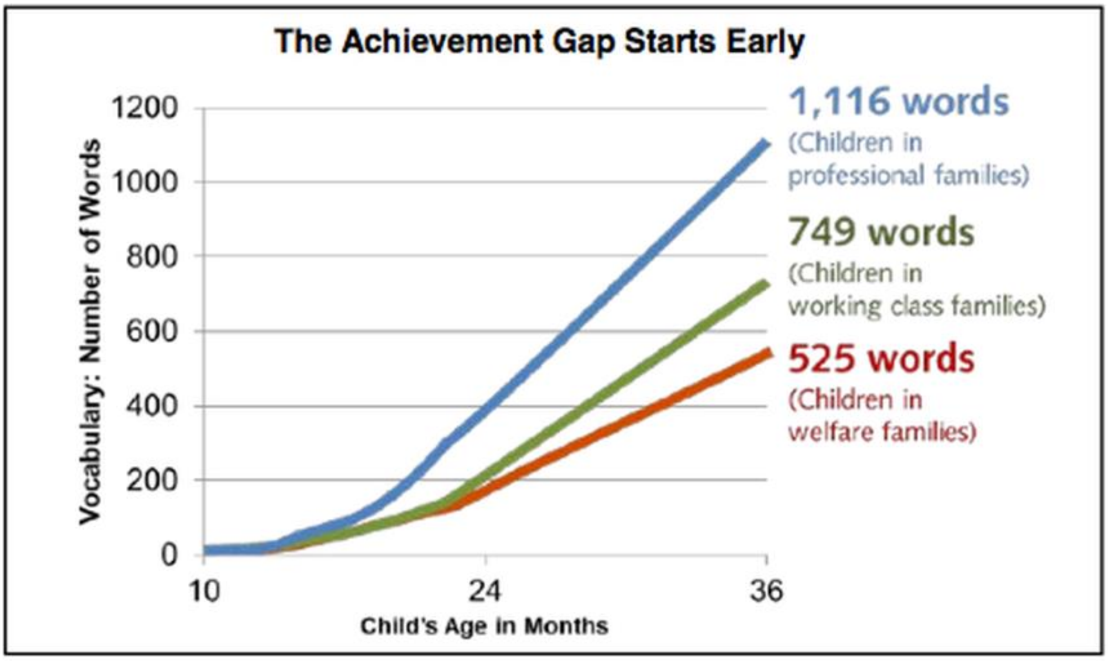
Technology can be very useful for keeping children occupied, if you have too many devices children can end up working on their own. This could affect their confidence, speech and language. Using technology too much can mean they don't develop other skills, for example some children are not using pencils and pens at home, just iPads. Technology can mean communication can suffer.

Setting 5 mentioned the work carried out by Hart and Risley[10], looking at the number of words children from different backgrounds had heard by the age of three years old. It would be easy to look at the stereotype of a professional family providing more language. But this is not always the case, a professional family may have little time to spend with their children to do this. It is the quality of communication that matters, the

[10] Hart, B., & Risley, T. R. (2003). The early catastrophe: The 30 million word gap by age 3. American Educator, 27(1), 4-9.

child may hear lots of words from the television, but the interaction would be more important.

http://isites.harvard.edu/fs/docs/icb.topic1317532.files/09-10/Hart-Risley-2003.pdf



There is research that shows the level of communication between parents and children, and teachers and children can decrease when using technology. Again, this can depend on what devices being used and the purpose it is being used for. Technology can be used actively or passively.

The National Paediatrics Society has produced guidance on how many hours of screen time children should have, their advice has changed recently, and they now also support the view that it is what the technology is being used for that is important and that children shouldn't be stopped from using technology just because it has a screen. If technology is being used for a purpose then it can be valuable.

There was some discussion about the fact that children may have access to a lot of technology at home, so setting might feel that they don't want to use too much technology. The group felt that it was necessary to be selective in how technology was used and that it might vary depending on catchment area and what children were doing at home.

