University of Reading

One-to-One Chromebook Technology and Student Engagement in the Independent Secondary School Classroom: A Case Study

Thesis submitted for the Degree of Educational Doctorate

by

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January 2023

Author's Declaration

I confirm that this is my own work and the use of all materials from other sources has been properly and fully acknowledged.

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2023

Abstract

This pragmatic, sequential, mixed methods case study research project examined the use of one-to-one Chromebook technology in one independent, co-educational, UK secondary school for 11-18 years old students. The purpose was to understand the perceptions of students and teachers regarding student engagement with one-to-one Chromebook technology in the classroom, and in so doing, recognise how the Chromebook is being used and the opportunities and challenges it presents when engaging students. This seems timely in the wake of the COVID-19 pandemic (2020), where education came to rely heavily on mobile digital technology, such as Chromebook laptops. This research looks to fill gaps in current knowledge that exist regarding one-to-one Chromebook technology and student engagement in UK independent secondary school classrooms.

Data was collected via student surveys (n=168), teacher surveys (n=43), four student focus groups (n=10) and four semi-structured interviews with teachers (n=4), which allowed the views of both groups to be analysed and compared. The research was conducted, not at the beginning of Chromebook use in the school, but at a time when Chromebooks had been established in a one-to-one format for over four years. Using the conceptual framework of affective, behavioural and cognitive engagement and a bioecological student engagement, theoretical framework, an understanding of Chromebook use in this secondary school setting materialised.

Evidence shows that students and teachers perceive engagement using Chromebook technology differently but positively, and this is not by chance alone. The key differences in student and teacher perceptions, particularly of affective and behavioural engagement, help us to further understand engagement with one-to-one technology. Data revealed that students' perceptions show they are more affectively and behaviourally engaged across what this research terms the A-B-C (Affective, Behavioural, Cognitive) engagement continuum when

using their Chromebooks, and how teachers do not recognise the strength of their students'

engagement with the device. Teachers explained how they use the Chromebook with their

students in a variety of ways, showing a new confidence founded on skills developed over

time. Both students and teachers acknowledge and understand the dangers of technology as a

distraction, with students willing and open to strategies to help them utilise the technology for

the right purposes. Students and teachers also recognise the use of technology is contextually

bound, appropriate to use for some tasks but not for everything, and that ultimately one-to-

one Chromebooks need to be used judiciously.

Through the discussion of the findings, implications for practice emerged for teachers

and senior leaders in the school. For teachers, the implications are to consciously build their

pedagogical practice starting with affective engagement, exploring the A-B-C engagement

continuum, using personalisation as a key affective indicator on which to build. Teachers

should also look to establish agreed routines, consistent across the school, to help mitigate

against the ever-looming threat of distraction. For senior leaders, the implications are to lead

from the front in helping to provide opportunities for teachers to share best practice and bring

together students *and* teachers to establish a technology charter for all parties to agree and

follow. Through teacher and student collaboration, stronger engagement can be achieved.

Acknowledgements

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Glossary of Acronyms

A-B-C: Affective – Behavioural – Cognitive engagement continuum

BOYD: Bring Your Own Device

CPD: Continuous Professional Development

HE: Higher Education

MM: Mixed Methods

QUAL: Qualitative

QUAN: Quantitative

TA: Teaching Assistant

TEL: Technology Enhanced Learning

Chapter 1 Introduction

This chapter will explain the context of the thesis. It will identify the problem under investigation, why this is an important area of research and why it will prove a valuable addition to the understanding of student engagement using one-to-one mobile digital technology. Lastly, it will explain the origins of the thesis, before outlining the organisation of the research.

1.1 The Context

The context of this research is grounded in two key areas. Firstly, mobile digital technology, specifically the Chromebook laptop and secondly, student engagement.

1.1.1 Mobile Digital Technology

Mobile digital technology (which includes laptops and other devices not tethered to one location) in education is often viewed and described as being ubiquitous (Castañeda & Selwyn, 2018; Harper, 2018). Specifically, it has become a noticeable feature in secondary schools in the United Kingdom (UK) (Bergdahl et al., 2019; Marres, 2017; Selwyn, 2017). Despite this digital pervasiveness, it is difficult to escape the view that whilst this mobile technology has been on the brink of changing, or 'revolutionising' education in secondary schools, it has yet to be fully accepted and established in a coherent way (Blikstad-Balas & Davies, 2017; Christodoulou, 2020; Seldon, 2018). As schools in the UK largely remain places of tradition, it is hard to move away from the idea that whilst technological advances may *feel* as though they have caused a revolution, the reality when examined closely does not reflect this (Blikstad-Balas & Davies, 2017; Christodoulou, 2020; Seldon, 2018; Sproat, 2017).

The mobile digital technology of the modern day arguably has greater possibilities and opportunities to change education in a way that television, overhead projectors,

smartboards and DVDs never did (Fiorillo, 2015; Kolb, 2017). More so, the issue has been made more important in the wake of the global COVID-19 pandemic of 2019-2022, which has seen the use of mobile technology take on even more importance, as schools were closed with many resorting to emergency distance learning, much of which was heavily reliant on mobile digital technology. The power of today's mobile digital technology, the connectivity, portability and the seamless way it has entrenched itself in people's lives, is testament to its influence. It is here to stay, and with technological advances could become more powerful and thereby more influential, all of which make it an important area of research for an educational context, specifically in a secondary school setting. Many see technology as the future, however, the use and connection to learning remains problematic as Bergdahl et al. (2018) suggest, "While the fast-paced development of digital technologies might spur beliefs that learning technologies may solve all educational problems, concerns have stressed that it is not the learning technology itself, but rather how it is used, that will affect learning" (p. 114). In this sense, viewing technology as a tool to be used, rather than an end point is important to note, and therefore understanding how it is used, in the classroom, is vital.

Consequently, opinions that UK education has failed to embrace new technologies fully, and how the current educational system is arguably outdated and developed little in fifty or even one-hundred years, continue from some quarters (Blikstad-Balas & Davies, 2017; Coleman, 2017; Seldon, 2018; Selwyn, 2018). The potential for mobile digital technology to engage children in schoolwork is significant, providing teachers and students with powerful tools to facilitate academic and personal progress (Haßler et al., 2016; Holcomb, 2009; Sahin et al., 2016). Official reports in the UK have emerged targeting technology in education, illustrating the extent to which technology is viewed as being an important part of the future educational landscape in the UK, whilst at the same time indicating how technology is still viewed as having yet to realise its full potential (Connolly,

2018; Department for Education, 2019; McFarlane, 2019; Stringer et al., 2019). What remains to be seen in the aftermath of emergency distance learning of the COVID-19 pandemic, is how this technology may now advance. It is highly likely that whilst technology helps many school students, the combination of technology and the school classroom environment is the best combination for school aged children, as many parents who struggled with the remote learning concept in the home may attest. Therefore, a better understanding of how technology is used in the classroom could help nurture future effective use. When technology is combined with student engagement, there is potentially a potent recipe for academic engagement and therefore, academic success.

1.1.2 Student Engagement

The concept of student engagement in education, is a concept with potential to make a real difference in schools (Appleton, 2018; Sinatra et al., 2015). Engagement, when viewed as a necessity for academic progress and attainment, as opposed to engagement in regards to students participating and not dropping out of the education system, can be seen as being at best crucial and at worst important, with several studies claiming that engagement is associated with positive academic outcomes (Alrashidi et al., 2016; Appleton, 2018; Bergdahl, 2022). Indeed, engagement has been referred to as the "holy grail of learning" (Sinatra et al., 2015, p. 1). If a student is not engaged in the activity of learning, then making any progress in academic terms is difficult, if not impossible. As Bergdahl, Fors et al. (2018) explain, "…it is critical to engage students as, when they stop engaging with the learning material at hand, the learning process comes to a halt" (p. 115). It is therefore hard to see how a school which does not engage students can achieve positive academic outcomes (Gunuc & Kuzu, 2014). Bergdahl (2022) writes, "Research has shown that *how* teachers experience student engagement and disengagement influence their response to students" (p. 2), which suggests that teacher perceptions are important for any understanding of how technology may

be used to engage students, as teachers will influence student experiences. This is reinforced by Wang et al. (2022) who write, "Understanding lower levels of secondary school students' engagement is especially important and failure to do so may lead to ineffective teaching and learning with technologies" (p. 2). Therefore, any positive effect of technology use is dependent on how teachers incorporate it into their teaching (Vongkulluksn et al., 2022).

Yet the concept of student engagement is not a straightforward one, with the term sometimes being used in an ad hoc and uncritical way (Greener, 2022). As will be explained, studies can use the term superficially or else without defining their understanding of what the term actually means (Henrie et al., 2015; Nkomo et al., 2021). This creates an environment where understanding student engagement is not straight forward, and whilst there is research which does attempt to explain, even define the term, the lack of consensus creates a backdrop of some uncertainty (Nkomo et al., 2021). By making it clear what the term engagement means, researchers and teachers will be better positioned to understand and harness it in the classroom. The teacher is the key driver of the learning environment and is in control of what happens in the classroom therefore, understanding the perceptions of engagement of both students and teachers will be instructive. However, what teachers may believe are students' perceptions of any given situation, may not prove to be the reality and here lies important knowledge to be gained.

1.1.3 Mobile Digital Technology and Engagement

This thesis brings together the two strands of one-to-one technology and student engagement, as technology becomes a greater part of student life alongside engagement being accepted as an essential part of learning. Considering COVID-19, and the emphasis placed on technology in Higher Education (HE), it seems logical that secondary school students of the future will need to be prepared to use technology in different ways as they move through the educational system. How digital technology affects student engagement is therefore

becoming more important as the two areas increasingly exist at the heart of student experiences and achievement (Bergdahl et al., 2020; Bond & Bedenlier, 2019; Bond, Buntins, et al., 2020). At a time where screen time for teenagers in their personal life and technology as a distraction is a concern, the idea of technology and engagement for the purpose of learning and achievement, is an important area of research (Aagaard, 2015). An important role of teachers is to lead their students through a sequence of learning, where they can be viewed as "gatekeepers for students use of technology for learning" (Vongkulluksn et al., 2022, p. 422). Therefore, empowered with an awareness of their students' perceptions of engagement, the student voice has the potential to add to teachers' pedagogical armoury when engaging students in their learning.

The specific context for this research will take place in one independent, co-educational, day and boarding school for children aged 11-18 years old in the United Kingdom. Understanding how school students engage with one-to-one technology has significant potential for students and teachers alike. If we can understand how students engage positively with technology, and understand and share teachers' perceptions of their students, then teachers could be more empowered to design learning with technology that may lead to improved outcomes (Castañeda & Selwyn, 2018; Thomas & Kuh, 2005). As technology becomes more powerful, the search for how best to use it to engage students continues to stimulate debate as teachers, researchers and the technology industry search for ways to fully unlock its potential. No longer can it be assumed that technology will automatically engage the school student today, as young people become ever more technologically aware and mobile digital technology blends into the stream of every school student's consciousness. Greater understanding of technology and engagement is required if technology is to be used in a way to secure the right academic outcomes.

1.2 The Problem Statement

This thesis builds on and contributes to the field of engagement in the context of one-to-one technology used in secondary school education, in the USA, Australia and the UK (Coleman, 2017; Haselhorst, 2017; Maffia, 2019; Selwyn, 2018). There remains little consensus on how engagement in technology enhanced learning (TEL) in the secondary school classroom looks in practice (Bergdahl et al., 2020). Especially so in the UK. It is also suggested that engagement in TEL reveals itself differently than engagement in a traditional classroom (Bergdahl & Nouri, 2020; Bergdahl et al., 2020). Therefore, as will be shown, there is space in the literature to examine the impact of one-to-one Chromebook technology on student engagement in UK secondary school classrooms. Indeed, most classroom studies are carried out on undergraduates, meaning there is a shortage of informative data on how devices are used in secondary school classrooms (Christodoulou, 2020).

By exploring what is happening in one school as a case study, this research will help further an understanding of one-to-one technology use in the classroom with regards to engaging students, to help inform future practice in secondary schooling, ultimately to try and improve academic outcomes. It therefore presents an opportunity for teachers to learn and reflect more about their practice, and responds to the observation of the lack of engagement studies focussing on existing technologies (Bergdahl, Fors, et al., 2018). As technology is advancing and increasing in power and influence, the research opportunities in this area are significant and more importantly, necessary if a more informed future is to be found. As Sahin (2016) states, "Because mobile technology has become so pervasive in children's lives, use of it for teaching and learning has become a must" (p. 372). This research will help understand what is happening in the classroom to further our understanding of technology use at a time when schools and other educational establishments are spending large sums of money on technology in the hope of reward, perhaps more convinced of the power of

technology to bring about academic engagement and achievement. It will also approach the sometimes-held deterministic view that the use of technology automatically means gains in student academic performance (Magana, 2017).

1.3 Significance

The heart of this research is to explore the use of one-to-one Chromebook technology in one independent secondary school in the UK, and to understand more about how it is being used and how it impacts student engagement in the classroom. In so doing, it will help our understanding of how this technology can be harnessed for student engagement and improved learning outcomes. This research extends our understanding of the problem of technology integration in the classroom in the wake of a COVID-19 pandemic. Furthermore, it examines the use of one-to-one technology not at the start of the use of the devices, but when it has been established for over four years in the case study school. This is more important than ever to acknowledge if further understanding is to be developed as, "examinations that focus beyond the first year of one-to-one initiatives are critical" (Reichert & Mouza, 2018, p. 763). This is largely because the novelty factor wears off which then helps lead to better engagement with the devices (Fiorillo, 2015). In focussing on the actual use of technology in the classroom, as opposed to focussing on how it could and should be used, a better understanding of engagement and technology will add to our understanding and help facilitate the journey towards an even more effective use of technology in the future. Also, by viewing the problem through the eyes of the students *and* the teachers, it may inform future practice and help teachers to appreciate students' views and collaborate with them, to design more engaging lessons using one-to-one technology.

1.4 Researcher's Positionality

The origins of this research are grounded in my long-standing interest in the use of technology as a classroom teacher. Having been teaching for over 25 years and having seen

several technological innovations, it has been interesting to see how much has changed, but also how much has remained the same, despite having incredibly powerful tools at our disposal. The situation regarding TEL, and the use of one-to-one technology is complex and therefore further research and investigation will further our understanding which may be used to develop technology use in the future. Further to my interest in technology, as a school leader in this case study school, I have over the last ten years been at the forefront of teachers' professional development, working with and for teachers to provide them with the best structures in which they can facilitate outstanding learning. In this case study, understanding teachers' perceptions of engagement with one-to-one Chromebook technology, alongside those of their students, is a potentially powerful collaboration, from which teachers can drive forward their own practice. This research builds on existing knowledge by working with both groups, to understand their view of one-to-one Chromebook technology in the classroom and in so doing work towards some implications for future teaching practice.

1.5 Organisation of the Thesis

In the next chapter, a review of the relevant literature on engagement and one-to-one technology will help to put this research into context, before then explaining the theoretical and conceptual framework that will help to structure the research. Finally, the chapter will introduce the three research questions that will drive this study. In Chapter Three the philosophical approach and the methodological decisions will be explained, including the data collection methods and the process of data analysis that took place, before then considering the trustworthiness and ethical implications. The results and subsequent discussion are then presented in Chapters Four and Five as answers to the three research questions are presented. Chapter Six is dedicated to the conclusions to be drawn and includes the implications for practice, limitations and the future direction of study for this type of research, before ending with some reflections on my EdD journey.

Chapter 2 Literature Review

The aim of this chapter is to provide through a critical review of relevant literature, a better understanding of what is currently known about student engagement and one-to-one digital technology used for education. To begin, it will explore the literature of the three main strands of this research. Firstly, the concept of student engagement in learning. Secondly, Technology Enhanced Learning (TEL) and Chromebooks and thirdly, engagement *and* technology. It will then set out claims that have been made in the literature to date which will allow an understanding of what has still to be learnt in the field of engagement and technology, with a focus on the use of one-to-one devices. The issue will be to understand how technology plays an important part in the modern classroom. The challenge presented by researching engagement *and* technology in education is significant. Through this review it will become clear that a better understanding of student engagement at secondary school level, framed in a technological context is an area that requires further research, especially so in the UK, shown by the small pool of literature to draw upon.

2.1 Defining Student Engagement in Learning

Student engagement in learning is viewed by some researchers as important to successful academic outcomes and progress (Appleton, 2018; Fredricks et al., 2004; Henrie et al., 2017; Kahu & Nelson, 2017) and a growing body of literature has investigated academic engagement over the past 30 years (Wang & Hofkens, 2019). The purpose here is to understand the concept of student engagement in an educational context, before then trying to understand this concept in a relationship with technology. This research accepts the premise outlined by Lawson and Lawson (2013) that, "engagement cannot be pre-packaged as a neatly defined technical problem" (p. 461) given the view engagement is a multi-dimensional construct. However, this research does not accept this being used as an excuse to avoid

understanding the concept in greater detail, at a microlevel (classroom level) to inform future practice.

2.1.1 Challenges in Defining Student Engagement

The history of engagement research in an academic context dates back to 1985, where a review paper found only two studies which used the term 'engagement' (Mosher & MacGowan, 1985). Since this time, uses of the term have increased, highlighting the difficulty and yet the need to provide the definitional clarity desired (Appleton et al., 2008). Fredricks et al.'s (2004) seminal paper, provided a review of engagement literature up to 2004. It recognised the malleability of student engagement, as well as identifying it as a multi-dimensional construct. It is an important work from which it is now largely accepted by engagement academics that engagement should be viewed as multi-dimensional, made up of constituent parts, each discussed below (Alrashidi et al., 2016; Appleton et al., 2008; Bergdahl, 2022; Kahu & Nelson, 2017). More recent work on engagement has used the concept (Bond & Bedenlier, 2019; Bond, Buntins, et al., 2020; Kahu & Nelson, 2017), yet despite this attention, providing an agreed definition of student engagement continues to stimulate debate, with no universally accepted version forthcoming (Bond, Bedenlier, et al., 2020; Bond, Buntins, et al., 2020; Fredricks et al., 2019). Henrie (2015) find this lack of definition in academic articles as, "troubling" (p. 42). Greener (2022) is more forthright in her assessment, "Rather like "learner-centred" and "blended learning", the term student engagement can be used glibly and without intellectual scrutiny. Such theoretical laziness devalues the term" (p. 397). Yet, I disagree with her notion that, "it may be less important to fragment the concept into varying dimensions" (Greener, 2022, p. 397) as without breaking the concept down, we are left with a term that is not understood and therefore used, as she herself states, without due scrutiny.

Currently, engagement is a term widely used in research on learning, and can often be used in different ways to mean different things (Redmond et al., 2018). If further progress on understanding this construct is to be achieved, any study focussing on engagement should provide a definition of their understanding of the term (Boekaerts, 2016; Bond, Buntins, et al., 2020), even though a large number of studies do not (Bond, Buntins, et al., 2020). A review of definitions in the literature shows a comprehensive range from the very specific to the very broad with terms such as energy, effort, involvement, participation, and connection towards learning being used, which attempt to explain the idea of students being academically engaged. Below are three current examples of definitions from the literature, from three leading academics in the field:

- "Engagement often refers to students' level of involvement with and effort in learning and thus can be qualified as 'academic engagement'" (Bergdahl et al., 2020, p. 2).

- "Student engagement is the energy and effort that students employ within their learning community, observable via any number of behavioural, cognitive or affective indicators across a continuum" (Bond, Buntins, et al., 2020, p. 3).

- "Engagement can be defined most simply as a learners active participation in an activity" (Bishop et al., 2020, p. 10).

These three definitions include the idea of effort, which is an important part of the engagement construct, with the third expressing this as learners being active. The third definition also highlights the activity, which is important for this research, in that activity will be focused on the use of one-to-one technology.

For this study of engagement, we will use Bond's definition above, because, as it will be seen, the idea of engagement on a continuum, of affective, behavioural and cognitive (A-B-C) engagement dimensions has potential for us to understand the concept in appropriate depth, incorporating all three dimensions which is important to do (Fredricks et al., 2004;

Nkomo et al., 2021). As Skinner and Pitzer (2012) claim, "Emotion is likely the fuel for the kind of behavioural and cognitive engagement that leads to high-quality learning" (p. 33). This suggests the affective impacts directly on the behavioural and cognitive dimensions of engagement and is the start of the continuum. This study is not trying to redefine the concept but understand the integral parts and how they may connect for a better understanding of the whole. Furthermore, the concepts of authentic and ritualistic engagement can also be applied as explained by Dietrich and Balli (2014), where authentic engagement occurs because of an "intrinsic desire to engage" (p. 22) and ritualistic engagement arises, where there is engagement for other reasons than the content linked to the activity.

Overall, this research notes the lack of agreed specificity in the literature pertaining to the definition of engagement as it takes place in a school classroom. As a result, there will be an attempt to provide more specific details from the classroom regarding what is happening when students engage academically in a TEL environment, to help further our understanding of the concept in the classroom and avoid using the term without academic rigour.

2.1.2 Dimensions of Student Engagement

Within the engagement construct, it is accepted there are several dimensions, although there remains some debate as to the number, which range from between two and four. Within each dimension, are indicators which help to operationalise the concept, and again the number of indicators is not agreed (Fredricks, Wang, et al., 2016; Henrie et al., 2015). However, many accept the multi-dimensional construct is made up of three discrete and interrelated dimensions namely, affective, behavioural and cognitive engagement (Bergdahl et al., 2020; Bond, Buntins, et al., 2020; Fredricks et al., 2004). These dimensions are separate but related (Ben-Eliyahu et al., 2018) and can exist simultaneously. An understanding of the three main and accepted dimensions will form the basis of this research building on previous studies that have done the same in order, "to ensure that the real

richness of real human experience is understood" (Henrie et al., 2015, p. 44). Combining all three dimensions ensures a better understanding of the whole, where a focus on only one dimension can be limiting (Fredricks et al., 2004; Nkomo et al., 2021).

Some studies have also sought to add to the three dimensional construct as explained above, arguing there are further dimensions to add, such as agency (Reeve & Shin, 2020; Reeve & Tseng, 2011), academic achievement (Furlong & Christenson, 2008),volition (Filsecker & Kerres, 2014), collaborative engagement (Järvelä et al., 2016), social engagement (Wang et al., 2019) and socio-behavioural engagement (Linnenbrink-Garcia et al., 2011). Whilst engagement research continues, these may well become a more accepted part of the multi-dimensional construct. However, this is not the current situation at the time of writing. This study will therefore build on the understanding as outlined by the literature that engagement is a multi-dimensional construct which consists of three main dimensions; affective, behavioural and cognitive engagement (Bond, Buntins, et al., 2020; Fredricks et al., 2004; Fredricks, Wang, et al., 2016). Fredricks et al. (2004) argue it is difficult to separate the three main dimensions as they cannot necessarily be viewed in isolation, and this contributes to the difficulties in trying to understand which dimension of engagement may be taking place at any one time. However, the literature believes seeing them together will produce a fuller description than is possible when looking at each individually, for researchers and teachers (Fredricks et al., 2004; Henrie et al., 2015). However, this is not always possible to achieve, and an appreciation of the parts is required, which means viewing it as Bergdahl (2022) does as, "a multi-layered construct, reflecting layers within a momentary engagement" (p. 10), is perhaps the best approach. This research will therefore look to examine the constituent parts that contribute to the whole, where engagement in any one of the three dimensions can be acknowledged, but when combined strengthen the concept, meaning engagement can be viewed on a continuum of engagement strength (A-B-C).

2.1.2.1 Affective Engagement.

Sometimes referred to as emotional engagement, this dimension is concerned with the feelings towards the learning environment, by student peers and their teachers and the sense of belonging to the institution, which can be expressed as enjoyment, enthusiasm, interest and personalisation of learning (Bergdahl et al., 2020; Fredricks et al., 2004; Haselhorst, 2017; Henrie et al., 2015; Shackleton-Jones, 2019). This dimension can be split into two groups. Firstly, affective engagement in relation to academic pursuits, the focus of the current study and secondly, feelings towards and identification with an institution as a whole (Lawson & Lawson, 2013; Sinatra et al., 2015). Affective engagement also places emphasis on students' relationships with peers and teachers for long term academic success (Appleton et al., 2006; Waldrop et al., 2019). These relationships, including personalisation, can prove crucial to fostering positive emotional engagement, and also strongly links to help facilitate positive cognitive engagement (Pietarinen et al., 2014). With affective engagement also comes enjoyment in the learning taking place which can then lead to a strengthening of relationships which in turn leads to greater engagement, acting in a cyclical fashion, building and strengthening engagement, confirming the idea the engagement construct is malleable (Fredricks et al., 2004), but also suggesting that affective engagement sets the scene for behavioural and cognitive engagement (Wang & Degol, 2014). This suggests that all three dimensions feed from and into each other (Wang & Degol, 2014), further supporting the approach to engagement as multi-dimensional, working on an A-B-C continuum. Therefore, understanding perceptions of the affective dimension are important as it forms an integral foundation of the engagement construct.

2.1.2.2 Behavioural Engagement.

This is the most recognisable of the dimensions for teachers, students and observers, but care must be taken as, whilst it may look as though behaviours suggest engagement, for

example merely participating or completing work does not automatically mean a student is engaged. This strengthens the argument for the multi-dimensional approach, as the behavioural dimension combined with at least one other dimension, will be more indicative of genuine engagement. Behavioural engagement is concerned with the participation, conduct and involvement that students give to academic tasks and activities, that is the actions a student takes to learn (Bergdahl et al., 2020; Fredricks et al., 2004). This can be seen by effort, attention, participation, taking responsibility and completion of work. Fredricks et al. (2004) and Bergdahl et al. (2020) split behavioural engagement into three further dimensions. First, following the rules, asking questions and paying attention; second, actively participating in academic activities; and third, taking part in extracurricular life of the school. When students are engaged behaviourally, they support and encourage their peers and take an active interest in their learning, often finding a personal connection to it (Redmond et al., 2018), showing a link to the affective dimension (A-B), and thereby suggesting strong engagement.

2.1.2.3 Cognitive Engagement.

Cognitive engagement is described as a psychological investment in and towards learning (Fredricks, Filsecker, et al., 2016). This can be acknowledged through indicators such as students trying to understand, critical thinking, focus, concentration and deep learning. Cognitive engagement takes place as the learning takes place and illustrates the amount of effort a student will exert to understand and go beyond a desire to merely complete a task, and so is engaged in deeper learning, where students are engaged to, "comprehend complex ideas and master difficult skills" (Fredricks et al., 2004, p. 60). Surface cognitive engagement occurs when students repeat ideas, provide agreement without explanation and justification or solutions without judgement (Redmond et al., 2018) and as such this is often more likely to represent behavioural engagement, which explains how the two can sometimes

be confused. Students who display deep cognitive engagement are able to compare ideas, incorporate new materials from a range of sources, provide judgements and support their thoughts (Redmond et al., 2018). Therefore, students showing surface cognitive engagement are more likely to be distracted from their learning than those who demonstrate deeper cognitive engagement. When combined with affective engagement, Lawson and Lawson explain this as a state of flow, where students, "lose awareness of time and space" (Lawson & Lawson, 2013, p. 436). We can see a possible state where a student combines the three dimensions to bring about what could be described as 'total engagement', through an A-B-C continuum. From the three dimensions described, cognitive engagement is arguably the hardest to observe and measure, and has the least amount of literature, although this does appear to be now growing, as interest in cognition and meta-cognition grows in the current education climate. There is a suggestion that technology engages students cognitively, although the extent of the engagement is as yet is unclear (Crompton et al., 2019). It therefore relies upon self-reporting to assess whether students are operating at a deeper level and are cognitively engaged (Fredricks et al., 2004). This is seen to be the most effective way to understand cognitive engagement (Vongkulluksn et al., 2022)

2.1.3 Indicators of Student Engagement

In order to assess and measure the degree of engagement in each dimension, indicators or levels of manifestation are displayed making them observable by another person or recognisable by the individual (Fredricks et al., 2004), thereby operationalising the construct. These indicators, are recognised in the literature as being present at varying times, however, like the lack of an overall agreed definition of engagement, there is also a lack of agreement surrounding the indicators of engagement and no standardisation of them (Bond & Bedenlier, 2019; da Rocha Seixas et al., 2016; Henrie et al., 2015). It is therefore important for engagement research to attempt further clarity of approach in this area.

Using clearly explained indicators, it becomes possible to operationalise engagement and build a picture of the levels being displayed in any given learning situation in the classroom. Caution does need to be exercised, especially where indicators can be seen to overlap. Some studies disagree on which dimension and indicator is being evidenced (Bond, 2020a; Fredricks, Filsecker, et al., 2016) and different research can view the same indicators in different ways, for example, Jarvela et al. (2016) consider student interaction (with peers or teacher) to be an affective/ cognitive indicator whereas Bond (2020a) sees this as behavioural. Bond and Bedenlier (2019) see effort as behavioural whereas Lawson and Lawson (2013) see this as a cognitive indicator. Therefore, for the purpose of this research the indictors as collated from key literature will guide this research and are shown in Table 2.1. These indicators were collated and adapted from Bond (2020a) and Henrie (2015), two reliable papers that have themselves drawn from a wide range of engagement literature, to establish these key indicators. The table represents some of the most common indicators, but does not claim to provide every possible indicator, whilst recognising, "that students might experience these indicators on a continuum at varying times" (Bond, Buntins, et al., 2020, p. 4), across what we will see as the A-B-C continuum.

The idea of more personalised learning, an affective indicator used by Bergdahl (2020) and also emphasised by Shackleton-Jones (2019) and Bond and Bedenlier (2019), is an affective indicator worthy of further explanation. The concept of personalisation is, "complex and multifaceted" (Bartolomé et al., 2018, p. 2). Whilst there is a lack of a definition of personalised learning with technology (Shemshack & Spector, 2020) understanding it in relation to engagement is important. Personalised learning involves using, "teacher expertise in identifying and addressing students' ongoing individual curricular needs," including allowing students to present work in their own way, thereby strengthening affective engagement between student and teacher (Prain et al., 2013, p. 661). In the context

of this research therefore, personalised learning includes, "...giving students control over their learning, differentiating instruction for each child, and providing real-time feedback" (Shemshack & Spector, 2020, p. 14). Students can therefore personalise their work in a way that suits them, bringing their own style to the work they are doing, for example choosing to use colours, diagrams or a particular heading style which they can then use technology to change and correct as they see fit. It also allows students to go at their own pace, working through a series of learning asynchronously whilst also receiving direct and personal feedback from the teacher. These examples show an emotional attachment, to both the teacher and to their learning. In this way, and for this case study, personalisation is in the main an effect or indicator of affective engagement, where students working at their own pace, receiving direct feedback from their teacher or making decisions about how they formulate and access their learning is observable either directly or through self-reporting.

Personalisation can also act as a cause of affective engagement, where teachers are able to set up learning focussing on the individual and by assessing students' work individually, allowing them to progress at their own pace in a lesson. This helps to develop stronger engagement (Bond & Bedenlier, 2019) building on the teacher/ student relationship in the classroom (microsystem), as the student responds to the learning being personal to them. Teachers identifying their students' individual needs and providing individual feedback in real time, using technology, is also a good example of strengthening affective engagement (Prain et al., 2013). In this way, personalisation also acts a cause of engagement as the student responds to the direct learning taking place with them and their teacher, as the teacher is making the learning personal to the student taking into consideration their students' interests and specific needs (Shemshack & Spector, 2020).

Where previous research identifies many of the indicators in Table 2.1, what is less clear, is what any one indicator looks like in situ when it is operationalised. This is the next

level and the engagement literature does not go this far in explaining precisely what the indicators involve and so are explained superficially or not at all (Bergdahl et al., 2020; Bond, Buntins, et al., 2020; da Rocha Seixas et al., 2016). There is much need of the next level of definition despite Schindler et al.'s (2017) explanation that keeping it broad is better than being specific, as it will provide a richer explanation of engagement. However, this raises the question of what precisely is being explained? This research rejects the proposal that more general and non-specific recognition of indicators is more beneficial to an understanding of engagement, because the more general means more nebulous as previously highlighted by Greener (2022).

Table 2.1

Indicators of Engagement by Dimension adapted from Bond 2020a and Henrie 2015

Affective	Behavioural	Cognitive
Sense of belonging	Effort	Purposeful
Personalisation	Attention	Integrating ideas
Curiosity	Study habits	Critical thinking
Sense of Wellbeing	Attendance	Going above and beyond
Positive attitude	Attempting	Self-regulation
Interest	Completion of work	Reasoning
Positive interactions	Positive conduct	Trying to understand
Feeling appreciated	Action/ initiation	Reflection
Pride	Participation	Focus/ concentration
Excitement/Enjoyment	Taking responsibility	Deep learning
Desire to achieve	Asking for help	Justifying decisions
Enthusiasm	Time on task	Elaboration

Bergdahl (2022) has recently tried to operationalise engagement at the micro level, but her research is about engagement in an online environment, as opposed to in a classroom, so is not in harmony with the research. By being more specific there is a greater opportunity to recognise, and therefore understand engagement in the classroom.

Operational clarity could be potentially very helpful, as it could make clearer what is happening but more importantly help understand what level of engagement is taking place. For example, understanding how interest manifests itself, and how it is different to enjoyment. Understanding effort and participation and how can we separate the two. How we observe curiosity and enthusiasm and how a student shows reflection or deep learning. These and other questions remain unanswered in the literature as the typology for engagement does not go deep enough with overlap between dimensions and indicators (Schindler et al., 2017). The indicators in Table 2.1 above, taken from the literature helped to form deductive codes to provide the micro level analysis needed, and will be explained in the methodology chapter.

As with the definition of engagement and the explanation of the dimensions, making clear which indicators suggest which dimension of engagement is present is important. Even though there is disagreement, using actual students' and teachers' perceptions will help to go to the next level and classify affective, behaviour and cognitive engagement. This will help to ensure consistency, therefore providing clear and distinct indicators and dimensions of engagement to analyse (Lam et al., 2012). Yet, even in the most important studies (Appleton et al., 2008; Bergdahl et al., 2020; Fredricks et al., 2004; Lawson & Lawson, 2013), this specific clarity is not explained and therefore greater propensity for confusion exists.

2.2 Technology Enhanced Learning (TEL) and Chromebooks

Researching educational technology has been likened to opening a Pandora's Box, with a huge range in terminology and applications used making searching, managing and evaluating this corpus of knowledge challenging (Pretto & Curró, 2017). The focus of this

research is on TEL, where one-to-one Chromebook technology is used to enrich learning. Where technology is used in any form it is with a view to making the learning process better. For this study, TEL is defined as being, "the use of computer-based technologies, including smartphones and other smart devices. (Sen & Leong, 2019, p. 1). In this study, the focus is on the Chromebook, a computer-based technology, where students have access to different ways of learning in a secondary school classroom setting.

Chromebooks are devices developed by Google that have no hard drive and rely on the Internet, made by different manufacturers, and in the main are cheaper than many laptops (Haselhorst, 2017). Introduced in 2011, they were designed as an Internet appliance which required an Internet connection to work, with all Chromebooks powered by the Google ChromeOS (operating system). All applications are accessed via the web and all data is stored remotely, in the cloud. Adopted across the USA in large numbers, they have also been used in many UK schools, increasingly replacing iPads which were the device of choice for many schools. The benefits of Chromebook use for schools are mainly twofold in that they come ready to access the Google Apps for Education (GAFE), including Google Classroom, and once the devices have been procured, this educational suite of tools is free to use. Criticisms have been raised in that they do not function well offline and printing capabilities need to be cloud based, which can cause problems. Their ability to run Microsoft Apps is dependent on accessing the online versions of these applications, which without a connection is not possible. A number of studies have explored the use of Chromebooks, including the impact of Chromebooks in schools (Ahlfeld, 2017), and the implications for classroom practice (Radice, 2018) as well as impact specifically on engagement, which are explored below.

2.3 Student Engagement and Technology

Whilst the literature on technology in education and the literature on student engagement in academic settings is substantial, the same cannot be said of student engagement *and* technology in education, especially so in a secondary school context (Bergdahl, Fors, et al., 2018; Henrie et al., 2015). As computers and mobile devices have become ubiquitous in secondary school classrooms, understanding more about how students engage with their academic studies using this technology, and furthermore, how the expectations of students and teachers is managed, is becoming more and more important (Bergdahl, Fors, et al., 2018; Bergdahl et al., 2020; Howard et al., 2016; Schindler et al., 2017). As Bond et al. (2020) state, "it is not merely a case of technology plus students equals engagement," the realities are far more nuanced (p. 4).

The difficulties in understanding and tracking the literature surrounding educational technology across multiple journals and texts to see trends and shifts in approach is noticeable (Baydas et al., 2015). Studies which have attempted to address student engagement and technology focus on a diverse and wide range of areas, including engagement and; flipped learning (Bond, 2020b), context (Xie et al., 2019), collaborative learning (Northey et al., 2018), beliefs, online attitudes and behaviours (Redmond et al., 2018), online perceptions (Bolliger & Halupa, 2018), online environments (Groccia, 2018), measuring engagement (Henrie, 2016), blogs (Cakir, 2013), gamification (da Rocha Seixas et al., 2016), gaming, gender and non-native students (Bergdahl & Nouri, 2020) use of clickers (Han & Finkelstein, 2013), online courses (Dixson, 2010), performance (Bergdahl et al., 2020), and developing conceptual frameworks (O'Brien & Toms, 2008). This is a growing body of literature but is difficult to track because the wide variety of technologies involved and the wide variety of issues.

Whilst young people arguably use technology extensively and skilfully to navigate through their social life, the same cannot be automatically assumed when they navigate their educational one, as students need guidance especially at the start of using new technology for learning objectives (Wang et al., 2014). Indeed, where a teacher presumes using technology will engage, the opposite may be true, as was found by Stone (2017) in his study of the introduction of a one-to-one initiative, where there was a desire amongst school students to return to more traditional methods of teaching and learning. Where studies attempt to understand the *introduction* of technology, researchers need to understand the idea that any increase in engagement may be the result of novelty and students wanting to 'use a laptop' as part of their learning (Bergdahl, Fors, et al., 2018; Hur & Oh, 2012). In this research, where the use of Chromebooks is well established, anticipating the novelty factor wearing off does not play a part (as the majority of students have moved passed the novelty factor), thus removing a key issue identified by others (Bergdahl, Fors, et al., 2018; Hur & Oh, 2012). Indeed, Swallow (2015) found that post year one, dissatisfaction with the one-to-one device was clear. An alternative, view is that secondary students today increasingly display what has been termed 'digital maturity' where schools use technology appropriately and teachers are prepared effectively to utilise and then help develop the skills of their students to use the technology appropriately and effectively for their learning (Begicevic-Redjep et al., 2021).

Engaging students using technology is becoming more and more challenging, given that technology is not only an accepted feature of education but also an accepted feature of students' daily lives, especially so amongst secondary aged students (Escueta et al., 2017; Henrie et al., 2015; Schindler et al., 2017). Often the line between the two can become blurred and as many school children have been regarded as digital natives (Prensky, 2005), there can sometimes be a determinism that views any introduction of technology as automatically resulting in better outcomes (Magana, 2017). The digital native theory has now

been successfully challenged as too simplistic, as it is accepted the use of digital technology for learning is subtle and complex (Spiegel, 2021; Wang et al., 2014). If we accept students' increasing awareness and ability to handle and manipulate technology, we accept they have become adept at using technology in a variety of places for a variety of reasons, meaning no longer can technology be automatically relied upon to be a key driver of engagement, if that ever was the case. In short, it seems as though technology is becoming more accepted as part of the school classroom landscape, and less of a novelty factor.

When technology is introduced into the traditional classroom, it is more often than not accompanied by traditional teaching methods which do not include specific pedagogical strategies to make the best use of the technology to engage students (Bergdahl, Fors, et al., 2018; Håkansson-Lindqvist, 2015). That is, teaching can often be teacher led, lecture style, rather than student centred and student led, without considering the change in the classroom dynamics due to the introduction of technology. By identifying the aspects of technology use that positively engage students, teachers will be better placed to harness the power of technology for positive academic learning, through the design and planning of lessons as identified in previous studies (Bond, 2020a; Castañeda & Selwyn, 2018). Used ineffectively, technology could have a different impact and disengage students and hinder learning or else not lead to any meaningful learning at all (Howard et al., 2016; Hur & Oh, 2012). There are several key areas that emerge from the literature which prove instructive in our understanding of student engagement in TEL as we move towards the focus of this research, engagement and one-to-one technology.

2.4 Student Engagement *and* One-to-One Technology

The literature surrounding the use of one-to-one technology and engagement is not a wide, coherent and easily recognised body of knowledge, and focus on schools in the UK is not substantial. Engagement studies have many variables as seen above, especially so in the

one-to-one environment and as such we must draw upon multiple aspects of educational technology and engagement research, in different settings to place this research in context (Håkansson-Lindqvist, 2013).

One-to-one technology refers to an approach made by an educational establishment to provide a device to students for the delivery of academic learning, in the ratio of 1:1, one device for each student (Delgado et al., 2015). This is sometimes confused with BYOD (Bring your Own Device), which allows students an element of choice on a device they own which is then taken into school. The one-to-one approach provides the same device for each child and therefore allows students and teachers to work on the same level, providing equality of opportunity. Furthermore, it alleviates worries about specification, connectivity and access to key learning materials. Teachers can plan lessons in the knowledge that every child has the means to access the lesson in totality. One-to-one initiatives are now widespread throughout the world but especially so in the USA, Australasia and Europe (Connolly, 2018). Internationally, investigations involving one-to-one initiatives show they may lead to benefits in teaching and learning related to student engagement and achievement (Bergdahl, 2022; Håkansson-Lindqvist, 2019; Harper & Milman, 2016; Penuel, 2006; Reichert & Mouza, 2018), which, alongside the ubiquitous nature, suggests further understanding is much needed.

Research in the field of one-to-one initiatives have been described as, "…complex, broad and somewhat difficult to interpret" (Håkansson-Lindqvist, 2013, p. 630) as exemplified by the amount of research focussing on the use of one-to-one technology. There exists a number of studies focussing on a variety of topics such as one-to-one and; educational change (Håkansson-Lindqvist, 2015), student achievement (Williams & Larwin, 2016), teaching and curriculum change (Williams, 2017), one-to-one initiative implementation (Vu et al., 2019), teachers' pedagogical beliefs (Steffensmeier, 2016), teacher

practices (Lindsay, 2016; Maffia, 2019; Reichert & Mouza, 2018) and student/ teacher relationships (Higgins & Bushell, 2017). These studies examine different educational settings and different devices, looking at differing areas, in different countries. This suggests an interest in one-to-one technology and its use, but studies in the UK are lacking. The need for engagement studies in the UK has been further heightened by the increased use of technology during the 2020-2022 COVID-19 global pandemic. This period saw school closures putting pressure on schools, teachers and students to use technology to continue children's education, where one-to-one technology came into its own, showing it is an evolving and currently important field of study. In this case study, the Chromebook is the device of choice.

The studies focussed on student engagement *and* one-to-one technology specifically using a Chromebook, are fewer in number and largely focused on schools in the United States of America (Charleston, 2017; Fiorillo, 2015; Haselhorst, 2017; Sahin et al., 2016). Each of these studies employs a qualitative research methodology, designed to explore the impact of one-to-one Chromebook technology on the engagement of students. Sahin et al.'s (2016) study of teachers' perceptions of a one-to-one initiative, found that that teachers' years of experience did not impact on their perception of the effectiveness of the Chromebook, but additionally, teachers' attitude towards technology decreased after the first year of use, becoming more negative due to the lack of support and inconsistent whole school policy from school leaders, especially regarding addressing student distraction with the device. This supports the idea of the novelty wearing off as routine and consistency needs to kick in. Sahin (2016) did not include student perceptions in his study. Fiorillo's (2015) dissertation addressed teachers' perceptions of student engagement with a one-to-one Chromebook in a secondary aged school, and found both positive and negative insights from the survey completed by 48 teachers across three schools. Fiorillo (2015) wrote, "As Chromebooks are a tool, they are limited by the skill of the user. As the skills of the teacher

to create engaging lessons are developed, the Chromebooks will become more useful" (p. 114). Fiorillo (2015) went on to recommend the use of teacher focus groups to, "create context and give deeper meaning to the survey results" (p. 117). Perhaps importantly, the respondents in this research did not find the Chromebook had a positive impact on student engagement initially and that teachers shared concerns about students becoming distracted, as well as a decrease in personal interaction between students and between students and teachers. However, it also found that academic standards improved from those using the Chromebook in years two and three of the initiative, which suggest returns come more than one year after introduction. Fiorillio (2015) did not include student views in his research.

Haselhorst's (2017) research adopted a qualitative, phenomenological approach which utilised surveys, focus groups and interviews, to understand the perceptions of teachers and school administrators when asked about one-to-one Chromebooks and student engagement. The study took place across six schools, involving a total of 26 participants, and identified several key themes from the teacher respondents including increased student engagement, more collaboration between students, more chance of student distraction, more web-based opportunities and resources, increased personalisation, technological problems and more student-led instruction. Haselhorst did not consult students as part of her research. Charleston (2017) used a mixed methods action research design to frame his research into one school's one-to-one Chromebook initiative, which focussed on the perceptions of teachers' training leading up to the use of the technology and then secondly the impact it had on student engagement. It employed surveys, focus groups and interviews of teachers and administrators. The research showed that teachers perceived students to be more engaged in their lessons and as a result, student learning was improved, although this was tempered by a concern surrounding students' ability to use technology without the use of previous knowledge. Charleston (2017) did not include any student views in his research.

The research detailed in this section is very much in line with this research in terms of methodology and aims in trying to understand what is happening with one-to-one Chromebooks in the classroom. However, there are important differences which help make this research original, namely the use of student perceptions alongside those of their teachers and a more focused use of the concept of engagement, where the dimensions and indicators are placed far more prominently in the data collection and analysis phase, yielding a stronger conclusion when discussing student engagement with the Chromebook device.

2.4.1 Teachers and Technology

This thesis accepts the premise that teachers are in control of the classroom environment and of what takes place therein, and argues teachers are therefore central to student engagement with technology in the classroom. Importantly, Bergdahl (2022) is of the view, "Research has shown that teacher perceptions of student engagement affect how they interact with students" (p. 1). If technology is to be deployed effectively to engage students and therefore bring about positive academic outcomes, teachers' perceptions are important, and may be influenced by evidence of how their students view technology use in the classroom. Teachers also need to be empowered with the ability to use the technology in question and collaborate with their students to understand how best to use technology effectively (Heflin et al., 2017) and understand when students are, and are not, engaged. If teachers are not suitably trained this can lead to worse outcomes where it could be possible for teachers to be indiscriminately using technology under the pretence that it is engaging their students academically (Bergdahl, Knutsson, et al., 2018; Hur & Oh, 2012). In some cases, one-to-one initiatives have been abandoned due to a lack of understanding as to how to use the device (Reichert & Mouza, 2018). It could even lead to a void of skills in children as teachers assume they have the ability to use technology when this is not necessarily so, or else it is employed for no discernible reason (Spiegel, 2021; Thompson, 2013). The focus

here is on when, where and why technology is being used and how best to try and ensure students are engaged in the process.

Bergdahl et al.'s (2018) intervention study explicitly looked at the use of technology to enhance engagement, collaborating with teachers to design strategies that would engage students using learning technologies. They identified the possible barriers to student engagement, such as concentration/ distraction and the activities involved and how they might be overcome. An iterative process, using a design-based research (DBR) methodology, it allowed teachers and researchers to think about specific technology based lesson design as opposed to using traditional methods with a technological tool (Bergdahl, Knutsson, et al., 2018). It found that through collaborative interventions, greater opportunities were created for engagement and more time on task, as compared with traditional teaching in an analogue setting. Although limited in terms of time frame (8 lessons and three weeks) the research nevertheless gives a good indication of what can be achieved in a small scale study where teachers think specifically about their use of technology, to provide the nuanced and context specific approach called for by Lawson and Lawson (2013). It also highlights how important a two-way process of communication between teachers, placing students at the centre of the thinking is, to ensure that technologies are engaging.

In attempting to understand the phenomena in context and appreciating that often technologies can be introduced for the sake of technologies, Bergdahl et al. (2018) make some informative observations acknowledging this area requires further research. In asking how learning technologies were being used and what challenges and possibilities technologies present towards engagement, they attempted to provide a snapshot of what is happening in the classroom. This is a valuable viewpoint to inform future understanding, as in-situ research is lacking as to how technologies are actually being used in educational settings as opposed to how we would want them to be used (Christodoulou, 2020; Selwyn et

al., 2017). The findings confirm how important the teacher is in the process of TEL and how different approaches to technology yield different levels of engagement. Whilst some studies indicate that educational technology increases engagement, Bergdahl et al. found this could not be assumed, concluding the pedagogical approach was crucial, further supporting her earlier work and reinforcing the concept of the importance of the teacher (Bergdahl, Fors, et al., 2018; Bergdahl, Knutsson, et al., 2018). The study also revealed that whilst students may have found the lesson fun or alternatively boring, some still engaged in the activity of the lesson, meaning that engagement with technology can often be invisible (Bergdahl, Fors, et al., 2018).

The importance of the teacher is significant when looking at using educational technology in the classroom setting, especially when looking at engagement. Hur and Oh (2012) had previously conducted an intervention to try and engage students who were seen to be disengaged with school, as they believed that whilst students were physically present in school they were not actively engaging with the process of learning. By giving a laptop computer to each student specifically to engage them, they had identified that technology had a more positive impact for special needs and 'at risk' students, which sits slightly at odds with Bergdahl et al.'s (2020) conclusion that highly able students engage more positively with technology than those of lower ability, and the assertion that it is not ideal to only focus on one digital technology. Moreover, Hur and Oh (2012) identified that engagement with laptops began to fade after they had been used to study projects for some time, when the novelty was wearing off, and students began to use the technology inappropriately. This is an interesting proposition to test, as if technology is to be used in the long term, understanding how children use it will be important. Children who become bored or 'disengaged' in a traditional classroom with traditional tools (e.g a textbook) have limited options as to alternative behaviours, whereas a student in a TEL environment is able to wander into other

areas online, whilst all the time looking as though they are on task and giving an impression of engagement to the untrained or unsuspicious eye.

Furthermore, Hur and Oh (2012) found teachers were under pressure to formulate lesson activities with the laptops. The inference to be made here is that teacher knowledge and knowhow also impeded the development of the use of these devices for engagement, again returning to the importance of the role of the teacher. This research will look to anticipate this variable as many teachers in this case study have been using this technology for at least three years or more. Indeed, especially post COVID-19, teachers in this case study research have been incorporating the technology into lessons and as such are more in tune with using them naturally, without compulsion, for the learning process. This is an important distinction to make. Even though much has occurred since Hur and Oh's study took place, it highlights the need for teachers to be knowledgeable, skilled and able to use technology in the right way for the right ends, a concept that Yankelevich (2017) also corroborates.

A lack of teacher training can be viewed as a key reason for the ineffective use of technology, as many teachers feel overwhelmed by what is seen as an additional burden, where planning lessons with technology initially often takes far longer than their traditional practice (Charleston, 2017; Hur & Oh, 2012). Linking closely to this is the need for the curriculum to be adapted to embrace technology where the design of learning activities that engage students are crucial, making Bergdahl's (2018) study potentially an important forerunner, where teachers are able to collaborate with each other and importantly with researchers to design learning opportunities that suit their own educational technology context. Technology must be used in the right way and for the right purpose. Ultimately, Hur and Oh (2012) reported that technology led to a decrease in engagement, and whilst this may have been partly due to cultural phenomenon, the teachers' lack of ability to plan with technologies was a factor in the result.

Employing traditional pedagogical approaches, which are teacher focussed and teacher led, with technology may not be harnessing technology in the most effective way. The literature suggests the assessment of implementation of one-to-one initiatives are scarce, but some studies question the long term effectiveness of this approach to learning (Swallow, 2015). One of the key reasons cited for the introduction of educational technology in the form of one-to-one, is to increase student engagement, yet there appears to be a case to suggest that post year one, such initiatives can stall and stutter, likened to falling off a cliff (Swallow, 2015), although this cannot be assumed to be the case in every context, as seen in another study where long term improvements in academic results was achieved (Fiorillo, 2015). Whilst some failures could be due to technological issues such as connectivity and reliable hardware, Swallow (2015) found the main issue was the use of new technology to complete old tasks, and that new innovative ways of teaching with the technology were not being embraced by teachers. This appears to be the main drawback, although is not a widespread viewpoint. Using new, powerful technology to do old and traditional practices, rather than embracing a new approach that is more student centric and empowers them to take more control. When previous teaching practice is combined with an untrained, or even ambivalent staff body, the potential for technology to underachieve is significant.

2.4.2 Students and Technology

Viewed in one way, the use of one-to-one technology in school is a controversial issue, with limited results in terms of student progress and learning being reported (Cuban, 2001; Hattie, 2009). However, as time has moved on this is being challenged. As TEL becomes better understood and is used more widely, it may be reasonable to suggest the power of technology to improve academic outcomes has progressed and is more assured as not only can it be seen that technology plays a positive role in academic outcomes, but it can also have wider benefits including improving skills, productivity and communication as well

as greater engagement in school (Håkansson-Lindqvist, 2015). As stated, the COVID-19 pandemic will have only accelerated this and helped students fortunate enough to have been given technology, to utilise it in many ways.

Recent empirical work by Bergdahl et al. (2020) has tried to understand engagement and TEL in a secondary school context and its relationship to student ability, showing how low, average and high performing students engage and conversely disengaged when involved in TEL. This study was able to demonstrate through student questionnaires and interviews, that low and high performing students engage differently when technology is present, understanding digital technologies in a broad sense to include computers, tablets, smartphones and other similar devices, viewing them as tools (Bergdahl et al., 2020). The potential issue with having such a broad approach, is the lack of differentiation between the user experience and bias regarding the usefulness of the tool being used, which can heavily influence the user experience and therefore their perception of engagement. Bergdahl et al. (2020) argue that research which focuses on only one technology to measure engagement will not be useful. However, viewing any one tool in depth will reveal possible evidence for their use in a specific context, to foster greater engagement, especially when the device is used regularly, across the curriculum. It may also pave the way for other tools, such as interactive whiteboards, that may prove popular with students and teachers, akin to the previous intervention study, which centred on the use of the specific rather than the general (Bergdahl, Knutsson, et al., 2018). Asking students to self-report based on their non-specific/ general technology use, will not provide evidence moving forward to inform specific pedagogical practice as it will be difficult to know which technology is or is not engaging– asking them for views based on a specific type of technology will provide the researcher with greater surety, to then enable specific technological pedagogical techniques to be implemented. Furthermore, it could be possible that students feel engaged when using the technology for

one task but not another, or else forget that technology was even used (e.g. the use of a clicker or smartboard for example). In being general there is a lack of focus and uncertainty about what is affecting engagement. A further limitation in Bergdahl's work is the approach of examining students utilising their technologies without any monitoring in place. By facilitating student's ability to switch to social media and converse with friends etc will naturally be a temptation for students, especially those of a school age. Where schools provide the technology and control its access to distracting applications, we have a better chance of seeing technology being used for mainly academic purposes.