The group discussed the work done by Sugata Mitra, as part of his research, he provided children in India with a computer in the wall that they were left to use on their own. He found that the children could learn to use it without adult support. He is now working in Newcastle and doing projects in this country, including projects involving SOLE, Self-Organised Learning Environments. Adults support children to identify a question, the children are then left to work together using computers to find out the answers for themselves. He has also supported the development of a granny cloud, linking children to adults who provide support to children, but not formal teaching. More information about the work of Sugata Mitra is available on the blog.

The group also talked about the new computing curriculum and whether this can be extended into the early years. There are a number of apps that can be used to support this with young children, and information sheet is attached.

Future meetings

The group felt that being able to discuss research would be beneficial when talking to colleagues, especially if some colleagues were not trained in the early years. Have also found it useful to talk to colleagues outside of the setting and felt that this was something that didn't happen often in early years education.

Some members felt it would be useful to prepare feedback on my projects outside of meetings, others thought that talking to others about it would be more beneficial. I have suggested I sent out the list of questions and prompts to help people reflect on their projects.

It was agreed that future meetings would happen within settings where possible as seeing other people's practice was very helpful.

J. End of project evaluation form

Action Research Evaluation
Name:

What was the aim of your project?	
How did your project change in the 2nd year?	
What worked well?	
What challenges did you face?	
What have you learned?	
How has your thinking changed about technology?	
What do you plan to do next?	
Are there any the key messages that you would share?	
What were the best / worst things about the **whole** project?	

As a result of the action research project…	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**
I spent more time reflecting on my practice				
I shared the project with colleagues in my own setting				
My practice using educational technology improved				
I have more confidence using educational technology				
Children are using more educational technology in my setting				
Staff are using more educational technology in my setting				
I shared the project with colleagues in a different setting				
My attitude towards educational technology changed				
My general teaching practice improved				
Children are reflecting more on their learning				
Communication and language has improved				
My ICT skills have improved				
General feedback				
I spent too much time working on the project				
I would not participate in another action research project				
Visits to other settings were valuable				
Meeting with other practitioners on the project was valuable				
I would recommend action research to others				

K. Collated results of evaluation

Table 49: Project Evaluation (agree/disagree only)

	Agree	Disagree
I spent more time reflecting on my practice	75	25
I shared the project with colleagues in my own setting	100	0
My practice using educational technology improved	100	0
I have more confidence using educational technology	100	0
Children are using more educational technology in my setting	100	0
Staff are using more educational technology in my setting	100	0
I shared the project with colleagues in a different setting	25	75
My attitude towards educational technology changed	100	0
My general teaching practice improved	100	0
Children are reflecting more on their learning	100	0
Communication and language skills have improved	75	25
My ICT skills have improved	100	0
I spent too much time working on the project	0	100
I would not participate in another action research project	25	75
Visits to other settings were valuable	100	0
Meeting with other practitioners on the project was valuable	75	0
I would recommend action research to others	100	0

L. Cycle Three: Article

An account of Cycle Three was presented at the Imaging Better Education at Durham University in July 2018. An article based on this presentation was published in the conference proceedings.

Jack, C. (2019). *Enhancing the use of Educational Technology in the Early Years.* Paper presented at the Imagining Better Education Conference, July 6th and 7th 2018, Durham University.

Enhancing the use of Educational Technology in the Early Years

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Enhancing the use of Educational Technology in the Early Years

Educational technologies can have a positive impact on teaching and learning. Recent research suggests that these technologies are more embedded in early years settings than they were in the past, but practitioners may not be using them to their full potential. This project explored how practitioners can be supported to use them more effectively.

This paper describes a project involving eight settings in the North East of England where early years practitioners conducted their own action research projects. Each project was designed to meet an identified need in their setting.

The project shows that action research projects have the potential to support the implementation of technology and this approach appears to be more successful than regular training.