Qahri-Saremi and Turel (2016) conducted an empirical study of adolescents utilitarian and hedonic use of IT across the entire USA, viewing the use of technology as a double edged sword capable of helping children to both engage and disengage from schoolwork, dependent on the technology tool being employed. It is a study primarily concerned with engagement with school as a whole, as opposed to drilling down into the specifics of the classroom and specific activities involving the use of digital technology to enhance academic progress, but it does help to show how technology can be used as a key tool to engage students in the process of learning, connecting different aspects of technology use, such as social media and school IT, to the dimensions of engagement. However, the self-reporting survey used, whilst keen to explore the multi-dimensional engagement construct using a mixture of mainly closed questions, only included two questions, both relating to the use of technology, both focused on the number of hours spent using school based and hedonistic technology, meaning any deep insights into technology use were limited.

Students' instinct seems to be towards using technology socially. The assumption that students want to, are able, and can use technology for their education is not a given, as they may not be empowered, motivated, or interested to do so and will require support from their school to do so in an educational context (Bulfin et al., 2016; Steffensmeier, 2016). The

technology in their hands, be that a phone, a laptop, or a tablet presents many different uses, unlike the more traditional teaching tools such as the text and exercise book. Understanding why certain students may or may not engage with their academic work when technology is used, presents an interesting challenge as the line between social and academic tech use becomes more and more blurred. Additionally, the idea of technology being more of a distraction via multi-tasking is a very real one that both teachers and students acknowledge (Aagaard, 2019; Håkansson-Lindqvist, 2015; Selwyn & Aagaard, 2021). Multitasking gives students the ability to open multiple tabs and look at different things simultaneously, and this has been shown to be detrimental to learning (Kirschner & van Merriënboer, 2013; Kirschnerab & Bruyckerec, 2017). Therefore, when looking at student engagement and technology, the context of the learning environment becomes crucial and should not be overlooked.

2.5 Theoretical and Conceptual Framework

The challenge of applying theory to educational technology is made harder by the constantly changing landscape, characterised by the constant growth in the power and potential of machines placed in the hands of teachers and students (Bower & Vlachopoulos, 2018). The school classroom, even without technology, is ordinarily a socially complex arena to understand. With the introduction of technology, the situation is made even more complex. As Mishra and Koehler argue, "Developing theory for educational technology is difficult because it requires a detailed understanding of complex relationships that are contextually bound." (Mishra & Koehler, 2006, p. 1018). This suggests without an understanding of the relationships within the classroom, understanding the technological aspects is difficult. Developing and designing conceptual frameworks in which to understand and shape TEL has resulted in many possibilities. For example, little consensus emerged from the 21 TEL models that help create learning opportunities explored by Bower and Vlachopoulos

(2018). Because of the variety in approaches that can be made towards learning, even more so when technology is used, they acknowledged a large number of considerations, from ontological to pedagogical assumptions as well as other factors such as teacher-student interaction that add to the complexity (Bower & Vlachopoulos, 2018). What does emerge inadvertently from the literature, is a need to make any conceptual frameworks clear when undertaking research in TEL.

The conceptual framework for this research is guided by the established and accepted work of Fredricks et. al (2004) who show engagement to be a multi-dimensional construct. As such, the concept of engagement being made up of three dimensions, affective, behavioural and cognitive, within which several indicators exist, frames this research. Linked to this framework, a bioecological model (see Figure 2.1) will be used, as proposed by Bond (2020a), building on the work of Kahu (2013), the social ecological approach advocated by Lawson and Lawson (2013) and Hammond (2019) who defines it as, "one focused on the relationship of the individual to the system in which they act, a relationship which is seen as interdependent" (p. 855). This model places the student at the centre of the framework, surrounded by the bioecological contextual complexity that influences student engagement in a TEL environment. The model shows a way of viewing engagement that appreciates the complex influences involved, using Bronfenbrenner's (1979) bioecological model, which established four environmental levels within which research takes place. From the macrosystem, where the national agenda sits, with wider socio-economic and political factors at work, including government digitisation plans, to the exosystem where influences on the student include wider family, the workplace, institutional decisions and extra-curricular activities (Bond, 2020a). The meso-system shows the relationship between the micro and exosystems. The microsystem is the focus for this research where the student is at the centre, and includes the key contextual factors that

influence the engagement in a classroom setting, namely, teachers, peers, institution, curriculum and the technology (Bond, 2020a).

Figure 2.1

Bioecological Student Engagement Framework [with permission] (Bond, 2020a)
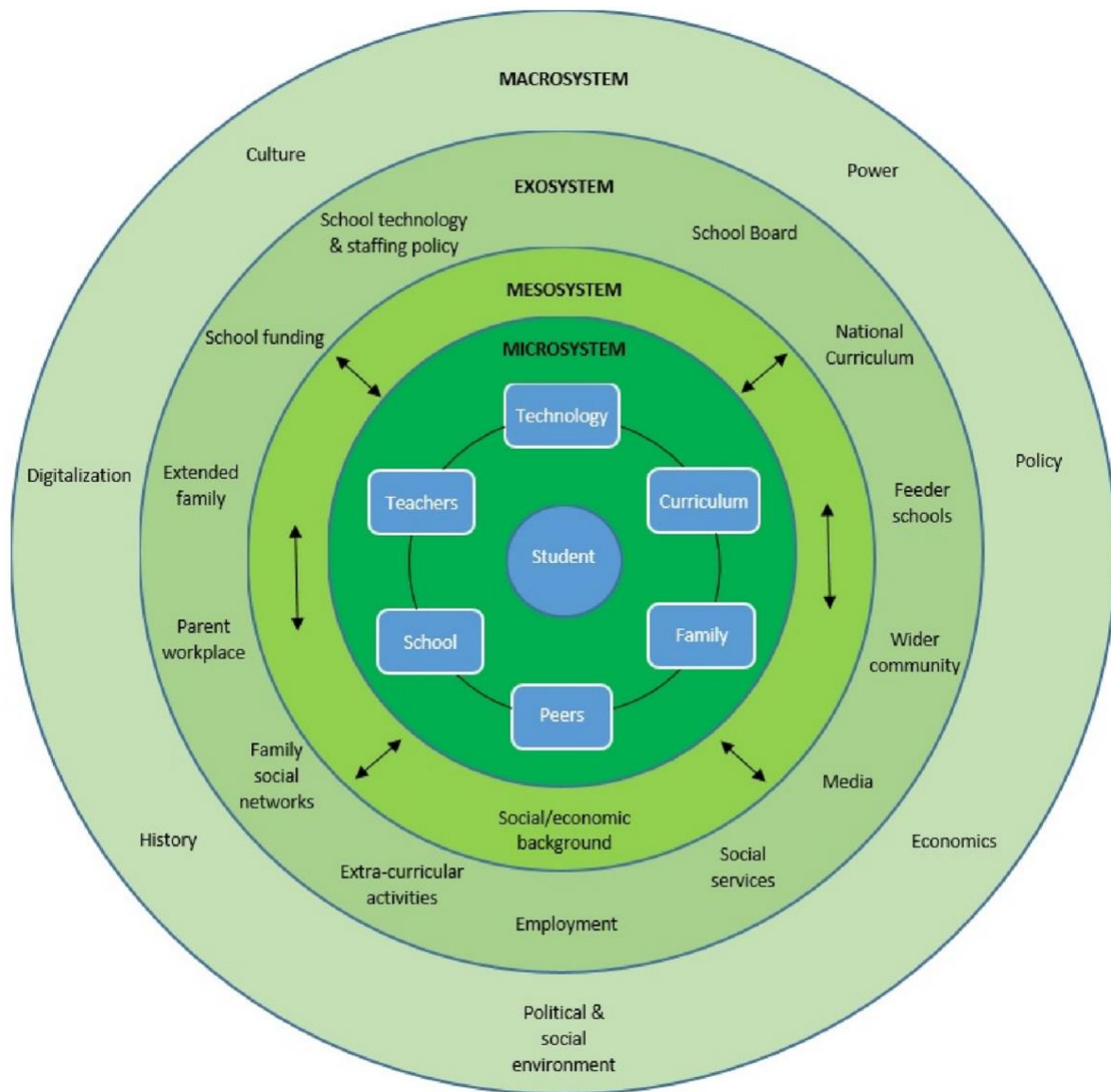
To bring the technology and engagement together, a further model can be used as developed by Bond (2020a) which further illustrates the connection between engagement and technology in the microsystem (see Figure 2.2). This shows the connection of the microsystem with the key dimensions of the engagement construct showing how the contextual elements of engagement and technology are so important. The learning environment is important for understanding technology use in the classroom, therefore this model can be made more specific to the classroom to identify key impacts on student engagement, with the circularity acknowledging there may be loops of feedback with the ecological model (Payne, 2019). In this way we begin to fuse TEL and engagement to understand the links to student outcomes, whilst acknowledging that engagement in the classroom is a multilevel construct (Wang & Degol, 2014).

Figure 2.2

Student Engagement Framework [with permission] (Bond, 2020a)
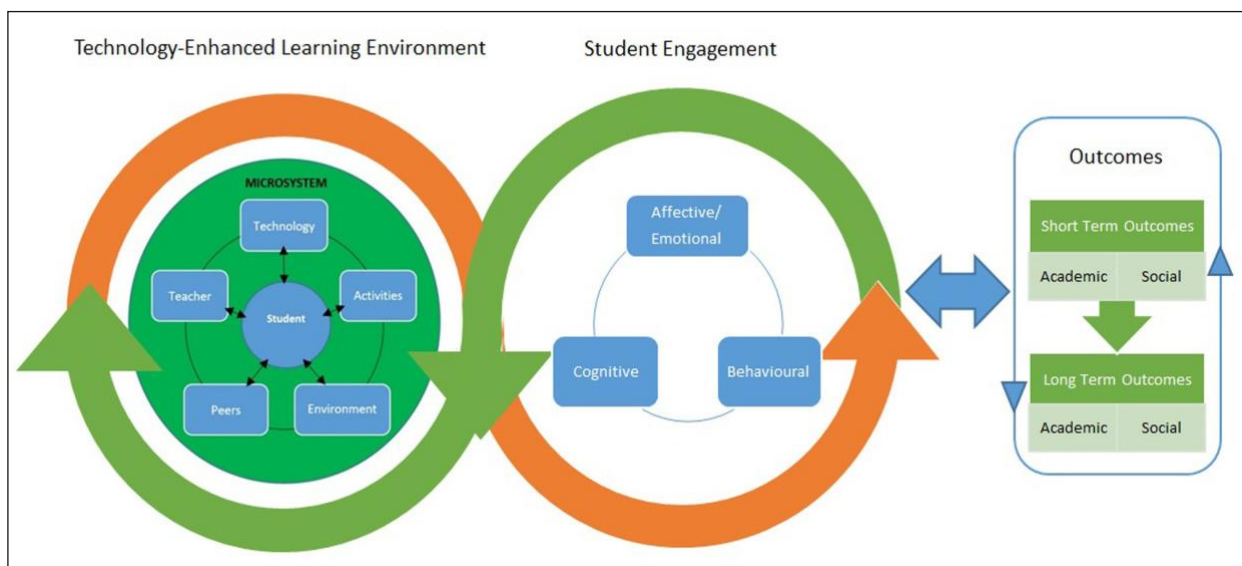
The elements of the microsystem in TEL need to be clearer as context is key, and engagement indicators will help achieve this clarity. In a classroom with teachers, peers and technology is potentially very different to being in a bedroom with siblings, parents and technology, as many students were during the emergency remote learning period during COVID-19 pandemic. The social dynamic between student – peers - teacher - technology is different to a classroom without technology, as arguably the technology provides a reliable and predictable constant. Understanding the technology, the activities, the social activity and the student and teacher perceptions in the microsystem will allow greater understanding of how teachers can utilise technology in the classroom in the future.

The ecological model will allow both engagement and technology to be acknowledged and understood, particularly as student engagement should be viewed as a "psycho-social process" (Kahu, 2013 p.768), meaning engagement and technology use are viewed as being influenced by both individual and institutional factors in the microsystem. Internal psycho-social factors which influence student engagement include student technology skills, their self-efficacy, discipline, interest and ability to self-regulate (Bond & Bedenlier, 2019; Reschly & Christenson, 2012). As ecology deals with the relations of organisms to their surroundings, so this research will explore how technology engages students in the environment of the classroom, the microsystem, building on previous research which has also attempted to use an ecological framework (Bundick et al., 2014; Zhao & Frank, 2003) to help describe and understand technology integration within educational contexts. Within this framework, schools function as part of the ecosystem where there are many existing species (stakeholders) as well as invasive species (technologies) to be examined and understood in their environment (the classroom). This research will build on this model by identifying the classroom as an explicit and important part of students' learning environment.

2.6 The Current Study and Research Questions

Research that involves technology's impact on engagement, acknowledges a realisation that technology is rapidly changing and has been over many years. With the ubiquitous nature of technology in school has come an acceptance of it as a normal part of everyday life despite the uses of it in schools as being neither agreed nor accepted and even though there has been a reliance on technology to facilitate learning during emergency distance learning period of 2020, due to the COVID-19 pandemic. Consequently, more than ever, technology's impact on engagement is rapidly becoming an important feature of students' school experience (Bond & Bedenlier, 2019). Based on this premise, greater use of technology in school should mean that learning, and the use of technology to facilitate it, is focused on the learning and not the technology, thereby assuaging fears among some that technology has a limited impact on student academic outcomes (Hattie, 2009) or is actually a distraction from the business of learning, as opposed to a tool for learning (Healy, 2016; Schuetz et al., 2018; Selwyn & Aagaard, 2020; Shernoff et al., 2016). Like the child who receives a brand-new textbook or exercise book at the start of a school year, the novelty quickly fades. As the technology becomes more familiar, there is potential for less distraction or disengagement, as the novelty factors dissipates. With more time and further entrenchment of key technologies in education, the same principle *could* be applied.

Considering the literature, this study will look at a Chromebook initiative not as it starts, but during year four, when many secondary school students and many teachers in this case study school have been working with the devices for over 12 months, alongside those who joined the school after the launch of the initiative and are using this way of working for the first time, six months in. This research will contribute to the knowledge and understanding of how technology contributes to a secondary school setting and the impact it is having on the learning environment, specifically engagement, through an examination of

one-to-one Chromebook use in this context. Uniquely, it will seek the perceptions of both students and their teachers. It is not research that is attempting to discover 'what works' (Biesta et al., 2019) or test out old frameworks used when learning with technology (e.g. TPACK, TIM, SAMR, Triple-E) but is an examination of 'what is happening' in the classroom, something that Selwyn (2018) argues is important to recognise as does Bergdahl et al. (2018). In doing so it will add to the body of knowledge attempting to understand how technology can be further utilised in education in the context of a specific device as seen from the perspective of secondary school students and teachers. The area of technology focus is often on the function rather than the hardware which raises the important question that is often considered, which is, exactly what are students engaging with? In this context, the Chromebook is a tool with which to access and engage with the learning as directed by their teachers.

This research will examine the use of 1:1 Chromebook use in a UK, independent secondary school environment and how it is perceived to impact on student engagement. The following questions will guide this research:

1. How do students and teachers perceive student engagement with Chromebook technology?

2. How do teachers report using Chromebook technology to try and engage students in their learning?

3. What opportunities and challenges do students and teachers perceive the Chromebook to have on student engagement?

2.7 Chapter Summary

This chapter has showed how the concept of engagement continues to provide educationalists with the stimulus to further understand it, especially in the context of TEL, despite there being a lack of consensus over the definition of the construct. Informed by the literature, the chapter has set out the three engagement dimensions and their meaning, to establish the affective, behavioural and cognitive dimensions as the focus of this research, within which indicators help to operationalise the construct. This has been placed in the wider field of literature on the use of technology in education. It has explored the research on student engagement and technology and then attempted to bring the two strands together to identify gaps in research on engagement in a TEL environment. It identifies UK independent secondary schools in the UK, as one such gap and therefore focuses upon this area to further understanding of TEL and engagement. The literature shows there remains an under researched view of engagement in-situ in secondary schools. The theoretical framework is introduced setting out how the research will be guided, using bioecological theory, before the current study and the research questions are introduced.

By exploring what is happening in one case, with one technological tool, we will take a journey of understanding students' and teachers' perceptions about engagement and how teachers may look to adjust their practice (or not) in the future.

Chapter 3 Methodology

This chapter provides an examination of the philosophical assumptions behind this research and the methodological approach taken. It explains the sample of students and teachers and the data collection methods used, followed by an explanation of how the data was analysed and quality control maintained. Finally, the trustworthiness and ethical considerations are explored.

3.1 Philosophical Assumptions

This research attempts to find an understanding of the perceptions of students and teachers in the use of one-to-one Chromebook technology for teaching and learning in the secondary school classroom. It is therefore important to set out the world view of this research. The aim is not to restate or reignite the paradigm wars, but to make clear where this research sits in terms of its approach to answer the research questions set out above.

Traditionally, in the social and behavioural sciences there are three views and approaches towards the world (paradigms), which can be simply described as; quantitively (QUAN) positioned positivist researchers working with numerical data, qualitatively (QUAL) positioned post-positivist/ constructivist researchers working with textual data and mixed methodologists (MM), described as pragmatist, working with both textual and narrative data (Cohen et al., 2018; Tashakkori et al., 2021). For much of the 20th century the prevailing approach was linked to positivism, which is considered to be objective, value free, governed by a set of laws, and produces a single reality view of the world by analysing and presenting numerical data (Gomm, 2017; Johnson & Onwuegbuzie, 2004; Tashakkori et al., 2021). This has been revised through the post-positivist school of thought which, acknowledges the role of values which the positivist tradition does not (Tashakkori et al., 2021). During the last quarter of the 20th century this view was challenged by a subjective constructivist approach, where meaning is individually and collectively constructed, value-

bound, creating multiple realities by analysing narrative data and resulting themes (Johnson & Onwuegbuzie, 2004; Tashakkori et al., 2021).

The alternative third way emerged in the shape of pragmatism. This view can hold both objective and subjective points of view and appreciate diverse interpretations about reality where individual value systems are important. It advocates using the tools which are most appropriate to answer the research questions, be they QUAN or QUAL focused, and therefore are described as mixed methods (MM) (Tashakkori et al., 2021). Founded in the late 19th century by philosophers Charles Sanders Peirce and William James, pragmatism fits a MM approach as it rejects the dualistic QUAN v QUAL methodology whilst proposing amenable solutions from both viewpoints (Johnson et al., 2017). It therefore rejects the *incompatibility thesis* which suggests the QUAN and QUAL approaches to research cannot be combined as they represent opposing paradigms (Johnson & Onwuegbuzie, 2004).

As shown in the Literature Review chapter, the conceptual framework used in this research presents engagement as a multi-dimensional construct having affective, behavioural and cognitive dimensions, which are acknowledged through multiple indicators, which are either understood by participants or visible to observers. These three dimensions focus on emotions, behaviours and mental reasoning, all of which are fluid qualities affected by context, and as such require interpretation (Cohen et al., 2018). Consequently, the approach of this research is that human behaviour is not governed by a general and universal set of laws (Cohen et al., 2018), meaning a greater understanding of social situations is needed from the viewpoint of the actors involved as they self-report their perceptions.

As such a positivist or postpositivist approach would not be suitable in this research as it would not allow the researcher to satisfactorily explore perceptions, assuming a single, objective epistemological view of reality, which in turn would suggest an ontological position where an external reality exists which can be easily understood (Tashakkori et al., 2021).

Numerical data alone could not provide the in-depth explanations linked to the research questions, although numerical data can go some way to suggesting a collective viewpoint. Alternatively, a purely narrative approach in a constructivist paradigm could lead to a narrow field of enquiry, especially when analysing the use of one-to-one technology across the school. Whilst this constructivist world view is better suited to the QUAN- QUAL debate, there are still elements that would not allow the research questions to be answered fully, specifically when trying to gather views of large numbers to inform deeper and richer narrative explanations of what is happening in the classroom with one-to-one technology.

A pragmatic approach is where both objective and subjective views can be taken, dependent on the point in the research cycle (Teddlie & Tashakkori, 2009; Thomas, 2017; Waring, 2017). The perceptions of the actors involved will allow the research questions to be addressed. Therefore, this study acknowledges a real world exists although it is only "imperfectly apprehensible" (Healy & Perry, 2000, p. 120). By listening to the insights of the actors in this case (students and teachers), and using the researcher's knowledge of the world, an acceptance of the centrality of subjectivity will be taken, where it is viewed that, "people have feelings and understandings and these affect the ways that they perceive and view the world" (Thomas, 2017, p. 112). As the pursuit for absolute truth remains questionable, and the issue of technology in education is complex, a simple cause and effect approach in this research must be managed with caution. If an understanding of what is taking place with one-to-one technology is to be achieved, a mixed methods approach, in a pragmatic paradigm will afford the best opportunity to answer the research questions, using the best method for each research question, accepting the Teddlie and Tashakkori (2021) view that all research lies along a QUAL-MM-QUAN continuum. When looking at social sciences, and more specifically at schools and education, it is not always possible to view phenomenon as black or white, qualitative or quantitative, and whilst the nature of this research is more towards a

constructivist stance, it is by acknowledging the world as 'mixed' that a better understanding will be gained (Cohen et al., 2018).

Therefore, the most suitable way forward is to adopt a pragmatist view, using both QUAN and QUAL evidence in a sequential MM design, to enable the research questions to be explored and answered, with QUAL as the driver ((quan + QUAL) -> QUAL). A case study is a prototype of mixed methods research (Cohen et al., 2018) and therefore is an ideal vehicle in which to approach technology in education and can incorporate both QUAL and QUAN approaches to research design (Yin, 2018). It is to case study methodology we now turn.

3.2 Case Study Methodology

The case study is considered by some as a contested area of research, which is neither "straight forward or uncomplicated" (Schwandt & Gates, 2018, p. 341). Whilst trying to provide a precise definition is needless (Cohen et al., 2018), and described by Schwandt and Gates (2018) as a distraction, some understanding of the nature of a case study is important in understanding this research and how it attempts to answer the research questions. A case study provides an opportunity to understand real people in real situations, where the researcher has little control over events (Cohen et al., 2018; Yin, 2018), lending itself to cause and effect questions, that ask why and how, whilst recognising that context is a powerful determinant of both (Cohen et al., 2018; Yin, 2018). What comprises a case is not always straight forward and can vary, as it could be an individual, a group or indeed a whole school, where the case and the context can be blurred (Day-Ashley, 2017; Schwandt & Gates, 2018; Yin, 2018). For the current study, it will not be necessary to examine every aspect of school life, but only those areas that are pertinent to the use of one-to-one technology in the classroom for the purpose of learning (Verschuren, 2003).

Case study is an appropriate methodology for this research as it will attempt to find a greater understanding of the idea of engagement and technology in one case, one independent, co-educational, day and boarding school for children aged 11-18 years old in the United Kingdom. The case will be the students and teachers within the school who use one-to-one Chromebook technology for learning and teaching, and will attempt to reveal the complex and dynamic context of a real-life situation, including human relations, academic study and the impact of technologies on them (Coleman, 2017). As a case study, the research will allow the reality of the situation to emerge and present an understanding of a real-world case where the contextual conditions are particularly relevant (Yin, 2018). The case study approach lends itself to this research in a way that an experiment, survey, archives and history does not, as these methods cannot answer the research questions satisfactorily, whereas a case study lends itself to using QUAN and QUAL methods and techniques that know no bounds in a MM study (Schwandt & Gates, 2018). Whilst this approach, like many other research designs, can be messy and complex (Tight, 2017), it provides the right approach in this context to discover more about one-to-one Chromebook technology use and its impact on engagement.

Research interests are not always neat and tidy with a natural way forward, and so for this research, the advantages of a case study outweigh these perceived weaknesses, using MM in a pragmatic paradigm (Seidman, 2019). The key strength is how case studies are grounded in the perceptions of those who contribute to them. A distinctive example of real people in a real situation (Cohen et al., 2018; Tight, 2017) which make the reading and understanding of the process relatable and the results accessible for those in a position to use them. In this research, making results accessible to school leaders and to teachers is important and as such, this case study provides the potential to reach the appropriate audience practically and meaningfully. A case study can also provide a more in depth, richer

description of people's real experiences, appreciating the context at a deeper level, allowing the data to speak for itself rather than being heavily evaluated, judged and interpreted by the researcher (Cohen et al., 2018). Linked to this, a case study has the potential to provide insights which can then provoke action towards a certain end, without which it may prove difficult to know how to proceed. The reader is also able to understand and make subsequent judgements based on the case study findings. Finally, the process of a case study, drawing from multiple strands of data then transformed into evidence, also allows a focus on the how and why, which other approaches lack. As such, this research is being produced by teachers and students for teachers and students.

However, criticisms of the case study approach do exist. Some believe the results are not generalisable, and are not easily cross referenced with other studies, leaving them open to bias and subjectivity (Cohen et al., 2018; Tight, 2017; Yin, 2018). Bias and subjectivity are seen as an ever-present danger in case study research, but this is a well-designed study, which is clearly articulated and will address any issues of manipulation. However, the purpose of case studies, is not necessarily to produce a generalisable result that can be applied directly to other cases (Day-Ashley, 2017; Schwandt & Gates, 2018). This research is intended to shed light on one specific case and in doing so, allow the leaders in this school to make informed decisions (Odell, 2001) about the future use of one-to-one devices. It *may* also allow those in similar, but different contexts to apply the ideas to their specific situation and thereby act accordingly, although this is not the primary driver. The research may not be replicable, but it may provide an insight into an approach that if replicated would produce different results, useful for a different context, specific and tailored. Limitations of what case studies can tell us is also a perceived shortcoming, where randomised control trials (RCT) aim to establish the effectiveness of interventions, the case study is unable to do so, but is able to answer the 'how and why' that a RCT cannot (Yin, 2018). In this case, we wish to understand the how

and develop an in-depth understanding of everyday technology use through the eyes of those who use it, which will then provoke a 'why' response, which an RCT could not achieve. The criticisms of a lack of rigor are also put towards the case study, yet this could also be laid at other methodologies and is not seen as a convincing reason not to adopt this approach.

Overall, for this research the benefits of the case study outweigh the criticisms and so a case study research design will be the approach taken to discover the perceptions of students and teachers towards everyday use of one-to-one technology, and how it helps with a fundamental part of the learning process – engagement.