Keywords: educational technology; action research; early years education, CPD

Introduction

This project investigates whether an action research network can be an effective way of supporting early years practitioners to use educational technology (EdTech) more effectively. In England, the Early Years Foundation Stage (EYFS) refers to the stage between birth to five years old, this project involved practitioners working with children aged two to five years in EYFS settings.

What are educational technologies?

The literature review described in this article showed that the term educational technology has traditionally been used to refer to computers, tablets and interactive whiteboards. There are many other devices available including: digital and video cameras, programmable toys, microphones, role play equipment and 'sound buttons' that will record and play audio recordings.

What is effective use?

While there are ongoing debates about the impact of these technologies, there is a growing consensus that they can have a positive impact on teaching and learning, if they are used effectively (Vaughan & Beers, 2017). Effective use means different things to different people and links to the reasons why EdTech is being used.

Hawkridge (1990) identified four rationales:

- Social: technology is everywhere in society, this should be reflected in educational settings
- Pedagogical: technology can have a positive impact on teaching and learning
- Vocational: technology is necessary for future careers
- Catalytic: technology can profoundly change the education system

The EYFS curriculum (Standards and Testing Agency, 2017) states that children should be able to:

- recognise that a range of technology is used in places such as homes and schools
- select and use technology for particular purposes

The exemplification materials expand on this by saying: 'The child chooses … technological opportunities … as a tool to enhance and extend his or her learning' (Standards and Testing Agency, 2012). The curriculum refers to the social and pedagogical rationales.

Effective use of technology does not just refer to supporting 'academic' subjects such as maths or literacy. The EYFS curriculum also highlights characteristics of learning including learning dispositions: cooperation, curiosity, reflection, perseverance, confidence and independence.

It is not enough to put EdTech into a setting and expect it to make a difference (Higgins, Kokotsaki, & Coe, 2012). EYFS practitioners need to link EdTech to specific needs they have identified within their settings, whether these relate to the curriculum areas or characteristics of learning.

The current context

A systematic approach was used for reviewing the literature. The Education Resources Information Centre (ERIC) was searched using the following Boolean string: ("computer" OR "technology" OR "digital" OR "ICT") AND ("early years" OR "pre-school" OR "kindergarten" OR "young children"). Results were limited to peer-reviewed journal articles from 1996 and 2016. 1996 was chosen as this was when the Desirable Outcomes for Children's Learning were published in England (School Curriculum and Assessment Authority & Department for Education and Employment, 1996); this was the first EYFS 'national curriculum' (Anning, 1999). 2016 was the last full year before the literature review was conducted.

All 29 articles from 1996 had computers as the main focus. By 2016 the focus had expanded to computer, tablets and interactive whiteboards, 74 of the 84 articles focused on these. Even when articles listed a range of EdTech, the analysis often focused on this limited range of devices. Only four articles had a broader focus.

Articles describe how often EdTech was being used and in which curriculum areas, they did not usually say how EdTech is being used. Plowman and Stephen (2013) suggest that technology use is limited to using computers during free play time, or a focus on operational skills or turn taking.

To find out whether this is an accurate picture, interviews were conducted with 20 settings in the North East of England (Jack & Higgins, 2018). Some of the findings are relevant here.

The interviewees' view of EdTech was much broader than the literature suggests. This is important as practitioners' understanding of the definition of EdTech can impact on their practice. A focus on just computers has been linked to a 'mechanistic approach' where children learn how to operate technology, while a broader view is seen to provide 'scope for more imaginative, creative and collaborative activities' (Plowman, McPake, & Stephen, 2012). This view was supported by the interviews which showed that a range of technology was being used creatively to support teaching and learning across the curriculum and to support a range of learning dispositions.

The interviews showed that EdTech was being used to support the pedagogical and social rationales but revealed a number of barriers. The interviewees valued opportunities to increase their colleagues' confidence and skills but identified a lack of available training (Jack & Higgins, 2018).