3.3 Data Collection Methods

The case study approach allows for a variety of data collection methods (Schwandt & Gates, 2018; Thomas, 2017). To understand engagement and technology, self-reporting of technology use has been viewed as successful in understanding the subtleties of how technology can influence learning (Vongkulluksn et al., 2022). Following a survey pilot study for students, and consultation for staff, this sequential explanatory research employed a two staged, MM approach ((quan + QUAL) -> QUAL), involving a teacher and a student survey, teacher interviews and student focus groups. The pilot and consultation process helped refine and adjust the online survey ready for the first stage, where students in Years 7 to 11 (n=358) and all teachers (n=88) were invited to complete the survey (quan + QUAL). The responses of students (n=168) and teachers (n=43) were then analysed, identifying key themes before exploring these in stage 2, using four semi-structured interviews for Year 9 teachers and four focus groups with Year 9 students (QUAL). Self-reporting using student and teacher surveys informed the interviews and focus groups which allowed each of the three dimensions of engagement to be explored in both quantitative and qualitative terms (Schoonenboom & Johnson, 2017) ((quan + QUAL) -> QUAL), whilst addressing the research questions, as set

Table 3.2

Research Questions and Data Collection Methods

Research Question	Participant	Data Collection Methods
1. How do students and teachers perceive student engagement with Chromebook technology?	Students	Survey Focus Groups
	Teachers	Survey Interviews
2. How do teachers report using Chromebook technology to engage students in their learning	Teachers	Survey Interviews
3. What opportunities and challenges do students and teachers perceive the Chromebook to have on student engagement?	Students	Survey Focus Groups
	Teachers	Survey Interviews

out in Table 3.2. Self-reporting is a method that has been identified as being successful in understanding engagement in a TEL context and so it was employed in this study (Henrie et al., 2015). Both students and teachers were asked to self-report on various aspects of student's use with their Chromebooks, which allowed for the two most important groups to report their perceptions, providing data to compare for synchronicity. By aligning or at the very least appreciating students' perceptions, teachers will be better placed to plan accordingly using the technology. This research therefore does not accept concerns raised about validity aired by Vongkulluksn et al. (2022) but instead puts forward the view that both students' and teachers' perceptions are valid in helping to work together form the best TEL environment to engage students.

In attempting to understand the multi-dimensional construct of engagement, these data collection methods allowed all three engagement dimensions, affective, behavioural and cognitive to be explored. The use of case study methodology acknowledges variables within

the case and as such, different tools were used to collect both quantitative and qualitative data (Cohen et al., 2018), explained below.

3.3.1 Pilot Study and Quality Check

A pilot study and quality check in two stages, one for students and one for teachers was undertaken to refine the survey data collection process for both groups, to then inform the focus groups and interviews. A pilot test of questions is recommended so as to afford opportunities to adjust and rectify the questions to avoid mistakes (Creswell & Guetterman, 2019). For students the pilot study involved the Head teacher inviting 153, Sixth Form students aged 16 to18 years old, to participate in the online survey, and provide feedback in the spaces provided. This would avoid asking the same students to complete the survey twice which could impact on returns for the main study. Further to this, the Sixth Form students who completed the survey were asked if they would be interested in participating in a focus group to discuss the questions and the research, to provide further insights into the construction of the survey and any potential areas for confusion or improvement. From the 153 students invited, 21 completed the survey (14%) and eight agreed to participate in a focus group to discuss the key issues as outlined above. Of the eight invited, seven (33% of survey respondents) participated in the focus group discussion to refine the survey for completion by students in Years 7 to 11. The feedback from the seven participants helped to develop the survey regarding cognitive ease and making the process of answering as straight forward as possible whilst provoking respondents thought process. The pilot participants felt the start was far too long and difficult to follow and would put many students off, as all believed most, if not all student respondents would answer using their mobile phone. Other comments focused around the area of clarity in targeting key aspects of Chromebook use. The feedback and actions are summarised in Table 3.3.

Table 3.3

Pilot Focus Group Feedback and Changes Made to Student Survey

Survey Section	Focus Group Comments	Changes Made
1	• Too much text; intimidating • Too dense in one block	• Text broken up
2	• SEND question would be helpful	• SEND question included
3	• Completing question not easy • Questions too similar	• Completing question changed • Differences in questions made clearer
4	• Better clarity on finding out positives and negatives needed • Clarity needed on engagement with and without a Chromebook	• Questions rewritten to clearly identify positive and negative aspects • Questions make clear whether it is engagement with or without Chromebook
5	• Likert scale questions appear last – would be better earlier • Provide a comment section after the Likert questions	• Likert section moved up to feature earlier • Opportunity to comment included after Likert questions

For the teachers, the IT Strategy Group, a group of teaching and non-teaching staff focused on the use of IT in the school, reviewed the teacher survey, which was discussed at a meeting in April 2021 to provide a quality check. It was decided the research would not involve all teachers in a pilot study to avoid teachers having to answer two sets of questions in relatively quick succession, thereby risking a smaller return on the main survey. As the number of teachers (n=80) in the school is small, it was felt there were not enough to have a separate group answer who would not form part of the main study as was afforded in the student version. However, it was felt some scrutiny was needed of the questions, and whilst time was not available to use another school setting as a pilot case, the IT Strategy Group

who is knowledgeable in the use of one-to-one technology in the school were seen as an ideal vehicle for this.

Feedback from the strategy group was in the main positive and complimentary. The main areas of comment centred around access to the questions where some subjects do not actively use the Chromebook in their teaching and learning, in Design Technology and Music for example, where the machine is not able to run key software. Thought was needed for teachers in these subjects answering the questions as they may well feel unable to answer and may then respond for the sake of responding, or else not offer their views at all. The invitation reflected that whilst some teachers may not use the Chromebooks with their students directly, their perceptions were important as they had knowledge in their roles as tutors for Years 7 to 11, where Chromebooks are also used. This would be revealing for the school, as the focus is on the use of computing technology, which if not being widely used, is important to know. Further thought in this regard also led to the development of the question about use of one-to-one Chromebooks during a career. This question was given greater focus on the classroom setting, given that all teachers have been using the one-to-one technology at home during school closures forced by the pandemic. This research is focused on technology in the classroom, not for emergency learning at home as part of COVID-19 crisis that has necessitated it. It was also considered necessary to include some reference to special educational needs and disabilities in the survey in the demographic section, and to replicate this in the student survey, to ascertain how Chromebook devices are viewed in this respect.

3.3.2 Survey

Quantitative and qualitative data was collected via the survey, a method commonly used and regarded as the most appropriate tool to gather information about engagement in TEL (Appleton et al., 2006; Fredricks & McColskey, 2012; Henrie et al., 2015). Henrie et al.'s (2015) study which reviewed how research has attempted to measure student

engagement in TEL environments, shows how valuable a quantitative self-report method such as a survey is. They identify how most surveys in their review were completed by students and some were used to collect perceptions of engagement from teachers, however, it does not reveal any research which addressed both as part of the same study (Henrie et al., 2015). The study by Zepke et al (2014), does examine teacher and student perceptions of engagement, but does not focus on technology. The surveys for students and teachers were developed following Creswell and Gutterman's (2019) guidance; using different types of questions, good question construction using simple language and a pilot test (for students), allowing the perceptions of both groups to become visible and then comparable. This research addressed student and teacher perceptions using the same survey items, appropriately worded for each, that will be cross referenced to search for areas of alignment and disagreement.

As this research is looking at the perceptions of both students and teachers, there was no existing survey that could be replicated. Other surveys which have tried to understand engagement and technology did not have the same aims or objectives, with most targeting students and fewer studies targeting teachers (Henrie et al., 2015; Jang et al., 2016). Some targeted one dimension of engagement (Reeve & Shin, 2020) and others examined engagement as part of a wider study, where accessing the questions proved difficult as well as lacking the focus this research was seeking (Qahri-Saremi & Turel, 2016). Recent studies on technology and engagement focused on engagement and disengagement with a different focus to this this study, such as attainment of various student groups (Bergdahl et al., 2020). Importantly, many surveys developed to measure engagement were focused on university students and as such were not deemed appropriate for this study and others were focused on online courses as opposed to technology in the classroom (Henrie et al., 2015). Therefore, the surveys used in this research for students and teachers adapted previous work (Bergdahl et

al., 2020; Jang et al., 2016; Reeve & Tseng, 2011), being selective so as to provide the right coverage of the dimensions identified in the literature review. They also invited comment on engagement indicators, to help participants identify with the concept of engagement and Chromebook technology as clearly as possible, in a survey that would not be too long and onerous to complete. In short, a survey designed for the respondents in this case.

After capturing the demographic information, the survey used Likert scales responses based on the conceptual framework of the three main dimensions of engagement as informed by the literature. Four items for each dimension were presented, all focusing on the use of the Chromebook in lessons. In using a five-point scale from 1= strongly disagree to 5= strongly agree, several factors were considered. As a general principle, as many options as respondents are able to cope with is one way forward, with three and five options commonly used (Thomas, 2017). One school of thought suggests researchers use an even number of options in order to force respondents into making a decision to agree or disagree (Tymms, 2017). However, it was felt for this research, that if respondents feeling is uncertainty they should be able to reflect this in their answer and therefore a five-point scale was chosen (Thomas, 2017). Indifference or doubt is also revealing. The Likert scale questions are contained in Table 3.4, as phrased for the teachers, with the student version appropriately adjusted.

Following this, open ended questions allowed respondents to offer their thoughts on the idea of engagement and then how the Chromebook was and was not helpful for students' learning. The qualitative questions were developed to allow respondents to comment on the Likert scales responses should they wish to, and then to elicit responses regarding engagement meaning and student Chromebook use. The questions were phrased as appropriate for either the students or the teachers but both groups were asked the same questions, contained in Table 3.5. The underlying aims of the quantitative and qualitative

survey items are not easily detectable by respondents unless they have prior knowledge of the engagement construct. This was unlikely, particularly in children. Therefore, a more genuine response was likely to be elicited from the survey, where the questions being asked are more relatable to everyday school and classroom experiences, and so removes the possibility of second-guessing answers. This also means that when analysing the responses, making key inferences to link the responses to the indicators and dimensions of engagement would be needed.

Table 3.4

Likert Scale Survey Items by Dimension

Variable	Survey Item
Affective (A)	I think we should use Chromebooks more to support learning than we currently do.
	When using Chromebooks in lessons, it helps students to feel better about their learning.
	Student engagement in schoolwork would increase if Chromebooks were used to personalise the content for students.
	When we work on something in class with a Chromebook, students feel less interested than when we do not use a Chromebook (reverse coded)
Behavioural (B)	Students are less likely to ask for help if they are using their Chromebook.
	Students often do other things on their Chromebook in class when they are supposed to be paying attention on their academic work (reverse coded).
	If students are using their Chromebook, they participate more in the lesson.
	Students try harder in lessons when we use the Chromebook.
Cognitive (C)	Students find it difficult to concentrate when using their Chromebook for learning in class. (reverse coded)
	Students learn more effectively when they use the Chromebook.
	The Chromebook allows students to reflect on their learning
	Using the Chromebook helps students to persevere with difficult problems.

Table 3.5

Open Ended Survey Items

Engagement Observation

Please make any further comments or share any further thoughts on any of your answers above if you wish to do so. Write NA if you have no comments. (Follows on from the Likert scale responses)

Engagement Meaning

If students are described as being 'engaged' in a lesson when they are NOT using a Chromebook, what are they doing?

If students are described as being 'engaged' in a lesson when they ARE using a Chromebook what are they doing?

Chromebook Use

When in lessons, in what ways are Chromebooks helpful for students learning?

What do you think a Chromebook device could be used for in lessons that they are not currently used for?

When in lessons, in what ways are Chromebook devices not helpful for students learning?

The use of a survey, however, is not without debate, and the limitations are acknowledged. Asking questions of students and teachers through this method can only lead to the measuring and evaluating of the questions being asked (Wood et al., 2005). Whilst asking open ended questions can invite a wide, varied and freer response, it may also lead to superficial answers or may not allow a full and comprehensive answer that truly represents the views of the respondent. In this way it can be deemed inappropriate for children and take too long to complete (Henrie et al., 2015), diverting them from their learning. Students and teachers may have trouble expressing their thoughts electronically, or else not be bothered to try. Furthermore, using a survey means that responses are always reflective in nature, as the respondent is looking back on previous events as opposed to reporting feelings, thoughts and

emotions in the moment (Sinatra et al., 2015). As such it is acknowledged that views as expressed in the surveys and indeed the focus groups and interviews represent a snapshot in time from students' and teachers' recollections.

However, the critique of the survey is not convincing enough to avoid its use for this study, as whilst it has some limitations, the strengths outweigh them. The questions are wholly appropriate to a student population who is used to being consulted and is a group of young people which sees the importance of giving views to shape actions by the school. The point made that asking students to complete surveys diverts them from their learning again does not apply to this research as no child is being asked to substitute completion of the survey for their learning. In this case, the questions being put to the students took careful consideration of age and understanding and a pilot of the questions also allowed refinement and to check for cognitive ease. Whilst some students and teachers may find it difficult to express themselves, the ideas were also explored as part of the student focus group meetings and teacher interviews, which is an intentional part of the research design. Indeed, in using the survey first, the qualitative methods are then well placed to follow up on key issues raised (Haselhorst, 2017). Observing behavioural engagement directly may be possible in a classroom, however, observing the affective and the cognitive in a 'live' situation presents insurmountable difficulty which would disrupt the learning of the students. It is therefore the view here that limitations to a survey do not detract or distract from understanding engagement, but rather make it easier to recognise.

3.3.3 Focus Groups

The second qualitative data collection method, were focus groups, used to elicit descriptions from Year 9 students to understand technology and engagement in greater detail. It is a useful method to gauge opinions of the student participants, with the aim of letting the groups dictate the flow of the discussion (Gibbs, 2017). This method was also chosen partly

because of time, in that to interview enough students one-to-one, would prove too time consuming, and partly so views of the student body could also be understood through discussion. Practically, this method has its advantages, as the groups were easily accessible, could be gathered together relatively quickly, and as naturally homogenous groups it is appropriate to use them to provide further insight into the survey results (Stewart & Shamdasani, 2015). Teachers' and students' views from the surveys were explored as well as understanding the perceptions of both groups as to how one-to-one technology impacts engagement in academic learning in the classroom. An initial look at the survey results highlighted some key areas which were probed further in this stage, with prompts being developed following an analysis of items that stood out, such as distraction and the lack of understanding that seemed to be shown towards the cognitive dimension when a Chromebook was being used. The prompts are contained in Table 3.6 and helped direct the discussions, although not all groups could be taken through the same process, another feature of the focus group method, as depending on the answers, the interviewer was free to explore lines of questioning determined by the responses.

Using this format for students enabled them to share their views in a way that may not be forthcoming in a one-on-one interview situation with a senior member of staff. The idea of strength and security in numbers was also another motivating factor. Using members of the same year groups also facilitated the group dynamic which is important in enabling a successful focus group (Stewart & Shamdasani, 2015). The discussions surrounding the everyday experience of the students in their use of one-to-one technology and how it engaged them in their academic work, meant the various themes which had emerged from the survey were discussed and therefore explored in greater depth, as the students shared their views.

Table 3.6

Focus Group Prompts as Informed by the Survey Results

Prompt	Target
When you are engaged in a lesson can you discuss what you are doing?	Perception of engagement
The survey suggests that engagement increases when Chromebooks are used - do you agree?	Perception of engagement Opportunities
The survey suggests students are less likely to ask for help when using a Chromebook - is this true?	Behavioural engagement Opportunities/ challenges
The Chromebooks are a distraction and used for other things, what do you think?	Distraction Challenges
Is learning more effective with a Chromebook - if so why, if not why?	Perception of engagement Opportunities/ challenges
When you find things difficult - does the Chromebook help you to persevere?	Cognitive engagement Opportunities/ challenges
Can you share a time when you were so engaged in a lesson you did not want it to end? What were you doing?	Perception of engagement Opportunities

In normal school lessons, children's views and opinions can be influenced and filtered by the interaction taking place in the context of the classroom. As such, student focus groups could also allow students to further shape their views, develop and express them to reveal more secure views.

The limitations of focus groups, like other methods, do exist and are acknowledged. If the dynamic of the group is not functional there may be a situation where one or two of the group dominate the discussion and therefore do not allow for a natural view to emerge. Whilst conflict in focus groups is not necessarily a bad thing, as it may help to explore tensions or opposing views, each member of the group should be allowed to express their views (Stewart & Shamdasani, 2015). The knowledge and skill of the researcher in this case helps to mitigate against this, in order to ensure group cohesion and therefore productivity in

the aim of providing insights into the issue of engagement in TEL (Stewart & Shamdasani, 2015). The knowledge of the students who had expressed an interest meant the groups each member could contribute fully and not be afraid of explaining their point of view. The skill of the researcher having a strong background as a teacher meant each group was successfully managed allowing the discussion to evolve naturally as a focus group. Whilst a group of people with similar interests and background could produce a rather boring discussion, the blend of youth, awareness and knowledge of each other helps to mitigate this factor.

Focus groups from the middle year group of the student sample, are seen to be appropriate as it allows the student body from a specific year group to express the views and developed attitudes towards technology use in the classroom regarding engagement that build on the survey responses. The focus group discussions, lasted between 20 and 30 minutes, and were audio recorded and then transcribed.

3.3.4 Interviews

The third data collection method used was the semi-structured interview of a sample of teachers, using prompts informed by the survey data as with the focus groups. This method helped fulfil the aim of understanding teachers' perceptions in greater depth as to understand one-to-one technology in a classroom situation, the teacher voice is crucial given their impact in the classroom (Bergdahl, 2022; Heath, 2017). As with the focus groups, the aim of the interviews was not to corroborate the survey results but to explore the emerging themes and to find greater understanding of the results to gain a richer description of engagement and one-to-one technology from the teacher perspective (Cohen et al., 2018). The interview was the best way of finding out about the experience of teachers using one-to-one technology and their perception of engagement, allowing the opportunity for further discovery (Mears, 2017). By using the interview, rather than teacher focus groups a greater understanding of the teachers' lived experience and the meaning they bring to it, could be understood (Seidman,

2019). It was considered teachers would be more focused in a one-to-one interview than they would in a group where there may be a question of not speaking or not being able to share personal observations and thoughts.

As Seidman (2019) explains, if the researcher is aiming to understand the meaning people involved in education make of their experience, then the interview is a required if not completely satisfactory, line of analysis. The interviews were semi-structured and took place with teacher volunteers and therefore attempted to get the best of both the structured and the unstructured interview (Thomas, 2017). As with the focus groups, the same topic areas were explored with each interviewee, but the questions were open ended, and the wording tailored to each individual interviewee with prompts and probes depending on how each question was answered. This enabled the interviewer to clarify topics or questions which proved useful when the interviewee did not understand or misunderstood or was seeking clarification. It allowed for the rephrasing or repeat of a question to provide the right clarity.

The semi-structured questions are contained in Table 3.7. The questions contain a mixture of descriptive, experience and behaviour questions which are all relevant when trying to explore the various dimensions of engagement in TEL. Questions and resulting probes enabled the interviewer to ask the respondent to extend, elaborate or provide extra detail to any response that was given (Cohen et al., 2018). It could include asking for examples or seeking further clarification or greater detail. Probes can be both pre-scripted and not pre-scripted, that is the researcher knows at which point in the interview a probe would be needed, termed an anticipated probe (Cohen et al., 2018). However, the researcher also was alert for spontaneous probes that were not pre scripted and were used on the spur of the moment based on a particular response (Cohen et al., 2018), being mindful not to lead the participant.

Table 3.7

Semi-Structured Interview Questions with Focus as Informed by the Survey Results

Semi Structured Questions	Focus
When students are engaged in a lesson can you describe what they are actually doing?	Perception of engagement
If we view the Chromebook as a tool, does engagement improve when students use this tool?	Perception of engagement
Cognitively, teachers seem to be unsure of whether the Chromebook engages students, why do you think this may be?	Cognitive engagement
The survey suggests students are less likely to ask for help when they are using a Chromebook - is this true and how has it changed the role of the teacher do you think?	Behavioural engagement
In terms of behaviour for learning in lessons, what impact do you think the Chromebook has?	Behavioural engagement
One element of the survey suggested the Chromebooks are a distraction and used for other things, another suggested this was not the case, what is your view?	Distraction
Is learning more effective with a Chromebook?	Perception of engagement
Do you think Chromebooks should be used more?	Use of Chromebook
Can you each share a time when your students were so engaged in a lesson they did not want it to end?	Perception of engagement

The challenges posed by interviews are acknowledged. The time it takes to prepare, organise, conduct, transcribe and then analyse the data from an interview is significant, yet the rewards are also meaningful. Some of these issues are nullified because the researcher has direct and relatively easy access to both the students and the teachers in the case. The often-posed question about how many interviews was overcome by the fact that four expressed an interest in taking part and four were then interviewed. Following this, the amount of data produced was significant but allowed the exploration of the case in detail, to provide the rich evidence required for the teachers' perspective, to draw tentative conclusions.

Challenges also come in the face of the unpredictability of what respondents may say and in the fact that a view, opinion or perception expressed by one teacher could not then be taken to represent all teachers. Individual subjectivity and bias that may come from the researcher and interviewee, as both will interpret the interview in a particular way (Cohen et al., 2018). This is acknowledged and not thought to be prohibitive to this research process. Perceptions are the foundations of this aspect of data collection and as such the researcher is searching for teachers to express their opinions and thought processes more fully than they were able to in the survey. Furthermore, the researcher was alert not to use probes too frequently as this could lead to bias entering the study. There is no known reason why any participants may want to mislead the research. Each teacher was interviewed once, lasting between 20 and 30 minutes, and each interview was audio recorded and then transcribed.

3.4 Research Sample

3.4.1 Student Sample

A non-probability purposive sampling technique was employed to ensure a sample fit for purpose could be produced. Purposive sampling involved selecting specific individuals based on the purpose required, who are especially knowledgeable about the focus of the research (Palinkas et al., 2015; Tashakkori & Teddlie, 2003). In this case, students and teachers with the experience of using one-to-one Chromebook technology on a regular basis were required. Whilst the sample does not reflect the whole population, this is accepted, as the case study approach is not attempting to produce research which is generalisable to a larger audience. The sample is therefore representative of itself (Cohen et al., 2018). The case in question is a school, which is an independent, co-educational day/ boarding setting of 510 students across seven distinct year groups, from Year 7 to Year 13, covering the age range of 11-18 years. To choose the sample, working from the largest to the most appropriate was the way selected, ensuring as far as possible the sample size was appropriate. Students in Year 7

to Year 11 inclusive are all provided with the same Chromebook laptop, meaning the overall sample size was reduced to 358. This done, it was felt consistency would be achieved as all students taking part will be drawing on the use of the same device and have the required understanding to answer the set questions. For the first phase of data collection following the pilot study and information sent to parents, the student body in Year 7-11, were given the information sheets after which they were invited to complete the survey by the Head teacher. In total, 173 responded, with 5 choosing the option stating they did not understand the information, meaning 168 in total completed the survey in full.

A focus on students in Year 9 (n=76), the middle year group from the survey sample, was taken into the second a phase of data collection. This would provide an initial sample that could then explore the idea of engagement in TEL further through focus groups. Within the Year 9 cohort is a girl/ boy split of 26/ 50. Following the survey, a request for volunteers was made and then followed up. From this request, seven students expressed an interest in taking part in a focus group. This provided the sample for the second phase of the research, from which 2 groups were organised and then convened, a group of two and a group of four boys, with one student unable to make the agreed time. A further call for volunteers, created two further groups, one of two and one of three, all girls. The Year 9 student cohort were particularly instructive to focus on, as they are comprised in the main of students who have been in the school since Year 7 – all those interviewed were in this group. As Year 9, it was felt they had the understanding required of the questions being put to them in both the survey and the focus groups and are also the middle year group of the five, Year 7 to Year 11, who are given the Chromebook device on entry to the school (Sixth Form bring their own device to school). Year 9 are deemed to have sufficient understanding to answer questions on the topic of one-to-one technology and engagement and are therefore different to Year 7, who are all new joiners to the school.

3.4.2 Teacher Sample

As with the students, the teacher sample was created using a non-probability purposive sampling technique, to find the right teachers to be able to contribute (Palinkas et al., 2015; Tashakkori & Teddlie, 2003). The school employs 80 teachers, all of whom are provided with a Chromebook laptop device on starting at the school. Teachers from the whole teaching staff were invited to participate by the Head teacher. After sending out information sheets to 80 teachers, 43 responded by completing the survey. These included teachers who teach across the age range and specialise in a range of academic subjects. Following the completion of the survey a further request for volunteers to be interviewed was sent out to all teachers of Year 9 students. It was not a requirement for teachers to have completed a survey to participate, rather the need to have fulfilled the criteria of teaching Y9 students using a Chromebook device, to be able to comment, explain and expand appropriately. The aim was for interviewees to discuss their thoughts and provide further explanation of their experiences based on the initial findings of the survey. In total, 5 replied and 4 interviews took place, with one teacher being prevented from participating due to absence.

Although Fredricks (2016) advocates greater subject specific study regarding engagement, for this research this was not possible as the case in question is small and *potentially* could have led to a study of an academic department that contributed little or nothing in the way of Chromebook use in the classroom. By including all academic departments, a good sample of Chromebook use was gathered, across academic disciplines, with the data allowing tentative subject specific conclusions to be drawn where appropriate. Therefore, in gathering teachers' views, a variety of subject disciplines were included as well as a range of teaching experience, from those relatively new to the profession through to those with a significant number of years' service, and those who have been at the school for

up to and beyond 20 years, to those who joined in January of the year of data collection, 2021.

3.5 Data Analysis

As an exploratory piece of research, there is no attempt to prove or disprove any existing hypothesis, although this cannot be described as grounded theory, as previous ideas and conceptual theory have been used to develop the research enquiry (Coleman, 2017). In part the research is looking to see if the widely held, but sometimes assumed line of thought, that using technology habitually means that students are engaged necessarily rings true. As is the case with many educational tools, technology will engage some students more than others and is not the panacea that many hoped or thought it would be for automatically engaging students (Howard et al., 2016). Following the online survey, student focus groups and teacher interviews took place, which collected QUAL data, from 10 students and 4 teachers. This section explores the QUAN and the QUAL data analysis process separately below.

3.5.1 Quantitative Data Analysis

The Likert scale responses directly addressed the affective, behavioural, and cognitive dimensions of engagement, and were analysed using descriptive (crosstabulation) and inferential statistics (t-tests) to provide comparisons between variables, and to report similarities and differences in students' and teachers' perceptions, whilst also discovering if the results were by chance alone. The Likert items are presented in Table 3.4.

Treating the Likert scale data as ordinal data, a test for normality, and an independent-samples t-test was conducted for each of the affective, behavioural, and cognitive item scores for students and teachers, to see if the difference between the two groups was statistically significant, or whether the results were produced by chance. A t-test was also carried for each dimension of engagement overall, combining all four items into one, providing a whole score for the affective, behavioural and cognitive dimensions to produce an engagement scale, to

see if the results were statistically significant between students and teachers. This allowed for analysis of the differences between the two groups to be explored through the open-ended survey questions, focus groups and interviews, with an emphasis on understanding how and why the two groups might view the use of Chromebook technology differently. To assess the internal consistency and reliability of the scales being used, a Cronbach alpha coefficient was calculated for each of the three dimensions, and for overall engagement. This was the best way to ensure the same construct (engagement) was being measured. Whilst this can be sensitive to small numbers in the scale, it proved to be, along with the mean inter-item correlation, a good way of ensuring reliability and consistency (Pallant, 2020).

3.5.2 Qualitative Data Analysis

Qualitative data was generated through three methods; the open-ended questions in the survey, the student focus groups and the semi structured interviews with teachers. The survey items allowed free responses, which provided data to inform the focus group and interview prompts. The open-ended survey responses, focus group transcripts and semi-structured interviews for both teachers and students, were deductively and inductively coded, question by question, using NVivo12 and predetermined and spontaneous codes (Bergin, 2018), using the strategy of content analysis. The predetermined (deductive) codes were the key indicators of engagement identified and developed from the literature. The coding process helped to identify how students and teachers self-reported the indicators of engagement shown in Table 2.1, thereby giving an indication of the level of engagement. The coding process started with the survey responses, coding each response line by line, by highlighting key words and comments in NVivo and assigning them to an indicator where applicable. This slowly built up a code book of responses, to help ensure consistency, for example where 'listening' was mentioned, that it was always coded to 'Attention/ focus'. Examples of the indicators identified, and example statements can be seen in Table 3.8,

where the indicators of engagement are shown with the italics representing examples of statements from respondents coded to that indicator. These could be individual words or extended comments, depending on the nature of the response, as some developed comments could reflect more than one indicator. Where there was overlap, or different possibilities, Schindler's (2017) approach of the best fit, taking direction from the literature and employing my own interpretation of the indicators identified. In Figure 3.3 it shows how text from a small part of the teacher survey was coded, with each part of each response being coded to one most appropriate indicator. The deductive coding executed in this way provides more specific operational insight of student and teacher engagement, showing granularity which is missing from current research. Following this process allowed the same or similar comments to be coded in the same way, helping to ensure consistency of coding across the three qualitative data collection methods.