Top-down training has not been linked to sustained impact in the classroom (Wall & Hall, 2017) and collaborating with peers is seen as one of the best ways to provide support (Shields & Behrman, 2000). This research aimed to find out if action research would be better than standard training.

Action research aims to find a solution to problems identified by practitioners within the context being studied. It would allow the use of EdTech to be linked to practitioners' practice and beliefs. This has been shown to increase the likelihood of practitioners using technology (Higgins & Moseley, 2001).

Methodology

The term 'action research' is becoming so widely and loosely applied that it is becoming meaningless' (Tripp, 2005)

An evaluation of an action research project needs to provide details of what was done and be clear about how this fits within the action research field. This research can be described as rigorous self-reflection, similar to the approach described by Baumfield, Hall, and Wall (2013).

The Projects

The action research group was made up of eight EYFS practitioners with an interest in improving their use of EdTech. They included a preschool manager, nursery teachers from stand-alone nurseries and teachers from nursery classes and reception classes in local authority schools. They were each supported to plan a project that would target a specific need in their setting, these include:

- using EdTech to record children's learning and support later reflection
- using EdTech to enhance the children's language and communication skills
- developing the practitioners' own skills and confidence

Their projects fit within the practical, personal and professional approach to action research described by Rearick and Feldman (1999) who describe a cyclical process used to evaluate practice, plan changes, implement the changes and evaluate before moving on to another cycle.

Data collection

Over the two years of the project, all settings were visited twice. I observed practice and interviewed participants. Interviews included questions about the participant's project and the action research process. Participants were also invited to termly meetings which facilitated collaboration.

Group meetings provided an opportunity for participants to share their progress. Participants were encouraged to justify their decisions and actions, and to use questioning to challenge each other. The aim was for the research process to be more rigorous than the reflection that naturally occurs within classrooms. Meetings also included discussions about key themes: defining EdTech, discussing how EdTech could be used and what effective EYFS pedagogy looks like. Audio recordings and field notes were written up after each meeting. Participants completed an end of project evaluation questionnaire which provided extra details about the action research process.

NVivo was used to conduct a thematic analysis of the transcripts (Schreier, 2014).

Ethics

All participants gave informed consent, participation was voluntary, they had the right to withdraw at any point and anonymity was guaranteed. Ethical approval was granted by Durham University.

Was action research an appropriate approach?

Meeting the settings' needs

The end of project evaluations indicated that the participants' main aims had been achieved. The eight settings were at very different stages in terms of using EdTech. For some, the project was a way of exploring what was possible and identifying what resources they needed to purchase. Others already had access to a range of EdTech but wanted to use it more effectively to support their children's learning.

> *I was guilty of 'what do I do with these iPads we've been given? We just got them out for an afternoon… [but now] we are using the iPad because it really enhances what you are trying to achieve (Setting 7)*

At the end of the project, all participants were able to describe their project's impact and provide evidence, including progress data.

This year we have had the most number of ‘exceeding’ children in ICT (Setting 7)

Impact on participants

The project provided time to reflect and practice in all settings had improved.

In terms of the influence it’s had for moving us on to thinking more about IT, it has been great (Setting 1)

Participants wanted to continue to develop their knowledge and skills.

It’s still quite scary I have to say because it’s a whole different way of working, but I am excited by it because I can see the potential (Setting 3)

One person thought they would have been able to make changes to their own practice without being involved in the group, but the project had enabled them to talk to colleagues within their own setting and support them to make changes to their practice.

I might have done this myself anyway, but I’m not sure other staff would have done (Setting 5)

Empowering

The project increased people’s confidence, enabling some of the group to ask for more resources or to justify their use of EdTech to colleagues who did not see the potential benefits.

I’d put my action plan together … we had a meeting with our LA advisor … I said we were doing this … she said, ‘I don’t see the point’ … I was ‘I really do’ … it has made me re-evaluate [and say] ‘no, this is really important for us as a school’ (Setting 6)

Comparison with training

Feedback was collected throughout the project so even participants who left before the end were able to comment on the value of the action research process. Everyone said the project was better than traditional training. Training was not aimed at their specific needs so was often not put into practice. Action research allowed them to focus on their own priorities.

> *with training, a lot of the things you look at are 'yes that's brilliant' but then you come back into the classroom and you just fall straight back into the old routines and you forget about things … [with this project] I've always had a very clear objective… it's very clearly set out ... [and] because I've always had that in my head I have done it. (Setting 4)*

Practical challenges

> *when I first spoke to my head and she said, 'what is [the project] … is this going to cause more work' and I was 'no cos it's what we're doing anyway, it's part of the action plan (Setting 6)*

Although meetings and visits to other settings were seen as the most valuable aspects of the project, only one participant attended all the meetings. One did not attend any, though she did visit another setting to see how they were implementing EdTech. This was due to the challenge of running the project alongside the practitioners' already busy workloads. Three of the group left after a year due to sickness, maternity leave and changing settings.

Despite these challenges, all of the participants were positive about the approach and the impact it had made on their thinking and practice.

> *Once you make a start you think 'I could have been doing it all the time' (Setting 3)*

Only the person who had not managed to attend any meetings said they would not participate in action research again.

Conclusion

For these practitioners, action research effectively supported their use of EdTech. They all planned to continue their projects after my research finished. Evidence from interviews and the evaluation forms suggested that the change to their practice was sustainable.

I would recommend this approach to other settings wanting to use EdTech more effectively, but it is not possible to say if it would always be successful. Action research cannot be validated by replication (Wallace, 1987) as new participants would adapt the process to meet their own priorities.

The project is being written up as part of my doctoral thesis and will be publicly available. This may help other practitioners to decide if action research would be a valuable approach for them to use.

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Appendix E. Ethical Approval

Durham University

School of Education

Shaped by the past, creating the future

27/05/2015

Christine Jack

c.l.jack@durham.ac.uk

Dear Christine

Title : Exploring early years practitioners' understanding of how educational technologies can be used to support teaching and learning.

I am pleased to inform you that your application for ethical approval for the above research has been approved by the School of Education Ethics Committee.
May we take this opportunity to wish you good luck with your research

Dr. J. Beckmann
Chair of School of Education Ethics Committee

Leazes Road
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www.durham.ac.uk/education

Name	Christine Jack
Email address	c.l.jack@durham.ac.uk
Title of research project	Exploring early years practitioners' understanding of how educational technologies can be used to support teaching and learning.
Date of start of research project	June 2015

	Please tick one
PGR Student	✓
PGT Student	
UG Student	
Staff	
Other	

For PGR, PGT and UG students

Programme	Doctorate of Education
Supervisor	Professor Steven Higgins

For staff

Is the research funded	Y N
Funder	
List any Co-Is in the research	

Other

Please give further details	

(1) Does the proposed research project involve data from human participants? This includes secondary data. If the research project is concerned with the analyses of secondary data (e.g. pre-existing data or information records) please continue with Q6-9	(1) Y ~~N~~
(2) Will you provide your informants – prior to their participation – with a participant information sheet containing information about (2a) the purpose of your research (2b) the voluntary nature of their participation (2c) their right to withdraw from the study at any time (2d) what their participation entails (2e) how anonymity is achieved (2f) how confidentiality is secured (2g) whom to contact in case of questions or concerns Please attach a copy of the information sheet or provide details of alternative approach.	(2a) Y ~~N~~ (2b) Y ~~N~~ (2c) Y ~~N~~ (2d) Y ~~N~~ (2e) Y ~~N~~ (2f) Y ~~N~~ (2g) Y ~~N~~
(3) Will you ask your informants to sign an informed consent form? (please attach a copy of the consent form or provide details of alternative approach)	(3) Y ~~N~~
(4) Does your research involve covert surveillance? (4a) If yes, will you seek signed consent post hoc?	(4) ~~Y~~ N (4a) Y N

(5) Will your data collection involve the use of recording devices? (5a) If yes, will you seek signed consent?	(5) Y ~~N~~ (5a) Y ~~N~~
(6) Will your research report be available to informants and the general public without restrictions placed by sponsoring authorities?	(6) Y ~~N~~

(7) How will you guarantee confidentiality and anonymity?