Figure 3.3 shows examples of responses to the question, 'Generally, if students are described as being engaged in a lesson when they ARE using a Chromebook, what are they doing?' and illustrates how each response is coded to an indicator, with the coding stripes on the right showing the specific indicator to which it has been coded. Where there are lists, each item was coded individually, using the NVivo programme. This built up a demonstration of engagement with a Chromebook device. Once completed, the coded indicators could then be compared across this survey item, then across the whole survey and then across different data collection methods, which built up a detail insight into the perceptions of engagement. The coding also allowed for content analysis to take place which provided a further insight into the engagement construct.

Table 3.8

Dimensions of Engagement with Indicators as Deductive Codes and Example Statements

Affective	Behavioural	Cognitive
Personalisation	**Effort**	**Critical thinking**
Being allowed to choose	*Determined attempt*	*Critical thinking*
Individual	*Trying*	*Critical*
Feedback	*Working hard*	
Formative assessment		
Student outcomes		
Live feedback		
Own pace		
Interest	**Attention/ focus**	**Self-regulation**
Showing interest	*Listening*	*Self-discipline*
Interesting	*Focused*	*Ignore temptation*
Listening	*Focussing*	*Only using necessary*
Asking questions	*Looking at the teacher*	*websites*
Answering questions	*Paying attention*	
More interesting		
Positive interactions	**Completion of work**	**Trying to understand**
Feeling good about being involved	*Getting work done*	*Look up stuff I don't know*
	Spend less time writing	*Search up words I don't know*
	Quicker than writing	*know*
	Get more writing done	*Active listening*
	Typing faster	
	Completion of work	
	Complete work	
	Writing faster	
	Work done quickly	
Enjoyment	**Participation**	**Reflection**
Enjoy	*Taking part*	*Thinking*
Fun	*Doing tasks*	*Revising*
Want to be there	*Putting hand up*	*Reflecting on learning*
	Work	*Reflecting*
	Working	
	Research	
	Typing	
	Editing	
	Contributing	
	Engaging in debate	
	Asking questions	
	Actively participating	

Affective	Behavioural	Cognitive
Excitement	**Taking responsibility**	**Concentration**
Exciting	*Looking for information independently*	*Concentrating*
	Independent research	*Concentrate*
	Checking things	
	Finding new information	
	Research what I do not understand	
	Searching things up	
	Looking up extra information	
	Change and edit work	
	Remaining on topic	
	Asking for help	**Deep learning**
	Ask the teacher	*Expanding answers instead of simple ones*
	Ask	*Synthesising*
	Asking	*Practical applications of theory*
	Ask for help	*Deepens understanding*
	Get more questions	*Developing ideas*

Figure 3.3

Examples of Deductive Coding in NVivo
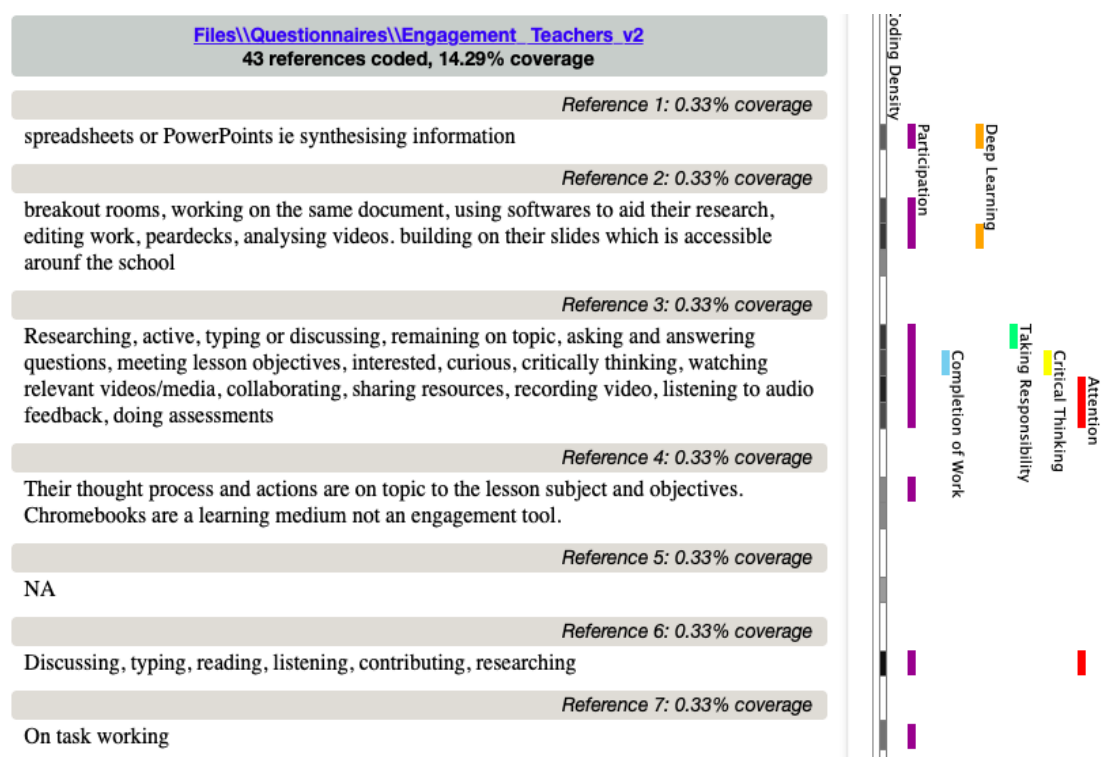
Once the survey responses had been coded line by line, this informed the prompts for the focus groups and interviews, to explore areas which had emerged. Once the focus groups and interviews had taken place, these transcripts were also coded in the same deductive way using the same indicator codes and the responses from the survey to help guide the coding. Once the coding process was complete, the triangulation of the qualitative evidence could be analysed across the survey, focus group and interview responses. Furthermore, NVivo has the functionality to analyse the data by indicator as well as by data collection method. As a result, the data could be analysed by dimension and by indicator. Figure 3.4 shows an example of personalisation and how this emerged across a focus group and two teacher interviews.

Figure 3.4

Examples of the Indicator Personalisation Across Data Collection Methods

When placed with the survey results, focus group and interview data, a picture of student and teacher perceptions of engagement began to emerge. Finally, the qualitative evidence from the surveys, focus group transcripts and interview transcripts were coded inductively, using spontaneous open codes, which allowed responses to be analysed for new ideas regarding perceptions of engagement. Again, NVivo allowed open codes to be compared across data collection methods, and by dimension and indicator.

Figure 3.5

Examples of Inductive Coding in NVivo
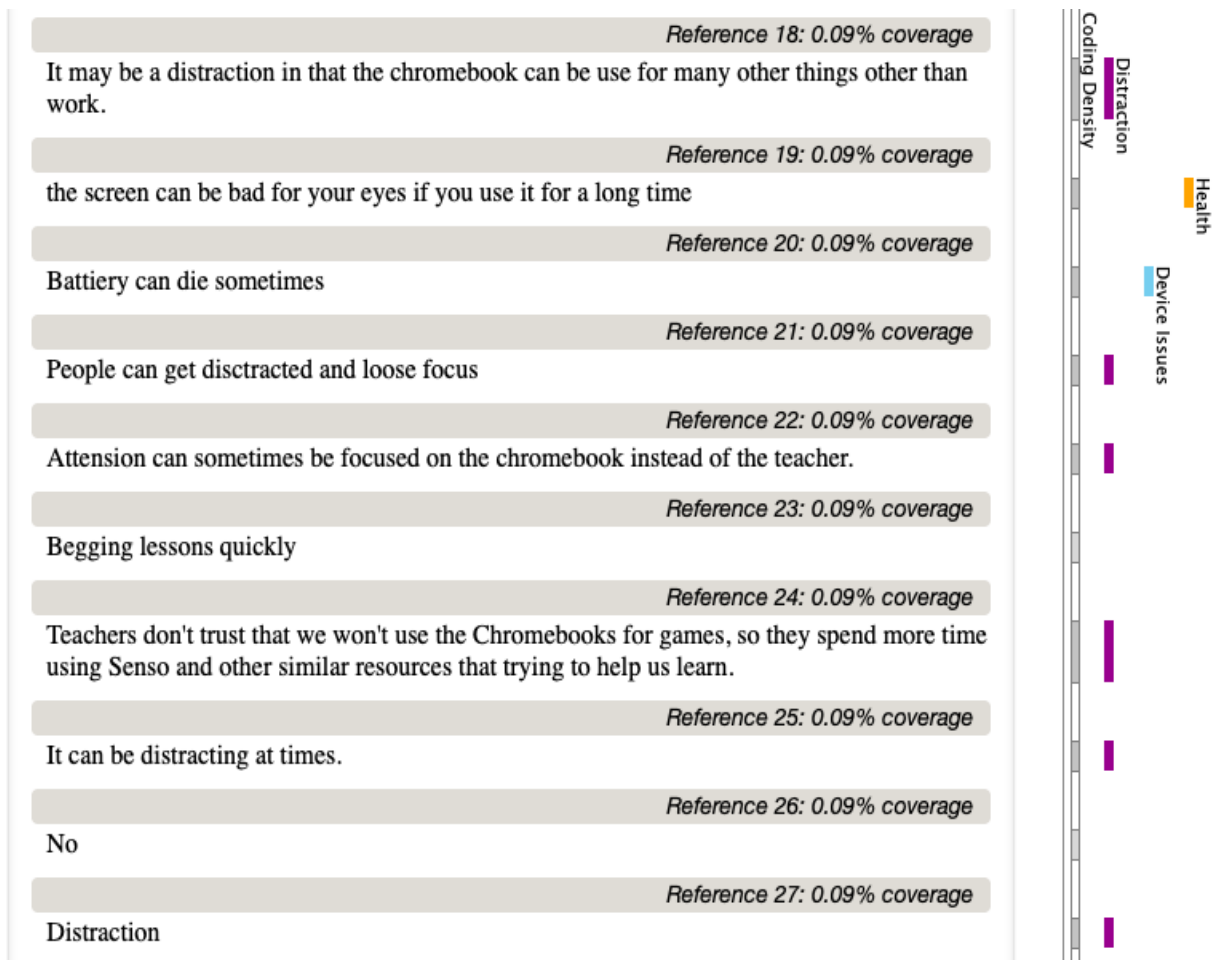
This whole process did not involve asking directly about engagement, as by posing questions related indirectly to the indicators and dimensions, this would enable a natural focus on engagement (or not) to emerge and remove the possibility whereby respondents could provide answers the interviewer wanted to hear, especially those geared artificially towards engagement. Predetermined codes allowed the key indicators of affective, behavioural, and cognitive engagement to be recognised, although the specific terms did not have to be reported. Employing content analysis of the data also allowed further insights to emerge and for the data to be thoroughly investigated, in terms of student responses compared to teacher responses. This represents an advance from previous research, as we have greater granularity and understanding of what is happening in the classroom and a comparison of student and teacher responses.

In writing up the findings, the first draft was written without any quotations, to avoid superficial use of quotes to automatically be accepted as evidence (Bazeley, 2009). Quantifying the qualitative data through content analysis helped the process, as it allowed categories to be identified in such a way as to invite further scrutiny and comparison, using a describe, compare, relate formula to move beyond the merely descriptive (Bazeley, 2009).

3.6 Trustworthiness

In order to ensure a rigorous approach to the study which moderates subjectivity and increases validity and reliability, this case study used three different methods and sources of data collection (Thomas, 2017). There is not time here to discuss the taxonomy of validity, but for this research the idea of external validity, as the findings are not generalisable to a wider population, is less of a concern in case study methodology for reasons outlined above (Thomas, 2017). Internal validity is more relevant, to ensure that any findings and interpretations are supported by the evidence, by matching and cross referencing the data (Cohen et al., 2018). The triangulation of methods allows findings to be confirmed and for

any irregularities or anomalies to be addressed (Kuhn & Hacking, 2012; Thomas, 2017). As Yin (2018) outlines, by allowing the reader to track the study, from inception to research questions, data collection and the circumstances they were collected in, to the conclusions will allow the validity and reliability to be strong. Students and teachers are being asked about things relatable to their school lives and as such have few problems expressing their perceptions, without being able to easily detect any underlying theme or focus that may then lead them to answer in a specific way. The anonymous approach to the survey further strengthens the opportunity for honest rather than influenced answers, thereby increasing the trustworthiness.

3.7 Ethical Considerations

Any research has an obligation to take into account any potential effects the work may have on the participants (Cohen et al., 2018). This is particularly important when the participants are children, and research in this field needs to be conscientious when ensuring ethical considerations are fully and clearly met. This research pays close attention to the British Educational Research Association's (BERA) Ethical Guidelines for Educational Research, 4th Edition, 2018 (BERA, 2018). Before any data could be gathered, the project first had to receive ethical approval from the Ethical Committee of the University of Reading's Institute of Education, following a lengthy and robust application process (Appendix A). Following ethical approval from the Ethics Committee, and in line with ethical requirements, this research produced information sheets for parents, students, teachers and the Head teacher at the school, to ensure as far as possible that all participants, potential and actual were well informed (Appendix A). Volunteers were then requested and consent from teachers and parents gained along with assent from students for the surveys, focus groups and consent for the interviews where relevant to the individual (Appendix A). Initial approaches to enlist participation from both teachers and students were made initially from

the Head teacher at the school so as not to put any pressure on students or teachers to participate from the researcher. For the survey, consent and assent was gained via the survey itself, however, it was also felt prudent to inform parents of the nature and purpose of this process, providing them with the opportunity to ask questions and ultimately not allow their child to participate (Appendix A).

Students, parents and teachers were informed of their right to withdraw their consent/ assent at any time, with particular emphasis placed on ensuring the information provided to students made it clear what was being asked of them, as far as is possible, given that a child's understanding may not be total. Results and transcripts of both the qualitative sections of the survey, the interviews and focus groups were anonymized so that in the results section of the thesis anonymity was preserved, and neither students nor teachers are referred to by name. Data collected was preserved and password protected on the researcher's personal computer.

In terms of the position of the researcher, special care and attention was needed when gathering data from all areas of the project. As the Deputy Head in this small school, I have considerable authority and care was needed to be taken in order not to unduly influence the students and the teachers. A risk assessment was written up which put control measures in place (Appendix A). When talking to both students and teachers in person, care was taken to ensure the power relationship did not impact those involved, and the perceptions and views they offered were genuine, by allowing any participant the opportunity to withdraw at any time, and an appeal/ complaint process in place. As a well-respected member of the school community, it was felt the researcher would be able to not only explain the rationale behind the research but also to put children and colleagues at ease, allowing them to speak freely in sharing their perceptions, in a neutral space within the school. As an insider, it was important to be cognisant of endogenous research and the implications it could have for this study. This research follows Trowler (2011) in seeing 'insiderness' not as a fixed value, but one that has

enabled the research to discover aspects of my institution previously unknown to me. This research also appreciates the benefits of having access to data and respondents which will allow emic accounts to be produced (Trowler, 2011). Whilst the reader could easily identify the institution that forms the case, an ethical process of clearance has taken place and measures to preserve anonymity as far as possible have been taken.

3.8 Chapter Summary

This chapter shows the underpinning philosophical assumptions on which the research is based. It explores the case study research approach and then outlines the data collection methods, the research sample and how the data will be analysed. Trustworthiness and ethical considerations are also explained. This pragmatic, sequential, mixed methods case study design will help to bring the two main actors (students and teachers) in the classroom together, and whilst it cannot simplify the complex microsystem of the classroom, it can begin the journey towards understanding more about what is happening in the classroom with regards to one-to-one Chromebook technology and engagement, with a view to understanding how to best to develop this in the future.

Chapter 4 Results Analysis

This thesis set out to explore what is happening in one coeducational, independent secondary day and boarding school in the UK using one-to-one Chromebook devices, to further an understanding of one-to-one technology use in the classroom with regards to the engagement of students in Years 7 to Year 11. This pragmatic, mixed methods case study research employed a two staged, sequential approach ((quan + QUAL) -> QUAL) to examine the perceptions of students and teachers, to further an understanding of what is happening in the classroom with a view to utilising the technology to aid the engagement students in the future. In this chapter, following presentation of the demographic detail of the sample, results from the data collection process will be presented by data collection method starting with the survey results as they informed the focus groups and interviews, which are presented separately.

4.1 Survey Data Results

The student demographic detail is shown in Table 4.9. Student responses numbered 168 (47% of the total in Years 7 to 11) and were spread over Years 7 to 11. Gender was also spread evenly. The largest group to respond was Year 7 and the smallest group Year 11. The boy to girl ratio of 96 boys to 63 girls reflects the nature of the school population, where 2/3 identify as boys and 1/3 identify as girls. Across the student demographic, nine preferred not to state their gender.

There were 43 teacher responses (25 identified as females and 18 identified as males) representing a range of teaching experience, across a range of subject specialisms, with the greater number in Science and Maths as shown in Table 4.10. The largest age group came in the 41-50 age range and 16-25 was the most popular for the number of years teaching experience.

From the sample, 77% of teachers have been using the Chromebook in their teaching practice for a year or more. One teacher reported they do not incorporate the Chromebook into their teaching, as they only teach in the Sixth Form, and Sixth Form students do not use Chromebooks but their own device. As a ((quan + QUAL) -> QUAL) piece of research this order allows for logical progression from the quantitative to the qualitative results of the study. The survey results now follow, presented by research question.

4.1.1 Research Question 1: How do students and teachers perceive student engagement with Chromebook technology?

The perceptions of students and teachers were addressed in the survey with 12 Likert scale responses generating quantitative data, reported in section 4.1.1.1, and six open-ended questions generating qualitative data analysed in section 4.1.1.2. Students and teachers were presented with the same survey items, phrased appropriately for each group. The quantitative data is presented first as this data informed the focus groups and teacher interview questions.

Table 4.9

Student Demographic Survey Responses

Gender	Year 7	Year 8	Year 9	Year 10	Year 11	Total
Male	28	17	24	12	15	96
Female	14	9	11	17	12	63
Prefer not to say	1	3	2	2	1	9
Total	43	29	37	31	28	168

Table 4.10

Teacher Demographic Survey Responses

Characteristics	Total	Male	Female
	n	n	n
Sex			
Male	18	18	0
Female	25	0	25
Age in years			
20-30	5	2	3
31-40	12	6	6
41-50	18	7	11
51-60	7	3	4
61+	1	0	1
Subject Specialism			
Science/ Maths	17	7	10
Humanities	8	5	3
Creative Arts	6	2	4
English/ Languages	6	3	3
Learning Support	1	0	1
Sport	1	1	0
Other	4	0	4
Years Teaching Experience			
1-5	8	3	5
6-15	12	4	8
16-25	16	8	8
25+	7	3	4
Years Incorporating Chromebooks in their teaching			
1	9	1	8
2-3	17	8	9
4-5	10	5	5
6+	6	4	2

Following a test for normality, an independent-samples t-test was conducted for each of the affective, behavioural, and cognitive survey item scores for students and teachers, to ascertain if the difference between the two groups was statistically significant, or whether the results were produced by chance (12 t-tests). A t-test was then carried out for each engagement dimension, combining all four survey items in each dimension to provide a score for each of the affective, behavioural, and cognitive dimensions of engagement (3 t-tests). This showed if the results were statistically significant for the whole dimension. Although the t-test could not reveal *why* the results may or may not be statistically significant, when cross referenced with qualitative data further assessment in this area could follow. The Cronbach alpha report for each dimension was affective (.728), behavioural (.441), and cognitive (.731), showing the behavioural to be the least consistent of the three. For the total engagement score adding all three dimensions it was .835, which suggests good reliability and consistency for the total engagement scale (Pallant, 2020).

4.1.1.1 Quantitative Survey Data.

Quantitative data was gathered using the Likert scale responses which asked questions focussed on the conceptual framework of affective, behavioural, and cognitive engagement dimensions. Four items focused on each dimension, affective, behavioural and cognitive engagement, making a total of 12 survey items. Student and teacher respondents were given a range of options from 1 to 5, where 1=strongly disagree, 3= neither agree or disagree and 5= strongly agree, meaning the higher the score the greater the agreement with the statement. For each group, a mean score could be calculated to show how far there was agreement or disagreement with each item, linked to each engagement dimension.

4.1.1.1.1 Affective Results.

The affective engagement t-test results are presented in Table 4.11, and the crosstabulation tables from the Likert scale data are contained in Appendix B.

Table 4.11

Affective Engagement T-Test Results

Survey item	Students			Teachers			Mean Diff	95% Cl		df	t	p
	n	M	SD	n	M	SD		Lower	Upper			
I think we should use Chromebooks more to support learning than we currently do.	168	3.47	.909	43	2.72	.882	.75	.44	1.05	209	4.85	**<.001**
When using Chromebooks in lessons, it helps students to feel better about their learning.	168	3.51	.966	43	3.00	.787	.51	.23	.79	209	3.62	**<.001**
Student engagement in schoolwork would increase if Chromebooks were used to personalise the content for students.	168	3.38	.933	43	3.14	.966	.23	-.08	.55	209	1.57	.14
When we work on something in class with a Chromebook, students feel less interested than when we do not use a Chromebook (reverse coded)	168	3.40	1.01	43	3.19	.932	.21	-1.24	.55	209	1.25	.21

In two survey items, the results were seen to be statistically significant, and two survey items results were not statistically significant.

The first two items, 'I think we should use Chromebooks more to support learning than we currently do' and 'When using Chromebooks in lessons, it helps students to feel better about their learning' show the differences between students and teachers is statistically significant, and the results were not produced through chance alone. When asked about using

Chromebooks more to support learning, students (M=3.47) feeling was more positive, than teachers (M=2.72). Results show 38.7% of student respondents and 44.2% of teachers answered 'neither agree nor disagree' which does not suggest an overwhelming desire to use the technology more on behalf of both groups (Appendix B1). The difference sees teachers moving more towards less use of a Chromebook (41.9% disagreeing or strongly disagreeing), and students towards a greater use (49.4% agreeing or strongly agreeing). Teachers' and students' perceptions are therefore different. When asked about Chromebooks helping students to 'feel better about their learning', students were more positive (M=3.51) than teachers (M=3.00) whose mean score suggests their perception leaned neither one way nor the other. 53.5% of teachers neither agreed nor disagreed, compared to 31% of students. 55.4% of students agreed or strongly agreed with this question compared to 23.2% of teachers (Appendix B2). Teachers' understanding is again at odds with the student body in terms of affective engagement and use of the Chromebook.

The second two affective survey items were not statistically significant. Firstly, 'Student engagement in schoolwork would increase if Chromebooks were used to personalise the content for students showed both students and teachers were positive about this, but not overwhelmingly so, with both groups mean t-test scores over the mid mark of 3.0 (Students M=3.38, Teachers M=3.14). 44% of students and 39.6% of teachers agreed or strongly agreed with this question with 42.3% of students and 34.9% of teachers neither agreeing nor disagreeing (Appendix B3), suggesting similar views. Secondly, the survey item, 'When we work on something in class with a Chromebook, students feel less interested than when we do not use a Chromebook' was reverse coded and reveals that, both students (M=3.40) and teachers (M=3.19) have a positive perception, suggesting the Chromebook is influential in generating interest and then engagement. Students were more inclined to agree or strongly agree they were less interested (50%) compared to teachers (39.6%) (Appendix B4).

The total affective scores across this dimension when the t-test was run produced a result which shows the mean score for students in the affective dimension of engagement (M=3.44, SD=2.74) is statistically significantly higher (t= 3.68 *df* =209, two tailed p= <0.001) than those of teachers on the same variable (M=3.0, SD=2.61). It shows that students and teachers in this case think differently about student's affective engagement, and this is not through chance alone. The results suggest the perception of student affective engagement overall is different between students and teachers, with students reporting stronger affective engagement when a Chromebook is being used than the teachers recognise (Appendix B5). With students reflecting more positively regarding affective engagement it suggests they are more emotionally positive towards their learning with a Chromebook than their teachers appreciate.

4.1.1.1.2 Behavioural Results.

The behavioural engagement t-test results are presented in Table 4.12 and the crosstabulation tables from the Likert scale data are contained in Appendix C. In all but one survey item, the results were seen to be statistically significant and did not occur by chance. Firstly, the three statistically significant items will be reported. The item, 'Students often do other things on their Chromebook in class when they are supposed to be paying attention on their academic work' (reverse coded) showed students and teachers responded very differently, with 65% of students (M=3.80), disagreeing or strongly disagreeing they would use the device in any other way than for learning and 77% of teachers (M=2.14) agreeing or strongly agreeing students often use it for other things when they should be using it for learning (Appendix C2). This item produced the largest mean difference of all items across all dimensions.

Table 4.12

Behavioural Engagement T-Test Results

Survey item	Students			Teachers			Mean Diff	95% Cl		df	t	p
	n	M	SD	n	M	SD		Lower	Upper			
Students are less likely to ask for help if they are using their Chromebook	168	3.37	.958	43	3.28	1.054	.09	-.239	.419	209	.539	.591
Students often do other things on their Chromebook in class when they are supposed to be paying attention on their academic work (reverse coded).	168	3.80	.976	43	2.14	1.037	1.7	1.325	1.991	209	9.81	**<.001**
If students are using their Chromebook, they participate more in the lesson.	168	3.10	.893	43	2.74	.848	.36	.059	.655	209	2.36	.019
Students try harder in lessons when we use the Chromebook	168	3.12	.881	43	2.74	.727	.38	.088	.662	209	2.57	.011

The item, 'If students are using their Chromebook, they participate more in the lesson' also saw a difference in results from the two groups, with 30% of students agreeing or strongly agreeing (M=3.10) whereas 32% of teachers disagreed or strongly disagreed (M=2.74) and feel that students are not participating as much when a Chromebook is introduced. Teacher responses showed 0% strongly agreed. Just over half (51%) of teachers and just under half (48.2%) of students neither agreed nor disagreed with this statement (Appendix C3). The results were similar for the item, 'Students try harder in lessons when we use the Chromebook', with students (M=3.12) and teachers (M=2.74) overall on opposite

sides of the midway point, but with a notable number of students (53.6%) and teachers (62.8%) neither agreeing nor disagreeing with the statement (Appendix C4). These three survey items were all statistically significant and did not occur by chance and suggest students and teachers in the sample view behavioural engagement differently.

The survey item that was not statistically significant and could have occurred by chance was, 'Students are less likely to ask for help if they are using their Chromebook', where the responses from students and teachers were very similar. Results showed students (52%) and teachers (53%) agreed or strongly agreed with the statement with the statistics going slightly over the mean in each group (M=3.37 students and 3.28 teachers), suggesting a very slight preference towards agreeing with this statement. The number of students (27.4%) and teachers (18.6%) neither agreeing nor disagreeing suggest a stronger feeling about this item than the others in this dimension (Appendix C1).