The initial stage of the research will involve questionnaires, interviews and observations. No names, of individuals or settings, will be used when writing up findings and care will be taken to ensure participants are not recognisable from the information included. Participants in the action research phase will be given the opportunity to have their contribution credited if they wish.

(8) What are the implications of your research for your informants?

Participants in the questionnaire phase, and in related interviews or observations, will benefit from the opportunity to reflect on their practice. Interim findings will be made available through blog posts which will be shared.

Participants in the action research phase will be able to research areas of personal interest. They will benefit from: direct support from the researcher e.g. training on hardware or software, opportunities to reflect on and share experiences, and opportunities to implement changes in their practice and reflect on the impact of these changes.

(9) Are there any other ethical issues arising from your research?

I will not work directly with children or their parents but contact will occur during school visits and lesson observations. The schools' guidelines on visitors in school will be followed.

Participants in the action research phase will be encouraged to reflect on their existing practice and identify ways of using technology more effectively. This will result in some changes to their practice that may impact on children or their parents. Input from the researcher will support participants to reflect on any potential implications of this. Head teachers from participating settings will be kept informed at all stages and asked for their consent.

Further details

Declaration

I have read the Department's Code of Practice on Research Ethics and believe that my research complies fully with its precepts.

I will not deviate from the methodology or reporting strategy without further permission from the Department's Research Ethics Committee.

I am aware that it is my responsibility to seek and gain ethics approval from the organisation in which data collection takes place (e.g., school) prior to commencing data collection.

Applicant signature: Date: 15/05/15

Proposal discussed and agreed by supervisor

Supervisor signature Date 19/05/15

To enable electronic submission of applications, electronic (scanned) signatures will be accepted.

[DATE]

Participant Information Sheet [questionnaire]

Exploring early years practitioners' understanding of how educational technologies can be used to support teaching and learning

You are invited to take part in a research study into the use of educational technologies to support teaching and learning in early years settings. Please read this form carefully and ask any questions you may have before agreeing to be in the study.

The study is conducted by Christine Jack as part of her Doctoral (Ed.D) studies at Durham University. This research project is supervised by Professor Steven Higgins s.e.higgins@durham.ac.uk from the School of Education at Durham University.

The purpose of this study is to identify how educational technologies are currently being used in early years settings and whether current usage supports practitioners general approaches to teaching and learning.

If you agree to be in this study, you will be asked to complete a short questionnaire.

Your participation in this study will take approximately 30 minutes.

You are free to decide whether or not to participate. If you decide to participate, you are free to withdraw at any time without any negative consequences for you.

All responses you give or other data collected will be kept confidential. The records of this study will be kept secure and private. All files containing any information you give are password protected. In any research report that may be published, no information will be included that will make it possible to identify you individually. There will be no way to connect your name to your responses at any time during or after the study.

If you have any questions, requests or concerns regarding this research, please contact me via email at c.l.jack@durham.ac.uk or by telephone at [redacted]

This study has been reviewed and approved by the School of Education Ethics Sub-Committee at Durham University (date of approval: DD/MM/YY)

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[DATE]

Participant Information Sheet [Interviews/observation]

Exploring early years practitioners' understanding of how educational technologies can be used to support teaching and learning

You are invited to take part in a research study into the use of educational technologies to support teaching and learning in early years settings. Please read this form carefully and ask any questions you may have before agreeing to be in the study.

The study is conducted by Christine Jack as part of her Doctoral (Ed.D) studies at Durham University. This research project is supervised by Professor Steven Higgins s.e.higgins@durham.ac.uk from the School of Education at Durham University.

The purpose of this study is to identify how educational technologies are currently being used in early years settings and whether current usage supports practitioners general approaches to teaching and learning.

If you agree to be in this study, you will be interviewed and the researcher will conduct a half day classroom observation which will look at the use of educational technologies in your setting. During the interview an audio recording will be made to allow the interview to be transcribed for analysis. The researcher will take notes during the observations. The interview will take approximately 60 minutes.

You are free to decide whether or not to participate. If you decide to participate, you are free to withdraw at any time without any negative consequences for you.

All responses you give or other data collected will be kept confidential. The records of this study will be kept secure and private. All files containing any information you give are password protected. In any research report that may be published, no information will be included that will make it possible to identify you individually. There will be no way to connect your name to your responses at any time during or after the study.

If you have any questions, requests or concerns regarding this research, please contact me via email at c.l.jack@durham.ac.uk or by telephone at [redacted]

This study has been reviewed and approved by the School of Education Ethics Sub-Committee at Durham University (date of approval: DD/MM/YY)

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[DATE]

Participant Information Sheet [action research]

Exploring early years practitioners' understanding of how educational technologies can be used to support teaching and learning

You are invited to take part in a research study into the use of educational technologies to support teaching and learning in early years settings. Please read this form carefully and ask any questions you may have before agreeing to be in the study.

The study is conducted by Christine Jack as part of her Doctoral (Ed.D) studies at Durham University. This research project is supervised by Professor Steven Higgins s.e.higgins@durham.ac.uk from the School of Education at Durham University.

The purpose of this study is to identify how educational technologies are currently being used in early years settings and whether current usage supports practitioners general approaches to teaching and learning.

If you agree to be in this study, you will work with the researcher and other participants to plan, implement and evaluate the use of educational technologies in your setting. During the research you will meet with the researcher and other participants and participate in interviews and observations. Details of these meetings and interviews will be agreed with you in advance. During interviews audio recordings will be made to allow the interview to be transcribed for analysis. The researcher will take notes during the observations.

You are free to decide whether or not to participate. If you decide to participate, you are free to withdraw at any time without any negative consequences for you. All responses you give or other data collected will be kept confidential. The records of this study will be kept secure and private. All files containing any information you give are password protected. In any research report that may be published, no information will be included that will make it possible to identify you individually. There will be no way to connect your name to your responses at any time during or after the study.

If you have any questions, requests or concerns regarding this research, please contact me via email at c.l.jack@durham.ac.uk or by telephone at [redacted]

This study has been reviewed and approved by the School of Education Ethics Sub-Committee at Durham University (date of approval: DD/MM/YY)

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Declaration of Informed Consent

- I agree to participate in this study, the purpose of which is to identify how educational technology is currently being used in early years settings and whether current usage supports practitioners general approaches to teaching and learning.
- I have read the participant information sheet and understand the information provided.
- I have been informed that I may decline to answer any questions or withdraw from the study without penalty of any kind.
- I have been informed that all of my responses will be kept confidential and secure, and that I will not be identified in any report or other publication resulting from this research.
- I have been informed that the investigator will answer any questions regarding the study and its procedures. Christine Jack, School of Education, Durham University can be contacted via email: c.l.jack@durham.ac.uk or telephone: [redacted]
- I will be provided with a copy of this form for my records.

Any concerns about this study should be addressed to the Ethics Sub-Committee of the School of Education, Durham University via email (Sheena Smith, School of Education, tel. (0191) 334 8403, e-mail: Sheena.Smith@Durham.ac.uk).

Date Participant Name (please print) Participant Signature

I certify that I have presented the above information to the participant and secured his or her consent.

Date Signature of Investigator

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