The total behavioural scores across this dimension when the t-test was run produced a result which shows the mean score for students in the behavioural dimension of engagement (M=3.16, SD=2.25) is statistically significantly higher (t=5.86, df =209, two tailed p= <0.001) than those of teachers on the same variable (M=2.58, SD=2.49). It shows that students recognise their behavioural engagement in one way and that teachers' perceptions are different and this was not through chance alone. The results show that students perceptions are more positive regarding behavioural engagement when compared to the teachers' perceptions, although teachers are more inclined to recognise behavioural engagement in their students and appear more certain of this dimension than the others (Appendix C5). However, the differences between the two groups is small.

4.2.1.1.3 Cognitive Results.

The results of the cognitive dimension were statistically significant in three of the four survey items and are shown in Table 4.13.

Table 4.13

Cognitive Engagement T-Test Results

Survey Item	Students			Teachers			Mean Diff	95% Cl		df	t	p
	n	M	SD	n	M	SD		Lower	Upper			
Students find it difficult to concentrate when using their Chromebook for learning in class. (reverse coded)	168	3.59	.993	43	2.77	.992	.82	.492	1.152	209	4.91	**<.001**
Students learn more effectively when they use the Chromebook.	168	3.39	.960	43	2.77	.812	.62	.144	.332	75.02	4.29	**<.001**
The Chromebook allows students to reflect on their learning	168	3.26	.902	43	3.00	.951	.26	-.051	.563	209	1.64	.102
Using the Chromebook helps students to persevere with difficult problems.	168	3.49	.902	43	2.86	.833	.63	.152	.328	209	4.13	**<.001**

The crosstabulation tables for the cognitive dimension are in Appendix D. Firstly, the items

that were statistically significant. The first survey item in this section, 'Students find it

difficult to concentrate when using their Chromebook for learning in class' (reverse coded),

saw a difference between students (M=3.59) and teachers (M=2.77) in that students were less

likely to agree with this, with over 59% responding disagree or strongly disagree, whereas

teachers were inclined to agree with this more, with 37.2% agreeing or strongly agreeing with

this survey item. The teachers' perception is that students do find it difficult to concentrate

when a Chromebook is being used, although the number of teachers (46.5%) who neither

agreed nor disagreed shows there is no firm consensus on this area (Appendix D1). For the

item, 'Students learn more effectively when they use the Chromebook', 48.8% of students

(M=3.39) agreed or strongly agreed, compared to 11.6% of teachers (M=2.77) who expressed

the same view, a noteworthy difference. For most teachers, they neither agreed nor disagreed,

with 58.1% choosing this option. This middle, non-committed option suggests a viewpoint

that shows uncertainty about this cognitive aspect of learning with a Chromebook device.

When combined, 41.2% of all those who responded, students and teachers agreed or strongly

agreed that learning is more effective with a Chromebook device (Appendix D2). The final

survey item which produced a statistically significant result was, 'Using the Chromebook

helps students to persevere with difficult problems', which again saw teachers uncertain or

else, disagreeing. Not one teacher strongly agreed with this statement, with 58.1% neither

agreeing or disagreeing, and just over 50% of students agreeing or strongly agreeing

(Appendix D4). The mean for students (M=3.49) compared to teachers (M=2.86) shows they

are thinking differently about the Chromebook helping students to persevere.

The one question where the result was not statistically significant related to the idea,

'The Chromebook allows students to reflect on their learning'. This produced a result far

more similar in both students (M=3.26) and teachers (M=3.00) than the other cognitive items,

and overall, the results suggest the students and teachers are more closely aligned in their

view of this area of cognitive engagement and Chromebook use. Results show that 42.3% of

students and 30.2% of teachers agreed or strongly agreed with this statement, but 39.3% of

students and 46.5% of teachers neither agreed nor disagreed (Appendix D3).

The total scores across the cognitive dimension when the t-test was run produced a

result which shows the mean score for students in the cognitive dimension of engagement

(M=3.43, SD=2.74) is statistically significantly higher (t=,5.04 *df* =209, two tailed p=

<0.001) than those of teachers on the same variable (M=2.84, SD=2.51). It shows that students have a stronger connection to their cognitive engagement than their teachers recognise, and this was not through chance alone (Appendix D5). The results show that students are more positive in their views on cognitive engagement and teachers are of a different view as to their student's cognitive engagement when using the device.

4.1.1.2 Qualitative Survey Data.

The qualitative survey data in relation to the first research question is presented by the three dimensions of engagement, before then presenting emerging themes. Teachers and students responded to items designed to draw out perceptions of engagement, giving them more freedom to express their views. The results came from a deductive and inductive coding process using NVIVO12 and the indicators of engagement as identified in the literature. Responses from students and teachers were deductively coded to an indicator, with some respondents making developed comments, with each word or phrase coded to only one indicator, meaning one longer comment could be broken down and coded to several different nodes. Indicators as shown in the literature review not referenced in respondent's answers do not appear.

Three survey items phrased appropriately for students and teachers were:

- "If students are described as being 'engaged' in a lesson when they are NOT using a Chromebook, what are they doing?"

- "If students are described as being 'engaged' in a lesson when they ARE using a Chromebook what are they doing?"

- "When in lessons, in what ways are Chromebooks helpful for students learning?"

The first question above probed each participant's understanding of the concept of engagement. The second addressed engagement specifically when a Chromebook is being used, to develop an awareness of their perceptions and to begin the process of thinking

about how engagement may differ when a Chromebook is involved in a lesson. By prompting students and teachers to think about engagement in general and then think about engagement with the Chromebook, a focus on the impact of the Chromebook and not the general idea of engagement emerged. The aim of the third question was to understand how many respondents would explain how Chromebooks are helpful using the language of engagement without direct prompt, as with the Likert scale questions, but focused on the process of learning, to probe students' and teachers' perceptions of engagement.

Overall, the qualitative survey results of student and teacher perceptions of student engagement when a Chromebook is being used, showed behavioural was the strongest dimension, followed by cognitive and finally affective.

4.1.1.2.1 Affective Results.

The affective results are presented in Table 4.14. Indicators in the affective dimension are not well represented when compared to the other two dimensions in the survey and responses overall show a limited connection to the affective indicator of engagement from students and teachers. Results also show little difference in affective engagement between when a Chromebook is and is not used. Reference to enthusiasm, enjoyment and excitement were all noticeably low or lacking. No students or teachers used indicators identified as relationships with peers or teachers as examples of affective engagement when explaining their answers to the survey items, although there were references to personalisation from teachers and students. This is revealing of the relationship between students and teachers. When teachers construct learning specifically for the individual, respond directly to the individual students and then allow students to progress at their own pace whilst formatting their learning in a way that suits them. This shows us how teachers enhance student engagement and how personalisation acts an indicator of student engagement.

Table 4.14

Survey Responses Showing Student and Teacher Perceptions of Student Affective

Engagement

Indicator	Examples of Statement	Total N=211 f (%)	Students N=168 f (%)	Teachers N=43 f (%)
"Generally, if students are described as being 'engaged' in a lesson when they are NOT using a Chromebook, what are they doing?"				
Interest	*"Showing interest"*	1 (0.5%)	0 (0%)	1 (2%)
Excitement	*"Exciting material"*	1 (0.5%)	0 (0%)	1 (2%)
"Generally, if students are described as being 'engaged' in a lesson when they ARE using a Chromebook, what are they doing?"				
Enjoyment	*"We are more engaged because we are using good websites such as kahoot to make it more fun"*	1 (0.5%)	1 (0.6%)	0 (%)
"In lessons, in what ways are Chromebook helpful for students learning?"				
Personalise	*"In books the teacher can move on too fast so you don't get the notes but on Classroom they put the slides you can go at your own pace without Chromebooks we could not do that"*	22 (10%)	10 (6%)	12 (28%)
Interest	*"There are interesting and helpful websites out there"*	3 (1%)	3 (2%)	0 (0%)
Enjoyment	*"Makes lessons more fun and interesting."*	1 (0.5%)	1 (0.6%)	0 (0%)

Note. f is taken here to refer to the number of times students and teachers mentioned an

affective indicator in their response to the question posed.

The teachers recognised the personalised learning indicator, reporting more strongly

than students how the Chromebooks help "with individual pace," and how students can

"make their own resources." From this, we can also see a desire to learn coming through

the student responses as one student explained how they can find information and research without having to "disrupt the teacher". The results in Table 4.14 shows personalising learning mentioned by 10% of the whole sample, whilst still low, suggests both teachers and to a lesser extent students, recognise how the Chromebook can engage through addressing special needs or else allowing students to work at their own pace (asynchronous learning), thereby engaging students in their learning as well as having more options as to how to complete their tasks. However, when explored in the focus groups and interviews, this indicator was strengthened.

Overall, the open-ended survey results show there is limited affective engagement as expressed by students and teachers in the sample when a Chromebook is being used. Aside from personalisation which is tentatively of importance recognised by teachers, there a small difference in the student and teacher perceptions of affective engagement.

4.1.1.2.2 Behavioural Results.

Indicators in the behavioural dimension are strongly represented in these results and are presented in Table 4.15. As indicated in the literature, the behavioural aspects of engagement are more readily identifiable and the results in this case study showed this. The important results are shown when we compare responses from when a Chromebook is not being used, to when it is being used. Without a Chromebook, participation as self-reported by students and teachers was relatively high when compared to the other indicators in this dimension and when compared to other indicators in the other two dimensions.

Table 4.15

Survey Responses Showing Student and Teacher Perceptions of Student Behavioural

Engagement

Indicator	Examples of Statement	Total N=211 *f* (%)	Students N=168 *f* (%)	Teachers N=43 *f* (%)
"Generally, if students are described as being 'engaged' in a lesson when they are NOT using a Chromebook, what are they doing?"				
Participation	*"...participating in a class discussion"*	238 (113%)	156 (93%)	82 (190%)
Attention	*"Listening"*	54 (26%)	40 (24%)	14 (32%)
Effort	*"Working hard"*	2 (1%)	2 (1%)	0 (0%)
"Generally, if students are described as being 'engaged' in a lesson when they ARE using a Chromebook, what are they doing?"				
Participation	*"Engaging in debate"*	220 (104%)	146 (87%)	74 (172%)
Taking Responsibility	*"I am using online resources to help find new information."*	19 (9%)	16 (10%)	3 (7%)
Attention	*"Listening to the teacher"*	12 (6%)	10 (6%)	3 (7%)
Completion of Work	*"Finishing the work without talking"*	9 (4%)	5 (3%)	4 (9%)
"In lessons, in what ways are Chromebook helpful for students learning?"				
Participation	*"Research and fact finding"*	98 (46%)	54 (32%)	44 (102%)
Taking Responsibility	*"Allow students to take more ownership of knowledge acquisition"*	54 (26%)	49 (29%)	5 (12%)
Completion of Work	*"typing speed is generally faster than writing"*	20 (9%)	18 (11%)	2 (5%)

Note. f is taken here to refer to the number of times students and teachers mentioned a behavioural indicator in their response to the question posed. Some responses mentioned more than one indicator, or the same indicator several times explaining why the *f* number is larger than the N.

Teachers commented on the actions of the students without a Chromebook, often describing an activity or task students may be performing such as students, "reading", "writing", "researching", "debating", "watching", "listening", "being tested", "presenting", "creating", "making," which relate to the idea that engagement is fostered by students doing what the teacher has organised them to do, when a Chromebook is not present. Further comments from the teachers include, "actively participating" which could allude to any number of activities, including some who were more specific, citing "debating" and use of a "Holocaust memory box" as examples. Students used the term "work" and "working" referring to non-specific tasks, such as, "doing my work", "working in our books" and "getting on with my work", all suggesting a level of participation without a Chromebook. Only two references were made to effort.

When asked about engagement *with* a Chromebook, a very small decrease is identified in participation from both students and teachers, but largely the comments are very similar, with taking responsibility now a noteworthy difference when a Chromebook is introduced. Another meaningful difference is the indicator of attention, where students reported listening to the teacher strongly, almost completely in the context of 'listening to the teacher' or just 'listening' when a Chromebook was not being used. This dropped noticeably when the Chromebook was being used. This is potentially important, as it suggests there is less reliance and involvement of the teacher when the device is being used, as students are no longer listening to the teacher as much, although it does not show if this means the teacher is talking less. This is also corroborated by the focus group evidence. No students or teachers

reported the Chromebook device was helpful for students' learning as it helps them listen to the teacher, or more broadly helps them to pay attention to the teacher. The impact of the Chromebook on students' attention would therefore appear to be notable, although it is not clear if the Chromebook provides the same attention level as the teacher.

Examining how Chromebooks were perceived to help learning, students and teachers reported more indicators, more strongly on the behavioural dimension showing Chromebooks helped with research and working quickly, although where students felt this allowed them to complete more work, this was not something the teachers reflected very strongly (5% teachers, 11% students). Responses also showed student focus on the engagement indicator taking responsibility when a Chromebook is being used, as they can find out information and check things on their own without having to ask the teacher or seek permission. Teachers did not reflect this as strongly and are perhaps not aware of it happening. This links in closely to the idea of students not asking for help or asking questions of the teacher as much when they used the device compared to when they did not use it.

We therefore observe a distinct shift in behavioural engagement when a Chromebook is being used compared to when it is not, with major differences in the student and teacher perceptions of behavioural engagement.

4.1.1.2.3 Cognitive Results.

Indicators in the cognitive dimension were stronger than the affective, but not as strong as the behavioural. The cognitive dimension results are presented in Table 4.16. Whilst there were many comments that could be interpreted as being surface cognitive engagement, the definition as identified in Chapter 2 refers to a deeper cognitive display to warrant being reported as cognitive engagement.

Table 4.16

Survey Responses Showing Student and Teacher Perceptions of Student Cognitive

Engagement

Indicator	Examples of Statement	Total N=211 f (%)	Students N=168 f (%)	Teachers N=43 f (%)
"Generally, if students are described as being 'engaged' in a lesson when they are NOT using a Chromebook, what are they doing?"				
Reflection	*"Reflecting on each other's work"*	8 (4%)	1 (0.6%)	6 (14%)
Concentration	*"Concentrating on the work and what is being taught"*	6 (3%)	3 (2%)	3 (7%)
Deep Learning	*"Using what they have learnt at the start of the class and applying it to their task"*	4 (2%)	1 (0.6%)	3 (%)
Trying to Understand	*"Active listening"*	2 (1%)	1 (0.6%)	1 (2%)
Critical Thinking	*"Critical Thinking"*	1 (1%)	0 (0%)	1 (2%)
"Generally, if students are described as being 'engaged' in a lesson when they ARE using a Chromebook, what are they doing?"				
Deep Learning	*"Synthesising information"*	4 (2%)	0 (0%)	4 (9%)
Concentration	*"I am concentrating in the lesson"*	3 (1%)	2 (1%)	1 (2%)
Reflection	*"Reflecting on their learning"*	1 (1%)	0 (0%)	1 (5%)
"In lessons, in what ways are Chromebook helpful for students learning?"				
Trying to understand	*"We can search up information that we do not know"*	20 (9%)	18 (11%)	2 (5%)
Concentration	*"It makes me concentrate"*	5 (2%)	4 (2%)	1 (2%)
Deep Learning	*"Practical applications of theory"*	5 (2%)	2 (1%)	3 (7%)
Reflection	*"Documenting their work and reflecting on it"*	3 (1%)	0 (0%)	3 (7%)

Note. f is taken here to refer to the number of times students and teachers mentioned a cognitive indicator in their response to the question posed.

Cognitive engagement in this context is concerned with thought processes and the mental effort to try and comprehend or master complex skills and ideas, using deep learning strategies, self-regulation and understanding rather than the process of thought or thinking. Whereas we may see everything we do as a human as being cognitively driven, this research discerns this important difference as informed by the literature regarding learning. Responses from both students and teachers did not show a strong link to the cognitive dimension, despite several indicators being identified.

The differences in perceptions of students and teachers between not using and using a Chromebook suggests there is some impact of Chromebooks on student cognitive engagement in the classroom. Cognitive comments suggest both groups did not recognise engagement at a cognitive level is taking place as strongly when a Chromebook is being used. Although the number giving this feedback is small, it may nevertheless, be important. The indicator of trying to understand came through far more strongly in the survey item asking how students and teachers find the Chromebook is helpful for leaning. This positive response came predominantly from the students, who reported being able to access information when they needed, or when they "didn't know" something, in their journey of trying to understand. This shows a shift away from asking the teacher, more towards asking a search engine to try and understand, as one student explained, "you don't need to disrupt the teacher or wait to ask a question you can just google it", linking closely to the behavioural dimension indicator of taking responsibility.

Overall, the cognitive dimension was better represented when looking at how the Chromebook helps with learning, than it was when students and teachers think about

engagement without the device. The low number of codes identified in the cognitive dimension when a Chromebook was being used suggests the device is not engaging students cognitively. The difference between student and teacher perceptions is minimal except when trying to understand when looking at how Chromebooks are helpful for student learning.

4.1.1.2.4 Emerging Themes.

Inductive coding identified some emerging themes. Further to the survey items used above, one further open-ended survey item targeted the use of Chromebooks in lessons, focussing on how students and teachers did not find the Chromebooks helpful for learning. The question asked was, "In lessons, in what ways do you find the Chromebook not helpful for your learning?". The deductive engagement codes were not used in this process, as they reflect engagement indicators, whereas this section is looking at what emerged from the data that would counter the idea of engagement. The content analysis for the question is shown in Table 4.17.

The major theme to emerge from this question was the theme of distraction, which is seen as an indicator of behavioural disengagement. This came through very strongly in both the teacher and the student responses, with 60% of all respondents mentioning this explicitly. Teachers' concerns around the Chromebook and access to other things, shows they feel students can be distracted, as one teacher expressed, "Distraction engines to enter the infinity pools of the internet, from games to clothing websites to media content". With 81% of the teachers' sample identifying this as an area that reduces engagement with a Chromebook in their planned learning, it represents a strong response from teachers.

Table 4.17

Survey Responses of Students and Teachers Showing Perceptions of How the Chromebook is Not Helpful for Students Learning

Theme	Examples of Statement	Total N=211 *f* (%)	Students N=168 *f* (%)	Teachers N=43 *f* (%)
Distraction	*"I think it does not help you because you sometimes get distracted by other things online"*	126 (60%)	91 (54%)	35 (81%)
Device Issues	*"Sometimes there can be a few technical issues"*	23 (11%)	20 (29%)	3 (7%)
Health	*"The screen can be bad for your eyes if you use it for a long time"*	5 (2%)	5 (3%)	0 (0%)
Passive Learning	*"Can engender passive learning"*	3 (1%)	1 (0.5%)	2 (5%)

Note. f is taken here to refer to the number of times students and teachers mentioned a theme as identified in the inductive coding process.

This to a lesser degree is replicated in the student responses, where 54% referred to being distracted. Students did not always expand on this, as they reported that, "you might get distracted" or simply, "distraction", with few providing more extensive comments that provided greater insight such as one student who wrote, "there is people in my class who do irrelevant things on the chrome book e.g. play games and watch videos" (sic), and another who commented, "I can get an email at a really bad time and then be really tempted to reply but I think that's okay. sometimes I get bored when I have my chrome book I know that I can find a game to play ect" (sic). These comments indicate potential issues of distraction with the use of the Chromebook when trying to engage students.

For some students, there was a sense of frustration that on the one hand some of their peers would allow themselves to be distracted, but also that teachers were not addressing the problem and monitoring this more effectively. Conversely, one student explained they felt the teacher was so busy using the monitoring software to check on students to see if they were doing other things, they were in fact, not teaching. These comments provide evidence of how in some ways distraction plays a part in the disruption of engagement with a Chromebook, and how technology is not helping engagement or the learning process.

Lesser mentioned themes also emerged. One related to device issues, which was seen to not help the learning process. Comments from students included the Chromebooks being slow to them not supporting relevant software, and teachers, whilst fewer in number referred to them being slow and not supporting required functionality, specifically in mathematics. Another theme touched on the quality of learning, which was mentioned by one teacher who referred to how the Chromebooks can lead to more passive learning, and explained they were not useful for learning because students, "just google it" to find an answer. This was supported by one student who commented, "I do not think about the answer, instead I just search the answer up", which has implications for cognitive engagement. This suggests a synergy in viewpoint between students and teachers, although the numbers reporting this are very small it could indicate a wider, shared viewpoint across the school.

However, most students put the concept of searching for answers forward in a way that suggested being able to "search things up" was positive, allowing them to take responsibility for their learning (behavioural) whilst also showing they are trying to understand (cognitive). This would suggest a difference in the views of both groups, although it was not one that received a lot of comment from the teachers. Finally, a small number of

students referred to health, including looking at the screen and the impact on the eyes. Health was not mentioned by any teachers.

The final open-ended questions allowed respondents an opportunity to share any thoughts they had been unable to share previously.

- "What additional comments would you like to make about the use of Chromebook devices, for learning in lessons, at [Name of School]?"
- "Please make any further comments or share any further thoughts on any of your answers above if you wish to do so (On the Likert Scale self-report questions re engagement)."

Not all respondents chose to write a response to the above two questions, with a total of 128 students and 22 teachers entering NA for the first survey item and 136 students and 22 teachers entering NA in response to the second survey item above. Students who chose to answer the first item mentioned device issues, such as the Chromebook not working or else asking for there to be a choice of device rather than the Chromebook. Some comments also targeted the school's filtering system which blocks access to some sites. Overall, some comments explained how good the Chromebooks are and some explained how they felt they were not good, in terms of screen time and how they do not help students to remember things, a further concern regarding cognitive engagement.

Finally, there were also students and teachers of the view that engagement with or without a Chromebook is the same. Whilst the content analysis seems to show a difference in engagement depending on the presence of a Chromebook, there were also opinions shared that suggest there is little or no difference. They did not see any major difference in doing their work, and how that work was being completed, it was, "Very similar, just with a Chromebook", "The same" or, "I'd say the same thing, unless your definition of engagement is doing schoolwork, in which case it won't be so much different either. I would just be using

a Chromebook instead of writing in a textbook." This counters the comments from the overall coding which suggests a shift in the focus of engagement, in terms of dimension and the strength of engagement overall. One teacher commented, "Not sure there is a difference", when thinking about engagement with and without a Chromebook. Another commented, "Exactly the same as without the Chromebook. The Chromebook is the tool." This suggests the impact of the Chromebook to engage students is minimal.

4.1.2 Research Question 2: How do teachers report using Chromebook technology to engage students in their learning?

Open ended responses to the survey questions allowed both teachers and students to explain in their own words how the Chromebook is being used to benefit the learning taking place and this generated qualitative data which is presented below by dimension. Teacher responses were more specific in explaining the use, detailing aspects such as "collaboration", "live marking", "sharing of media", "fact-checking", "research", "using the device as an instrument" or using "bespoke software", "annotation", "storage", "word-processing", "sharing resources", "listening to music", "listening to audio feedback", "accessing Google Classroom" and "submitting prep." Students were more inclined to report more generally they would be "doing work" or "working" rather than explaining specific detail of how the teacher had directed them. From these words, an understanding of the affective, behavioural, and cognitive indicators of engagement could be identified to show how teachers are using the Chromebook to engage their students.

4.1.2.1 Affective Engagement.

Common affective indicators referenced by teachers focused on using the Chromebook to personalise material, where students can work at their own pace creating an affective connection to their learning. One teacher commented regarding the Chromebook,

"This really helps with individual pace. Some learners are quick, and others need some guidance on the board." Another comment was,

> Fantastic for AFL and formative assessment - Teacher can monitor what students are writing as they write it and give comments which are formative and directly input into student outcomes as they are created, shaping learning as it is happening. This is really powerful when used effectively.

Other teachers commented that "individual practice", "individual written work", "watching videos individually, start and stop as they please rather than all together", were all ways in which the Chromebook helped to personalise the learning experience thereby fostering affective engagement. This was corroborated by the students' responses which focused heavily on being able to find information and research things, quickly and efficiently, free from the restraint of a textbook or having to ask a teacher, and therefore being able to work at their own pace. Students supported their teachers with some responding how the Chromebook allowed, "covering a presentation at your own pace", "you can go at your own pace" and "you can go through it at your own pace". Linked closely to this were comments relating to feedback, and how the teacher would use Chromebook tools to feedback personally to the students. As shown in the results above, these comments were not frequent, suggesting a lower level of affective engagement. Overall, the one important way in which teachers reported using the Chromebook to engage was to personalise the learning for the students, a key affective indicator.

4.1.2.2 Behavioural Engagement.

Teachers reported using the Chromebook in a variety of different ways that build on existing pedagogical practices as well as using the devices to bring in new software and electronic resources that otherwise would not be available. Student participation is a main feature of Chromebook use and it is again the strongest dimension reported, showing how

students participate. General comments from both groups included being able to complete "work", not always being specific, but general classwork which indicates participation and potentially, effort. The key words that stand out from both groups are the words 'work' and 'research' both key areas identified by students and teachers regarding how the Chromebook is helpful for their learning, related to participation, a key behavioural indicator.

Comments which explained how the Chromebook made things easier were common, as students explained the ease at which they could look things up, find things and write more efficiently to complete the work set, an important behavioural indicator. The synergy here between the two groups is evident. Teachers reported how they use the Chromebook, "as an instrument or using bespoke software", or for "appropriate websites", "individual research/ group work", "starter activity", "listening exercises", "organising prep", and "finding information". Students reported the Chromebook "helps me to write notes much quicker", "make writing faster", "makes researching very useful and easy", "make finding information much easier" and "getting work done quicker" all related to the idea of the completion of work.

The teachers responded how the Chromebook was helpful to allow students to research and find information for themselves, suggesting independent learning for the students, where the Chromebook allows them to take responsibility, "allow students to take more ownership of knowledge acquisition," although this was caveated with, "as long as they have the skills necessary to navigate the tool in this way", suggesting not all students are capable of doing so.

Overall, the behaviour dimension strong as it is, sees both the use of the Chromebook in terms of applications being used as a unique feature of this type of technology (appropriate websites, accessing Google Classroom), as well as the different activities it facilitates that would not necessarily require a Chromebook (independent work, group work, listening

exercises, presentations), both features of behavioural engagement that contribute to the completion of work.

4.1.2.3 Cognitive Engagement.

Cognitive indicators were the weakest dimension in terms of teachers reporting how they used the Chromebook to cognitively engage their students, with very few comments being made linked to cognitive engagement. Limited references from teachers explicitly touched upon deep learning, with comments such as "peer assessment" and "practical applications of theory", but these were exceptions. One comment from a student reflected a mature approach to their studies, showing how the Chromebook elicited deeper learning, a cognitive indicator of engagement, which reflects positive teacher use regarding cognition, but was not expressed by any teacher. This area is problematic, as there is more than likely cognitive engagement taking place, but the data collection methods in this research, did not capture it. In short, there was a lack of cognitive recognition in relation to the teachers' reported use of the Chromebook in the survey.

4.1.3 Research Question 3: ***What opportunities and challenges do students and teachers perceive the Chromebook to have on student engagement?***

Two survey items addressed the areas of opportunity and challenge, both of which encouraged the respondents to consider the use of the Chromebooks in lessons.

- "What do you think the Chromebook device could be used for in lessons that they are not currently used for?"

- "When in lessons, in what ways are Chromebooks not helpful for student's learning?"

The first item explored students' and teachers' perceptions about the opportunities the Chromebook presents, with the aim to understand what both groups believed the Chromebook could do and explore how this piece of technology could be used in more

creative ways to engage students in their learning. The counter to this question prompted responses to uncover the perceptions of the device which do not help the learning process and thereby presents challenges to engagement. For both opportunities and challenges, it is not effective to report the results thematically via affective, behavioural, and cognitive dimensions as this part of the research did not elicit strong responses to allow meaningful reporting in this way to take place.

4.1.3.1 Opportunities.

Students did not respond with any new ideas or with anything that could be viewed as inventive, with many students (n=98, 58%) selecting the non-applicable option, or writing "nothing", "not sure" or "don't know" and "open to new ideas but can't think of anything new now", showing they had nothing to report or were not able to offer new ways of working with the Chromebook. Those who had ideas mentioned opportunities that are already being used and were perhaps sharing they were personally not using the Chromebook for quizzes, taking notes, more collaboration and researching, all of which have been reported by students in another section of the survey. In these cases, they are personally not using the Chromebook in these ways but are aware others are. Some reported, "I think the Chromebook is used for everything we need", showing a lack of new ideas about potential use.

Some teachers also responded with a "non-applicable", "not sure" or "?" option (n=17, 40%). Some were able to reflect on using the device for more creative things, such as, "I am interested in developing a student self-tracking system so that they directly engage with their achievements, progress over time and can identify which of their own work is outstanding." This shows how some teachers are thinking about how they could use the device to help students make progress. One felt teaching student key skills like typing were important opportunities, another the skills of research and organisation. Another teacher wrote that "more differentiated task learning" was an opportunity, and another wrote

"Paperless classroom", all of which had no further explanation with the response. Comments in this section were therefore not revealing.

4.1.3.2 Challenges.

In looking at the challenges posed by the Chromebook, the strongest perception is the Chromebook is and can be a distraction with 35/ 43 (81%) teachers and 91/168 (54%) of students mentioning or alluding to distraction. Distraction it can be inferred, leads to a lack of engagement. Students and teachers were clear in expressing how the Chromebooks were not useful as they often proved a distraction, with games and adverts being mentioned as main culprits. Teachers commented; "availability of online gaming and YouTube", "They provide easy distractions for students", "students can be distracted", and students commented; "I can get distracted", "tempts me to watch YouTube in boring lessons", "it is not practical, and it is just a distraction". Linked closely to this, students also reported the Chromebook itself was not always the source of the distraction, as they considered the teacher as being more important in the process and in the distraction, where one reported, "if the lesson is not structured, they can get distracted". If the teacher asks for Chromebooks to be closed, gives clear instructions, and then monitors, by moving around the classroom, this appeared to prevent or reduce the opportunity for any distraction. This is also be backed up by the interviews and focus groups, where the focus of the engagement is more about the subject and how it is being taught than the Chromebook. The sense here, is the source of engagement comes from the teacher, be it directly or through the tasks they set up to be completed, whether a Chromebook is being used or not. In this way there may be a feeling the teacher could be competing with the Chromebook for the attention and engagement of the students.

The concept of the Chromebook being a distraction is also supported by the Likert scale data as drawn from students and teachers, see Appendix C, Table C2, which asks about students doing other things on their Chromebook when they should be paying attention to

their academic work. The results from students and teachers are starkly different, with 26.2% of students strongly disagreeing with the statement compared to 27.9% of teachers strongly agreeing with the statement. Where teachers seem more confident than their answers to other questions, a larger number of students, 25.6% opted for the neither agree nor disagree, compared to only two teachers representing 4.7%. The challenge presented here is the differences in views expressed by the two groups, with students and teachers both reporting very different perceptions.

Another challenge comes with certain skills not being developed by the Chromebook. These include "handwriting" mentioned by several teachers, which is not being developed or practiced when the Chromebook is being used. "Plagiarism much easier" regarding using information and "word-processing can create lazy SPAG [Spelling, Punctuation and Grammar]" in terms of writing skills. A further challenge reported is how the Chromebook creates "a barrier between teacher and student", which would make affective engagement problematic in terms of student/ teacher relationship. Another teacher expressed how the Chromebooks, "do not bring the subject to life", which may suggest the challenge lays with the use by this teacher, given the wealth of resources accessible on the Internet, but nevertheless represents a clear view of the place of the device.

4.2 Focus Group Results

A total of four focus group sessions were held with Year 9 students, two with boys and two with girls. After the first call for respondents, a small number of boys volunteered. This resulted in one group of two male students (Boy1 and Boy 2) and one group of three male students meeting (Boy 3, Boy 4, Boy 5). A further request for volunteers elicited a group of girls, so that two further sessions were organised, one group with two female students (Girl 1, Girl 2) and one group with three female students (Girl 3, Girl 4, Girl 5). The

focus groups did not address teachers' viewpoints and therefore the results are not pertinent to Research Question 2, meaning this research question does not feature in this section.

The prompts for the focus groups were developed using the data from the survey, contained in Table 6. The meetings were audio recorded and then transcribed. Coding was completed using Nvivo12, using the same deductive codes used for the analysis of the open-ended survey data. Inductive coding was used to ensure that emergent themes and ideas were also captured as part of an iterative process, specifically to identify opportunities and challenges. As with the nature of a focus group, the prompts were not always followed strictly as the semi-structured nature of the discussion is to allow freedom to pursue avenues that may not always be scripted. The aim of the focus groups was to give the students a voice, to hear their views concerning the use of the Chromebook in relation to their engagement in learning.

4.2.1 Research Question 1: How do students and teachers perceive student engagement with Chromebook technology?

The student's perceptions of engagement with Chromebook technology, are reported using the three dimensions of engagement below. The behavioural indicators featured more than affective and cognitive indicators. The students expressed a mature and digitally knowledgeable attitude towards their Chromebook use in lessons, being able to acknowledge the positives and the negatives associated with their Chromebook use.

4.2.1.1 Affective Results.

Student perceptions in the focus groups allowed a more detailed picture of affective engagement to appear compared to the survey results, although the number of references was still low compared to the other two dimensions. The main affective indicators raised in the focus groups were personalisation and interest.

Affective engagement as explained across the focus groups was perceived to be stronger with a Chromebook, especially allowing students to personalise their work in a way students felt unable to in a paper exercise book, which in turn made the academic work more interesting and therefore more engaging. Boy 1 explained how, "it makes things that would be slightly more boring, or in the books more interesting, because you can personalise it a bit more." It was also suggested by the same student it was easier to make their work look good as students can, "put text boxes around the page, and then put some colours in, it would make it more interesting and eye catching" making the process more engaging. This was backed up by Boy 2 who explained, "…you can personalise it, and then make it how you like, when you take notes, you can make it how you are able to read it". In another group Boy 3 explained how it helped him with "independent learning", specifically tailored to him and his progress. Girl 2 felt that crossing things out in an exercise book is "frustrating" and does not happen when using a Chromebook. This was backed up by other groups who also spoke about not have to worry about spelling or presentation, because they could easily go back and change what they had done to change the aesthetics, whilst allowing them to engage with the material, showing more interest in the topics being taught. The idea of making notes and writing with the Chromebook appeals to the students, engaging them in the work, as they can do this "…in a more interesting way," than when asked to do it in a standard book as Boy 1 explained. All spoke enthusiastically about completing this simple task using a Chromebook in a favourable way.

Interest was the other indicator of affective engagement which came through from the focus groups clearly. Students explained how the Chromebook allowed them to explore topics and pursue their interest in what they were doing as well as being able to check things they didn't understand quickly and efficiently, which also engaged them in the work they were doing. Opportunities to access the Internet and the wealth of information contained on

the World Wide Web was an advantage and an opportunity identified by the students, that generated interest in what was taking place, strengthening affective engagement. Boy 1 explained, "if you're doing a research project, then instead of them handing sheets on with information, you can find information that other people probably won't find to make your research project interesting, because there's lots of resources available". Boy 1 was one of three students out of 10 who took part, who explained a lesson they did not want to end involving the use of a Chromebook, where he was involved in, "finding a lot of information". The idea of students being more independent when using the device emerged as it presents them with the ability to find things out for themselves, which links strongly to the affective indicator of interest.

4.2.1.2 Behavioural Results.

The behavioural indicators of engagement were the strongest dimension to show in the focus groups, with taking responsibility, asking for help and completion of work as the key indicators of engagement to emerge, with the indicator of participation running as a thread throughout.

Student's perceptions reflected feeling more empowered with the Chromebook to take responsibility for their learning. Implicit in one response was the idea of how, if a student misses an explanation that is key to the lesson, then because they do not want to seek clarification from the teacher, they can "Google the answer and then carry on", and almost 're-join' the lesson. As Girl 2 explained, she felt there might be answers available on the Chromebook to help if they were having trouble, preventing them from having to be "confused the whole time". Another felt the Chromebook allowed them to find out information as and when they needed, independent from the teacher, strengthening the idea of students taking responsibility for their own learning. Taking responsibility also came through in the way some students spoke about being able to look at information in their own time and

find out things for themselves, as Girl 5 explained regarding her electronic textbook, "if you have a question, they can find the answer themselves, rather than just not asking and muddling through it." Boy 1 explained, "there might be answers and help on the Chromebook" and Boy 2 expanded, "there's like lots of different answers on the Internet so, like, you can just like, delete it and then like, redo it without much trouble", all showing students taking responsibility for their own learning.

The indicator of students asking for help, is not straight forward. Students were of the view they did not ask less for help when using the Chromebook, although this depended on the context of the situation in which they were in, which dictates where the questions are directed, to the teacher or the Chromebook. This could include contextual factors such as the teacher, the subject and/ or topic being studied and whether the student felt embarrassed to ask. Boy 1 explained, "…if it's something like maths, that's probably better to ask the teacher… Google wouldn't really help too much in Maths". Boy 5 explained how, "getting help electronically sometimes isn't as good as getting help from the teacher." Alternatively, Boy 3 explained he sometimes felt unable to ask the question for fear of it being seen as a silly one, therefore Googling the answer was a good alternative. Girl 1 expressed a similar view,

> if you like, don't know what a word means and it is being used a lot, and she's already explained that, or he, and you still don't understand then you can just Google it fairly quickly and in like 30 seconds and then understand

This also suggests an avoidance to ask the question in front of her peers. She also explained how asking an obvious question can be avoided quickly by using the Chromebook. Girl 3 was of a similar view, stating she would Google an answer if she was, "in a lesson and everybody knew what they were doing, it was pretty silent in the room, and you felt uncomfortable asking". In the second boys group the discussion indicated that asking for help

was not necessarily going to happen, but that teacher accessibility, to ask quietly, means that "we don't have to announce it to the whole class', as Boy 5 explained. The teachers' skill in explaining also added to the confidence of the student to ask, as Boy 4 explained, "if the teacher explains in a really good way that you understand it, you'd probably ask them for more help", before finishing by explaining the subject is also crucial – Googling things in art for example would not be helpful, so teacher help is always needed. Girl 5 was clear in her view the teacher is crucial,

> I think it depends on the teacher to be honest, like if the teacher who you know kind of can actually answer the question, who can help you then you would ask them, but if it's a teacher that you don't think would be able to answer that exact question then sometimes it is better to just search it up.

The Chromebook is therefore providing an alternative means of asking for help, although whether the number of questions is increased or reduced by the Chromebook is not clear.

Regarding the completion of work, students were of the view the Chromebook allows them to write quicker and therefore progress more quickly with their work, making speed a key factor of the Chromebook as opposed to non-Chromebook use. Boy 5 explained how "you can get a lot more writing done", and Boy 3 agreed how "…it's a lot easier to get notes down" and Boy 4 was of the view, "typing is firstly a lot quicker and also more efficient." Girl 1 also expressed this view explaining how, "when you're on a Chromebook, you can actually write it down and understand it more". Girl 2 also explained the Chromebook is, "quicker, and it's easier to get your thoughts out, whereas when you're writing you have to focus on your spelling a lot more". Allowing students to complete their work quicker, students felt this facilitated their engagement. Another explained the Chromebook meant students spent less time writing things down and more focusing on the work in hand. With the aid of autocorrect Girl 2 and Boy 3 also felt that more writing was possible, than when

writing by hand, as less focus was needed on spelling allowing more focus on the understanding and the completion of tasks.

4.2.1.3 Cognitive Results.

Indicators of cognitive engagement were notable in the focus groups, although not as strongly as the behavioural dimension. Trying to understand and self-regulation were the most prominent. Firstly, trying to understand came through from the students, and how they explained the Chromebook allowed them to look for things themselves and this helped their understanding. Whether this was because they were struggling to understand or because they felt they could not ask the teacher, the technology facilitated their desire to understand. Furthermore, Girls 1 and 2 particularly felt that using the Chromebook allowed them to focus on the learning taking place rather than focussing on spelling or the aesthetics of their work, as indicated above. This allowed their thought process to develop more as they try to understand, which also links to the affective dimension as interest is maintained, and the behavioural as they take responsibility for their learning (A-B-C).

Secondly, one male group thought self-regulation was important when working with a Chromebook, linked closely to the concept of distraction, which detracts from engagement in the learning process. The art of "self-discipline" was a point made by the boys in the second focus group, emphasising how being in control of yourself is important, as Boy 4 explained, "because you have a lot of self-discipline, you will ignore the temptation", showing how there are times when it is tempting to look and do other things, but that self-regulation would help to avoid this. He went on to state, "it depends how concentrated you are, self-discipline" in reference to learning being more effective with a Chromebook. Being independent, but knowing the teacher is there to help also came through in the responses in the focus groups, as when they felt the teacher had control and was knowledgeable, they too were more engaged in the lesson, whether the Chromebook was or was not present. Girl 2 felt that being

able to use the Chromebook to Google answers meant being "more independent" and therefore she felt able to regulate her behaviours, explaining that lessons without Chromebooks that use normal books, means "everything has to go to the teacher" which could hamper learning in her opinion as if, "everyone has lots of questions it can be really difficult for the teacher to filter through". One comment from Boy 4 explained how he felt engagement was more than doing what you have been asked to do, but it was more "you have to go like above and beyond to be properly engaged," a comment that resonates with the literature and the overarching meta construct of engagement, showing a strong connection to the cognitive indicator, 'going above and beyond'.

Conversely, Girl 4 felt strongly the Chromebook did not help deeper learning, a key cognitive indicator, and showed a cognitive awareness of learning and memory. She said, "for me I just feel like I take things in like much easier writing it down because…it's like muscle memory that when you write things down, it just goes into your head easier, and you remember it easier". This was at odds with the rest of her group who agreed that learning and engagement was more effective with the Chromebook.

4.2.2 Research Question 3: What opportunities and challenges do students and teachers perceive the Chromebook to have on student engagement?

The focus groups discussed their wider perceptions rather than purely reflecting their own, bringing in the idea of some of their peers prefer to have no Chromebook in front of them and enjoy the process of writing with a pen, on paper. In short, the students were also aware of the other views their peers may have towards the technology.

4.2.2.1 Opportunities.

4.2.2.1.1 Developing IT Skills through Chromebook Use.

Boy 4 explained how "you can learn to touch type. So, you can still be focussing on the lesson while you are taking notes" and then understandably, "typing is firstly a lot

quicker". Boy 3 explained, "you can get a lot more writing done". This links in with comments made by Girls 1 and 2 who explained how they can write more using the Chromebook, and how it allows them to focus more on the content of the lesson, as they feel confident writing things down safe in the knowledge if they make a mistake, it is easily rectified, whereas on paper it would create more of a mess. Boy 3 said, "you can get a lot more writing done, auto-correct is much easier than having to ask the teacher for the spelling". In short, this furthers behavioural engagement.

4.2.2.1.2 Increasing Personalisation and Participation.

Personalisation for students comes firstly, in students being able to personalise their own work more than they could when using more traditional methods without the concern of making mistakes and creating a mess and secondly, allowing teachers to provide students with learning needs with the materials to access lessons more readily. Finally, by being able to access information as and when they need to increase personalisation and participation.

Students felt the Chromebook was a facilitator when it came to helping them with their thoughts and getting them, "out" or down on a document via their Chromebook, leaving them to focus more on the learning than on secondary aspects such as spelling or neatness, "if you're doing a table or if you're asked to put in a diagram, it's much easier than like having to get everything like a ruler, pencil, then if you make a mistake you have to rub it out". The Chromebook gives students the opportunity to learn more and present their work in a more personalised and effective way, which leads to students feeling better, even more so where special educational needs and disabilities (SEND) are considered.

Girl 3 with a special educational need explained how the Chromebook is an important tool for her dyslexia, which allows her to access her work more easily than if she did not have a Chromebook, she explained her learning was, "better and more effective". In this way the Chromebook can be seen to provide an opportunity to empower those with specific needs that

may not be fulfilled ordinarily. This was explained by one participant but could also be indicative of a wider appreciation of Chromebook use among SEND students. Girl 3 felt her participation was enhanced with the Chromebook when working on a presentation with others, "it is better because you are then engaging with the lesson, you know, by helping with different pieces" and therefore her participation was being enhanced using the Chromebook. Girl 2 explained how the Chromebook, "allows you to ask more questions, because you can then go back and changes things", both of which suggest increasing personalisation and participation.

Finally, students felt comfortable being able to access information when they needed to, often during a lesson, when they could use the device to check their understanding or try and catch up with elements they had inadvertently missed earlier. In doing this, students are taking the opportunity to participate and have the lesson more personalised as they have an element of control.

4.2.2.2 Challenges.

The focus groups overall were careful and thoughtful in reflecting their ideas related to the challenges presented by Chromebook use in the classroom and did not discuss the Chromebook as the answer to or cause of all their problems or indeed as the panacea to their learning.

4.2.2.2.1 Distraction from learning.

Distraction is a strong challenge to engagement that emerged from all four focus groups. Boy 3 explained candidly, "we've all used it for something that we're not supposed to use it for. And we'd be lying if we said we didn't". Girl 4 when asked about being more engaged with a Chromebook, spoke about distraction straight away, "I just get distracted by things on my Chromebook" and went on to explain that "when it's just like breaking things down on a document I don't feel like I'm really involving myself in the class". Engagement

for this girl is about the context of the use and feeling part of something but when the teachers are talking and she has her Chromebook open, she explained, "I just don't feel like I'm taking it all in." Girl 3 explained simply, "I get distracted by things on my Chromebook."

Whilst there was some agreement with the results in the survey, there was also a feeling that distraction is very much a personal and a contextual phenomenon, where some students could be intent on not doing the work. Girl 3 stated, "I feel it depends on the person, if you're easily distracted by stuff, it could be a distraction". Boy 4 stated it depends on, "your personality and self-discipline" which also corroborated Girl 2 who felt some would get distracted when they, "were in a bad mood and did not want to learn". The context of the lesson was also a factor, in that Boy 4 explained, "it depends firstly on what you are asked to do" and Boy 5 explained it depends on, "what's really happening in the lesson". Boy 2 explained the distraction comes, "because the lesson isn't engaging", suggesting the teacher or wider influences are at play. Girl 5 explained that when, "a teacher is talking, the Chromebook is open and you're fiddling around, then it can be a distraction". Girl 4 was very honest about her interaction with the Chromebook and how the temptation to look at emails and do other things was often too great, thereby confirming to a degree what the survey revealed from the teachers and from some parts of the student body. This student was unusual in the focus groups but fitted the perceptions of the teachers in the survey, that showed this was a challenge. Focus group 2 were clear that self-regulation, or "discipline" was important when it came to using the Chromebook, which meant that opportunities for learning were great, although the links to distraction were never far away. One group explained how peer pressure can sometimes be brought into the equation, as if other students in front were doing things that were off task, the pressure to do the same intensified, thereby showing interaction with peers in the microsystem is an influencing factor.

Boy1 explained the Chromebook is a distraction, "sometimes" and that teachers "should ask for the lids to be down to avoid distraction", which Boy 2 supported, "it's better to like, for the teacher to ask everyone to put their lids down". Girl 2 explained how teachers talking when students are engaged in a task was not helpful and that if the teachers ask for "Chromebooks down" this would take away the opportunity to get distracted. For the most part the focus groups felt their Chromebook did not necessarily distract, yet they recognised it does and could, although this could be a reflection on the groups as excellent students, who may genuinely know they do not get distracted, or perhaps are not aware of being distracted or were reluctant to admit to it. Most students in the groups were of the view that if the teacher employed strong control of the class and at the same time made the lesson interesting, this would then mitigate from being distracted. The onus from the students seems to be very much on the teacher to control this aspect through their classroom craft, by either asking for Chromebooks to be shut, monitoring the classroom, or making the lesson interesting and engaging rather than using the Chromebook to take the responsibility. The pedagogical approach is therefore important and provides a challenge for the teachers to meet to try and secure stronger engagement, in a way that is consistent across the school.

Overall, from the focus groups, the Chromebook as a distraction is not presented as a major issue but more of an accepted consequence of Chromebook use.

4.2.2.2.2 Students By-Passing Deep Learning.

The idea of 'simply' googling answers leading to superficial learning is a challenge expressed by students which was also supported by teachers in the survey and the interviews. As such there could be times when students are content to copy and paste information across and not even be aware of its content, which would also reflect a lack of interest and therefore engagement. As such, students recognised this would not be the best way to learn, as Girl 2 remarked, "if you're just Googling and copying and pasting onto a Google doc, then it's

probably not as good, because you're not going to learn that way". Boy 4 explained how using Google, "shows the highest standard of work but then it's quite obvious that you Google and then write down exactly what they've written because it's written by like an adult", which strongly indicates that students sometimes cut and paste and use information uncritically, and plagiarism is occurring. The temptation to pursue the avenue of cut and paste can be strong, however, in recognising this, Boy 4 is aware of the 'danger' associated with doing so and recognises, "so we don't actually learn it, we just copy it". It therefore represents a challenge to student learning and strong links to cognitive engagement where there needs to be the deeper learning that is not being facilitated by such easy access to information via the Chromebook.

Focus group responses showed learning with a Chromebook does not always involve critical thinking, deep learning, or concentration. Girl 4 made the point that by physically writing with a pen, this helps her memory as opposed to typing, a point that was not made in the other groups. She presented this in terms of muscle memory and the cognitive process involved with learning, that she did not feel were present with a Chromebook. She stated, "…it just like goes into your head like easier and you remember it easier," when using the more traditional classroom tools such as a pen. This was corroborated by another comment from the same girl that whilst the Chromebook can be used to look up answers, she did not, "take it in," and so when it came to testing that knowledge she would, "do really bad," as she had not learnt the information to be able to recall, having not cognitively engaged with it. Following this, Girl 5 explained,

> I wouldn't take away completely from exercise books, because some people will find it
>
> easier to write on paper. Sometimes, if you draw a diagram or something you can't do it
>
> on the computer. So having a balance between both makes it effective.

This helps to show how students look for a balance rather than total use of Chromebooks. The challenge here comes in the perception that typing on a Chromebook device is not necessarily helping with deep learning and the cognitive aspects of learning in the same way. The perception of one student in a girl group, supported by others, showed that whilst the Chromebook may allow a greater volume of work to be done, the quality of that work is not necessarily better and that writing things down in a traditional way, leads to deeper learning. This could be the process of students engaging in completing the task, rather than engaging in the actual material of the lesson, with some students implicitly mentioning cutting and pasting information, which they acknowledge is not conducive to deep learning but done in the quest of work completion. As such, the teacher becomes invaluable to ensure the students are engaged in a meaningful sense and not just to complete work. Girl 4 explained how, "Like when I've done work, I didn't know I would just search up the answer but like I wouldn't take it in", showing a lack of deep learning, presenting a real challenge for students and teachers when using the Chromebook.

4.3 Interview Results

Interviews were carried out with teachers who volunteered following completion of the survey, responding to an email communication from the Head teacher inviting them to participate. Four volunteers were interviewed. Three females and one male made up the interview sample, which included teachers of History, English, Biology and Food Technology. Due to the small sample size, further information regarding the teaching experience and other demographic data was not collected as this would subsequently identify their survey responses, which would then breach the ethical approach of the study. To maintain their anonymity, they are given the pseudonyms Teacher 1, 2, 3 and 4. The prompts for the semi-structured interviews were developed from an initial analysis of the responses from the survey with the aim of trying to elicit more in-depth views about the use of the

Chromebook in lessons and engagement of students. Interview prompts are contained in Table 3.7. The interviews were audio recorded and transcribed. Coding was completed using Nvivo12, using the same deductive codes used for the analysis of the open-ended survey data. The results are presented via research question.

4.3.1 Research Question 1: How do students and teachers perceive student engagement with Chromebook technology?

The teachers' perceptions are reported using the three dimensions of engagement. Teachers did not discuss the cognitive dimension as much as they did the affective and the behavioural when explaining their perceptions about engagement with a Chromebook.

4.3.1.1 Affective Results.

All four teachers referred to this dimension, with key indicators being mentioned including personalising learning and interest, in line with the student focus groups. For three out of the four teachers there was a clear reporting of the ability to personalise learning for students when using the Chromebook, thereby effecting a feeling of appreciation from the students. Whether this was in reference to a student who was shy or who had special educational needs, the Chromebook was discussed as a tool that empowered students to engage in learning, in a specific way tailored to their needs that would not have taken place without the Chromebook. Teacher 1 explained the use of Pear Deck, in relation to a student who "is terribly shy and terribly quiet, but actually, because she is able to type her answer and I can get it… I think that's been a really good development." Teacher 4 explained, "a lot of low ability students in my experience have issues with handwriting and dyslexia and things like that, they feel a lot more comfortable using technology and keyboards". Teacher 4 also explained in some detail how students who work in second language have been provided with extra resources via the Google Classroom facility, "we have an ESL [English as a Second Language] classroom, where we have food dictionaries, and we have some translated

knowledge organisers" which allow students to access the learning in a specific, tailored way. Furthermore, Teacher 2 explained how being able to provide bespoke feedback was a crucial way in which students made progress by using the Chromebook to provide instant feedback in a personalised way, "you are giving them personalised verbal feedback on specific sections of their work," which has proved to be "absolutely brilliant".

Teacher 4 also focused on the use of instructional videos as a revelation as it allowed the students to access visual representation of key skills whenever they needed it rather than relying on the teacher to always be available to explain or indeed demonstrate, "we've got a wall of QR codes that they can go to... they can just scan it and there's the demonstration". Further to this was the idea that continually demonstrating skills for individual students in a class is not always possible from both a time and a resource perspective and so in this way the Chromebook is empowering learning using affective engagement by allowing students to access information as and when they need it, thereby personalising the learning. This connects to the behavioural indicator (A-B) of asking for help in that for this subject area it is not required as much, as students are empowered to solve their own problems and make progress at their own pace.

Linked closely to the above, interest was another affective indicator that was reported strongly in the teacher interviews. Teacher 1 explained how using the Chromebooks to post comments about slavery on an electronic forum elicited far more interest and therefore participation (link to behavioural, A-B) than would have been the case through normal whole class discussion. Teacher 1 explained how "they [the students] were completely outraged". The link from affective to behaviour is therefore clear in this example (A-B). The technology further fuelled the interest as other students posted further comments (participation), which in turn led to a deeper understanding (cognitive) (A-B-C). Through the technology Teacher 1 reported the lesson "took on a life of its own" and prompted an emotional response in

students which the teacher had not witnessed before, suggesting a class immersed in the lesson and seemingly experiencing 'full' engagement, or state of flow (Lawson & Lawson, 2013). Teacher 1 acknowledged "that was the moment I thought actually, this [the Chromebook] is, this is really useful". Teacher 2 supported this line of thought to a lesser extent as they explained how the opportunity to use Google and "have a bit of a search around" helped fuel students' curiosity and interest. Teacher 3 in using film versions of Shakespeare was of the view, "I find tasks like that they can get really drawn into because they almost don't realise, they are analysing Shakespeare" intimating strong affective through genuine interest, facilitated by the Chromebook.

4.3.1.2 Behavioural Results.

Behavioural indicators received a similar number of references to the affective and were again touched upon by all four teachers, including, asking for help, taking responsibility, attention and participation. Teacher 1 was of the view that, "the behaviour of students is different with Chromebooks", and Teacher 2 explained behaviour could change "if you're not on top of it", which was supported by Teacher 3 who also explained that when using a Chromebook, he/ she had needed to "reinforce quite frequently" the routines for the starts of lessons. Teacher 4 concurred in one respect, but also put an alternative view forward, explaining how students in his/ her view, "need constant stimulation" so the Chromebooks help to manage behaviour, as it provides the stimulation they require to remain focussed.

When it came to asking for help, Teacher 1 was clear students still asked for help and clarification with the work being undertaken both when a Chromebook is and is not being used, "I think my classes do ask quite a few questions actually if they're not sure of something". Teacher 3 expressed the view that students asking questions often presented an opportunity as a learning point and allowed the teacher to model how to find answers to questions that have come from a deeper understanding and interest. Teacher 2 was of the

view that "possibly" less questions are asked as there is "the temptation to google stuff", and when the Chromebooks were open, questions did seem to drop away. Teacher 4 was of the view that having too many hands up asking questions could be counter-productive to the lesson, "we don't want a million hands up at the same time. We want children to be able to access help immediately". For this teacher, the ability to use Google and the bank of resources in the department is enabled by the presence of the Chromebook device, where students could access these when they needed, to ensure the participation remained high and that progress was not hampered by waiting for help from the teacher.

Taking responsibility and attention were referred to less. In taking responsibility teachers referred to how students could use the technology to find information for themselves, as they have access to the Internet via their Chromebooks. Teacher 2 explained "they may be tempted to google a key word or phrase if they don't understand something, and I've noticed that", suggesting students taking responsibility and asking less questions as indicated above, but nevertheless on task. Teacher 4 was of the view that Chromebooks engaged the students directly and allows them to focus sharply on the work being undertaken. Teacher 4 was also clear that empowering students to take responsibility to access relevant materials when needed was a real strength of the Chromebook, which lessened the reliance on the teacher, "it's all about them taking ownership of their own learning". With attention, Teacher 3 felt they needed to be careful when using the Chromebook, as without it "the attention is there" but when using it had to try and break the "default setting" of coming into the lesson and opening the Chromebook straight away. Teacher 3 referred to body language when students are engaged and paying attention and how they will be sat upright and not slouched, or leaning on desks whilst maintain eye contact, meaning that he/ she could tell, then see how far students are understanding the content of the lesson. This was supported by

Teacher 1 whose clear focus on pedagogy and traditional teaching techniques, allowed her/ him to remain in control of the lesson irrespective of whether technology is being used.

Participation is a main indicator of engagement recognised throughout this study, although this did not feature strongly in the teacher interviews. Comments such as from Teacher 1 who reported using Pear Deck, "I really like to see that some of our quieter members of the class actually were engaging in a way that I don't think they would have done if I'd asked for volunteers to answer a question." Teacher 2 supported this, "you can see the engagement because it's literally being typed in front of you," regarding students collaborating on a Google Doc. Other such comments included students participating in the learning activities, but there seemed to be an assumption from teachers this was always the case, unless the theme of distraction comes into play.

4.3.1.3 Cognitive Results.

References to the cognitive indicator of engagement for three teachers centred mostly on the concept of distraction when asked specifically about cognitive engagement, which we have discussed in the behavioural sections up to now. It is noteworthy as the word distraction did not appear in the prompt, and so is a spontaneous response, suggesting teachers felt the cognitive dimension is impacted by the Chromebook which can act as a distraction. The direct prompt was based on the survey responses about how unsure teachers appear to be when trying to assess whether students were being engaged on a cognitive level when using the Chromebook with their students. Three teachers responded immediately with reference to distraction as impeding an understanding of cognitive engagement, with the fourth giving a very different response. It is therefore appropriate to report distraction in this cognitive section.

Teacher 1 observed that teachers are wary of the Chromebook as a distraction but also that teachers may also see the tool as doing too much of the work for the student in terms of

cognitive load, "So it's actually missing out some of those key steps where you sort of understand or embed that key information". This idea suggests the Chromebook performs the cognitive function of the student and therefore is missing out on vital steps in the learning process. Teacher 2 speculated that by having so many tabs open on their device there is too much distraction, especially if they are not directed precisely as to what to do, and by having lots of tabs open on the device the propensity for distraction increases. Therefore, Teacher 2's perception is that using more traditional methods such as a textbook and exercise book, combined with writing answers on a Google Doc, if the information needed is right in front of the individual, they are less likely to drift away and begin to look at other things which are potentially unrelated to the content of the lesson. Teacher 3 also agreed, explaining the sheer "proliferation" of material open to students with the Chromebook, means there is a higher chance of becoming distracted. Leading on from this Teacher 3 explained students now feel as though they need to be able to access information and complete work quickly, whereas not everything requires an immediate or speedy response. The skill of spending time and then discerning the relevant from the nonrelevant information is now much less than previously recalled, which has implication for students by-passing deep learning opportunities.

Teacher 4 expressed a different view, seeing the Chromebook as a tool that, "heightens senses of excitement and creates neural pathways for enhanced learning", where students can get more out of using the device in a quicker way, where speed was framed in a positive way. This perception is very much in tune with the feeling of some students as represented in the survey and to some extent in the focus groups, as students feel they are accessing information that is helping their learning and for many the quicker this happens the better. Overall, there was limited discussion of the cognitive dimension as teachers are of the opinion that the Chromebook distracts students from the cognitive processes, which suggests teachers are not convinced the Chromebook facilitates cognitive engagement.

4.3.2 Research Question 2: How do teachers report using Chromebook technology to engage students in their learning?

In talking about their use of the Chromebook and engaging their students in learning, teachers were able to articulate themselves clearly, reporting on the affective and behavioural indicators of engagement but not on the cognitive indicators as strongly, which corresponds closely to the survey results. During the interviews teachers mentioned specific applications such as Pear Deck, Google Docs, Google Slides, Google Forms, Kahoot, Moat, Jamboards, QR Codes and the use of YouTube for instructional videos, as a way of engaging students, all of which are facilitated by the Chromebook device. These are summarised in Table 4.18 below and the functions show the potential for teachers to connect to all three engagement dimensions, although the interviews did not always make these conscious connections. In assessing the use of the Chromebook Teacher 2 explained,

> I think if you're using a Chromebook because it's something you can't do any other way
>
> other than using technology, then it is better than if you're just using it as a replacement
>
> for a Google Doc, typing as opposed to writing it, what's necessarily the advantage there?

In this view, the use of these programmes must be for the reason they allow the learning to be better, as opposed to it being used for the sake of using it or using it as a substitute for another way of doing the same thing. This teacher explained further in relation to the options he/ she used how, "They [students] do like it, they do engage with it…as addons, but they do not replace the main thing", going on to explain how for a start to a lesson, "it's easier to give them a piece of paper…I think they engage quicker". This is at odds with the students, who feel engaged when using the Chromebook to personalise their learning, even when doing a perceived 'normal' or 'mundane' task such as writing or making notes.

Table 4.18

Summary of Teacher Tools Used via the Chromebook

Name of Tool	Function
Pear Deck	Interactive presentations and assessments/ feedback used with Google Slides
Google Slides	Presentations (interactive when used with Pear Deck), collaboration
Google Docs	Writing, note taking, essay planning and writing, collaboration and feedback
Google Forms	Quizzes, polls
Moat	Verbal feedback tool
Kahoot	Game based learning platform
Jamboard	Digital whiteboard for collaboration
QR Codes	Access and display online information
YouTube	Watching online videos
Exam.net	Writing exam papers in exam conditions
Google Search Engine	Surfing the Web for information

Teacher 4 found it useful to provide demonstrations of techniques, that could be accessed when the student needs to via a QR code as opposed to always needing the teacher to explain or demonstrate and potentially when there is not the time or the resources available to do so – "we have a wall of QR codes". By accessing instructions this way, students are allowed to dictate the pace of their own learning and can access resources in a timely fashion, personalised to the student's needs, at the time they need it. This example also showed that in terms of teacher time, the Chromebook allowed greater flexibility as the students in any given

class were not demanding lots of different things at the same time and not dominating the teachers' time as they were able to take responsibility for their own learning and at their own pace, fostering independent learning.

The teachers explained how they used the Chromebook to engage students in their academic work especially when asking students to work together with each other, as Teacher 3 stated, "for collaborative learning it can be a really effective tool", and with "clearly defined roles" in a group, it can be very successful. The Google Apps for Education, especially Google Docs and Google Slides are used to allow students to work on the same document or presentation together, leading to greater engagement. Pear Deck used by Teachers 1 and 2 allowed students to contribute to discussions and to receive real time feedback from the teacher. Teacher 2 explained the use of Moat, which enabled the teacher to provide oral feedback to students about their work, which students listen to at a time convenient for them, with the option of listening multiple times, helping lead to deeper learning, linked closely to the affective and cognitive dimensions. The idea of the Chromebook being a tool to be used when appropriate and not being used for the sake of using it or necessarily using it all the time also came through the interviews. Teacher 2 explained the Chromebook was more about "the little things that add to the lesson" rather than it being the leading factor of the lesson. This sits slightly at odds with the students who prefer the option of writing on the Chromebook, as it enables them to personalise their work and correct mistakes easily without making a mess more easily.

Overall, the teachers do perceive the Chromebook to be a useful additional tool for learning which has the potential to engage, but it is not reported in this study as something that forms the central focus of the lesson, with the Chromebook playing a part in engagement but not being central to it.

4.3.3 Research Question 3: What opportunities and challenges do students and teachers perceive the Chromebook to have on student engagement?

4.3.3.1 Opportunities.

A common view expressed by all four teachers indicated the Chromebooks are a useful tool that enables learning to take place albeit in a different way to a classroom without this technology. As such the opportunities for engagement are plentiful, although there was nothing offered further to how it is already being used, which suggests the teachers in this sample are perhaps adaptors rather than innovators. From the interviews we can infer key opportunities which are explored below.

4.3.3.1.1 Student Access to Information and Resources.

This relates to accessing information otherwise not available without the device. Teachers explained the opportunities presented by the Chromebook to help students of all abilities access material as well as using the device to generate real interest in their subject. This interest spilled into emotion when Teacher 1 described a lesson tackling the issue of the trans-Atlantic slave trade and students engagement was such the lesson, "took on a life of its own." The opportunity is therefore presented as one to engage through a genuine interest in the subject material (affective), which then leads to a greater participation (behavioural), and ultimately a better understanding of the topic (cognitive), which runs through all three indicators of engagement (A-B-C).

Teacher 3 explained how audio-visual features of the Chromebook allow for a more targeted approach to the study of a Shakespeare play. By structuring the lesson so that students watch different versions of the same scene being acted out, they are at one and the same time being drawn into the subject, their interest is heightened and as they are watching video material, the process feels less like 'learning' to the students in the teachers' perception. This represents a great opportunity to bring a subject to life, to allow students the

freedom to watch multiple scenes in a way that a traditional reading of the text, or else explanation of the interpretations does not allow. This leads on to a positive attitude to their learning which in turn could lead to the development of analytical skills using the Chromebook, something that possibly would not have been developed using a different method. As such accessing resources is a good example of an opportunity to engage students in deeper learning.

4.3.3.1.2 Developing Student IT Skills through Chromebook Use.

One teacher spoke of the 'how' of using the Chromebook, that students need to be shown things that teachers sometimes assume they already know. Teacher 2 felt strongly that students have not been empowered or upskilled to use the Chromebook device to its fullest, the implication being they have been given the device and then an 'over to you' approach adopted. As Teacher 2 explained, "It's like we are giving them a tool but on the other hand we are not providing them with the opportunity to use it properly" leading to, "frustration". Teacher 3 supported this, referring to students looking for information via the Internet and not checking their facts in their action to complete a set exercise. If deep learning and critical skills are to be advanced students must develop the skills to use the Chromebook, otherwise the device will not be utilised to its fullest. The challenge here is one of educating the students in the full use of the device and where possible upskilling them. This represents both a challenge and an opportunity.

Two teachers felt the Chromebooks were an opportunity to do things better, to enable greater skills on the part of teachers and of students. Teacher 2 felt strongly that teaching students to touch type was a wonderful opportunity that was being missed, a skill they felt would help them in the future and that given the use of them in school at the present time it was "insanity" this was not being taught to them. Being able to type quickly was also expressed by the focus groups and the survey, where they implied how it would be their

choice to learn this rather than something they felt the school should be teaching. Some students felt they could already touch type, although their understanding of this skill may be confused with being able to type quickly. Teacher 1 however was of the view that students "have actually got really quite skilled at sort of touch typing, which was another by-product I hadn't foreseen". The perceptions of teachers here, is seemingly at odds with each other.

Teachers therefore felt that a more concerted effort was needed on making sure that everyone, teachers and students, get the basic skills right and how there are ways of using the Chromebook in school that are not co-ordinated or thought through reflecting a piecemeal approach. The device used properly and to its full potential presents an opportunity for the future, for teaching and for learning, especially opportunities to focus more on technological skills and to empower teachers to update their current practice by using the Chromebook to engage students. The COVID pandemic was also mentioned by Teacher 2 as forcing teachers to make rapid progress with their technology use, especially during lockdown when remote teaching was taking place, meaning teachers had to "learn very quickly".

4.3.3.1.3 Increasing Student Personalisation and Participation.

Personalisation for teachers comes firstly, in providing feedback to students, secondly in allowing students with various needs to access lessons more readily, and finally by allowing access to information as and when students need to, thereby increasing personalisation and participation (A-B-C).

Teacher 2 explained how using the Chromebook for synchronous learning allows the teacher to see what each student was producing in real time, which then permits them to prompt for further and deeper understanding of individual students by name, "if you have Pear Deck open and they are doing it synchronously, you can see what is coming through…then you can instantly give them feedback". This can be done either through

further questioning or by asking the student to elaborate further on what they have produced, again eliciting deeper learning, through personalisation and participation.

Teacher 4 was animated when explaining how the "gadget" (Chromebook) gives the students a sense of ownership and a greater sense of comfort with the technology. This was at odds with the other teacher interviews, who expressed more negative views on the topic of cognition and the Chromebook (see below). Teacher 4 explained how the bank of resources, made available using the Chromebook through the Google Classroom, allowed all students to access information and help when they needed it, allowing for a much more personalised learning experience, where "higher ability students then have access to more information". Further to this Teacher 4 explained how each child was a member of the Google Classroom, "depending on a child's needs they are invited to different classrooms", which could be for those working in a second language or those with special educational needs. Teacher 1 also reported one opportunity was the fact that all students in Years 7 to 11 have the same device and therefore accessibility to online platforms is the same for all. Therefore, each class and each student can engage in playing a Kahoot and all are able to take part. Kahoot is a programme that provides coverage for a lot of the affective indicators, generating interest, enthusiasm, and enjoyment in the learning taking place, allowing every student to contribute in one way or another. All students are therefore able to access the summative assessment package.

4.3.3.2 Challenges.

4.3.3.2.1 Distraction from learning.

The key challenge to emerge from the teacher interviews was the concept of distraction, linked strongly to the behavioural indicator. Teacher 4 told how, "I have caught cheeky children trying to do their homework for the next lesson, because they rushed through my tasks and think I'm not going to notice". Teacher 2 explained how this was not always a

naughty child phenomenon, but a fact of modern youth and growing up in a technological world phenomenon. At two separate points in the interview Teacher 2 referred to students having multiple tabs open, "they literally have 25 tabs open, I'm not exaggerating" and "we've got too many tabs open physically or metaphorically", tabs that could be left open from previous lessons, but nevertheless prove distracting for students, alongside the emails which "pop up" or the Google Classroom which alerts students to a new assignment which could be connected to another lesson. The challenge represented here is one of conscious and inadvertent distraction as the Chromebook device provides both and must therefore be managed accordingly if the distraction is to not disrupt engagement of students in lessons. Interestingly, Teacher 2 did not think there had however, been any distraction deliberately happen in one of his/ her lessons.

Teacher 2 and Teacher 3 both explained that young people are used to having multiple things happening at the same time in a technological world, such as a TV on with music playing and a social media stream open, which seemed to infer children of the modern world can cope with such demands, an allusion to the initial digital native theory. The idea implied here is that students do not perceive multi-tech tasking as a distraction the way adults do. Teacher 3 referred to the teachers as being more on a "single track" suggesting the older generation are not able to operate the multiple track approach to academic work. Teacher 4 did not see any difference with the Chromebook being a distraction to other things in a classroom being a distraction, "a ruler can be a distraction", therefore the Chromebooks should be managed like anything other potential disruption. As such the concept of distraction is not perceived in a linear way but one that is contextually bound and far more complex than student + Chromebook = distraction. The source of the distraction is not necessarily the Chromebook.

Despite the Chromebook being acknowledged as a potential issue the teachers were clear that classroom management was the main way to ensure that students stayed on task, which is understandable given the behavioural aspect of engagement is the most visible. Making sure that "lids are down" when talking, positioning at the back of the room so screens can be seen and acknowledging the use of monitoring software, and as Teacher 1 explained, "how you set up your classroom and your expectations". The four teachers in this research did not report a strong desire to use monitoring software such as SENSO, as they all reported being focused on using their pedagogical skills to mitigate against this, sometimes simply, "standing at the back" or walking around the room and providing students with interesting materials. The challenge is therefore to as Teacher 2 expressed, "control" the Chromebook to prevent students from distraction. Teacher 3 agreed and expressed the view there needs to be "clear structures as to what points in the lesson they use it". Teacher 4 also employed a roving strategy to keep an eye on the screens, but also put a much more positive perspective onto the idea of distraction by explaining that yes, the situation needs to be manged. This downplayed the role of the Chromebook as a means for distraction, but this was a minority view among the four teachers interviewed.

4.3.3.2.2 Students By-Passing Deep Learning.

Teacher 1 referred to the idea of relationships and how the Chromebook needs to be used carefully, because "it can be, if we are not careful, make for a more docile kind of less interactive school community", which would impact on the affective indicator, specifically, relationships between students and teachers and students and students. This teacher was careful that we do not have students who simply "google it and find out an answer" but wanted to ensure that interaction and discussions still took place alongside the use of technology and that engagement with the subject materials is important, a view supported by Teacher 3. In this way, the use of the Chromebook becomes a challenge for all teachers as

students can by-pass the essential cognitive aspect of engagement, which is crucial to learning.

Teacher 2 in relation to using the Chromebook to find information, remarked, "I think maybe the temptation to Google stuff is that they're not necessarily going to be thinking", which suggests the Chromebook and the Google search engine is taking the cognitive load as opposed to the student. Teacher 2 put forward the perception that textbooks given to all students are not actually used any more. In this regard this is a challenge to which there is no straight forward response. Furthermore, the teacher also saw the idea that children differentiating between use of the Chromebook for school and the use of it for social media and gaming purposes is different and is a challenge for some students, which may also help explain a lack of affective engagement when using technology.

Teachers 1, 2 and 3 when asked about how teachers' responses from the survey suggested they were unsure as to the cognitive engagement of students, all mentioned the themes of distraction in their answer, a prominent theme from this research. These teachers overall demonstrated how engaging students with a Chromebook cognitively is a challenge and the features of the Chromebook in terms of the volume of information available, the number of tabs students have open and the concept of the device doing the cognitive work all came through as challenges that may need to be addressed in the future. Teacher 3 saw the potential for the Chromebook to get in the way of student's concentration, where they are expecting to find and process information quickly, by-passing deep learning. In this regard the challenge here is presented in terms of student's ability to spend some time looking carefully at information, discerning the relevant from the irrelevant all of which takes time. Instead, they expect to find things immediately. Teacher 4 saw this is differently, as empowering those of lower ability to "get on with the task" as they can find things quickly and easily, rather than having to rely on listening and remembering what the teacher has said.

Cognitive engagement is about deeper learning and the idea of students resorting to Googling answers was one challenge discussed by Teacher 3. She/ he was keen to ensure that students did not automatically resort to doing this as it would create a "problematic reliance" and this was closely linked to the concept of professionalism, with Teacher 3 seeing the teacher as the professional in the room, whose position it is to field questions and to then provide answers, even if this means not always having the answers to hand. Whilst finding information is not seen as difficult, finding the right information, and fact checking is another challenge that needs to be overcome with students.

4.5 Chapter Summary

Overall, the findings outlined above suggest there is a difference in the engagement of students when a Chromebook is used in the classroom, and that students' and teachers' perceptions are different. Results show to varying degrees how the three dimensions of engagement are affected by the Chromebook use according to the perceptions of the students and teachers who responded to the survey and took part in the focus groups and interviews. They show that both students and teachers are cognisant of some of the impacts of the Chromebook, drawing on their own personal experiences. The behavioural dimension of engagement is the strongest perception reported by both students and teachers across all data collection methods with more limited awareness on the affective and cognitive dimensions. Teachers are using the Chromebooks in a variety of ways to maintain engagement in their students learning, and this may have been impacted by the recent lockdown of schools during the COVID-19 pandemic. The results in this case study show how students and teachers perceive engagement with the Chromebook device differently, and how this is not by chance alone. However, whilst the engagement scores for the two groups show non-alignment, there is a desire to maintain the Chromebooks and continue to use them for teaching and learning in the school, with no perceptions showing they should be scrapped as a classroom tool.

Chapter 5 Discussion

This pragmatic, sequential, mixed methods case study research, set out to understand how students and teachers perceive student engagement in the classroom with one-to-one Chromebook technology. The research took place in one independent, co-educational, day and boarding school for children aged 11–18 years old in the United Kingdom. Furthermore, it set out to understand how teachers utilise the Chromebook device to engage students, and acknowledge the opportunities and challenges presented by using this technology, from a student and teacher perspective. These aims have been addressed through the deployment of a survey answered by 168 students and 43 teachers, four student focus group discussions involving ten students and one-to-one semi-structured interviews with four teachers. This study represents a departure from previous research in three clear ways. Firstly, it attempts to drill down further into the engagement construct with greater specificity, drawing out the indicators and dimensions more clearly where much previous research has taken a more distant and generic approach to engagement. Secondly, it uses data from students *and* teachers to further an understanding of engagement in a one-to-one TEL classroom, an approach not seen in engagement studies. Finally, it explores the use of one-to-one Chromebook technology at a school that is not introducing the devices but has been using them for over four years.

This chapter will discuss the major themes from the results and is structured using the three research questions and the conceptual framework of affective, behavioural and cognitive engagement where applicable. The final section discusses the Bioecological Student Engagement Framework and the Student Engagement Framework to understand what has been learnt by using these models to examine student engagement in this context.

5.1 Research Question 1: How do students and teachers perceive student engagement with Chromebook technology?

Like Buck (2019) the view of this research is students and to a lesser degree teachers, see the Chromebook positively engaging students in the classroom. This case study found students displaying strong signs of what has been termed 'digital maturity' (Begicevic-Redjep et al., 2021; Towndrow & Fareed, 2015) whilst teachers have made advances in technology use to engage their students, through use of the Chromebook device over time boosted by their work during the COVID-19 lockdown learning period. Based on the results presented in the previous chapter, the findings concerning the three dimensions of affective, behavioural and cognitive engagement will now be discussed in relation to the literature where possible.

5.1.1 Affective Engagement

Affective engagement, sometimes referred to as emotional engagement, relates to the negative and positive feelings towards the learning environment which can be expressed as interest, personalisation and enjoyment, which helps to strengthen the bonds between students and teachers (Bergdahl et al., 2020; Fredricks et al., 2004; Henrie et al., 2015). The basis of strong engagement starts with the affective dimension as the foundation on which the behavioural and cognitive dimensions can be built (Skinner & Pitzer, 2012; Wang & Degol, 2014). The quantitative results show how student respondents were more affectively positive than their teachers recognise. This sentiment was repeated when asked about feeling good when using the Chromebook for learning, with teachers not replicating the affective connection their students communicated. There was little difference reported in affective engagement between when a Chromebook was and was not used in the survey by students and teachers, which suggests the impact of the Chromebook is not significant for affective engagement in this case study, implying the Chromebook is not *crucial* to engagement and is

also not guaranteed to engage students. The overall affective engagement score from the survey was statistically significant and suggests that teachers do not recognise their students' affective connection to their learning when using the device. Affective engagement was noticeably stronger in the focus groups and interviews as affective engagement may be more individualised and therefore easier to express verbally (Ben-Eliyahu et al., 2018). The students perceptions sit at odds with Maffia (2019) who found that when used as a replacement for pen and paper the Chromebooks were a distraction and also with some teachers in this case study who felt using a Chromebook for simple tasks were not appropriate as they were not adding value. Students in this research valued the personalised approach the Chromebook appears to facilitate, which included completing what may be considered routine tasks.

In this case study the following two affective indicators are noteworthy in the perceptions of students and their teachers: personalisation and showing an interest.

5.1.1.1 Personalisation of Student's Experience.

Personalisation of schoolwork is not a new idea, although technology seems to have heightened the concept and it is increasing in significance. Personalised learning involves using, "teacher expertise in identifying and addressing students' ongoing individual curricular needs," including both providing the right materials, providing timely feedback and allowing students to present work in their own way, thereby strengthening affective engagement between student and teacher (Prain et al., 2013, p. 661). Personalisation also involves "...giving students control over their learning, differentiating instruction for each child" (Shemshack & Spector, 2020, p. 14).This allows asynchronous learning to take place, which in turn means that learning is now personalised. To tailor academic learning specifically to students is made more realistic with the use of technology, yet this remains an underexplored concept in the engagement literature (Shemshack & Spector, 2020), with only a small number

of studies identifying technology and personalisation as impacting positively on student engagement (Bergdahl et al., 2020; Haselhorst, 2017; Reichert & Mouza, 2018). In this research it was unexpected for personalisation to come through so strongly from students and teachers in the focus groups and interviews and this represents a significant finding in exploring engagement in the context of technology use in the classroom. However, as the Chromebook in this case study allows teachers to provide personalised learning more easily for the individual and encourages and empowers students to in turn personalise their work, it may have been unexpected but is not surprising and supports the findings from Haselhorst's (2017) research, which emphasised the ability to differentiate and for students to work at an appropriate pace.

Personalisation was articulated in teacher interviews, where they expressed their enthusiasm in being able to personalise academic work for their students and give real-time feedback, and by the students in the focus groups who explained how they had greater opportunity to do things their own way, which in turn fosters a positive attitude, towards their learning and with their teacher, showing a strong connection illustrated by the Student Engagement Framework. The use of Chromebook technology, especially utilising the Google Classroom, also allows teachers to do this at scale, for a whole class and for all the classes a teacher may teach, meaning the potential is significant (Dietrich & Balli, 2014). The affective context model of learning (Shackleton-Jones, 2019) places high emphasis on personalisation and the results in this case study also acknowledged students' and teachers' perception is of value, facilitated strongly by the Chromebook which is supported by Haselhorst (2017), who reported how teachers observed how the Chromebook allowed students to look up information independently, find out what they wanted to know and how this led to greater interest, further strengthening affective engagement. Furthermore, some teachers view how they can provide instant feedback to all students about their work, tailored to them, as being

an important feature of working with a Chromebook that again allows a more bespoke learning process to take place, fostering positive affective relations between the student, teacher and technology in the microsystem, although these relationships could be explored further in future research. This resonates strongly with Shemshack and Spector (2020) who suggest individual education plans for all students is made possible by the use of technology.

The student focus groups discussed personalisation as being important, a concept that made what some see as mundane tasks, more interesting and thereby more engaging, in line with Haselhorst's (2017) findings, where the ability to organise and present information in their own way was important to students. Yet this importance was not acknowledged by the teachers. Students explained how the Chromebook allows them to be creative and less worried about making mistakes, knowing that deleting and redoing their work is easy with their device, again not acknowledged by their teachers or by Maffia (2019). From the student body, and one teacher, using Chromebook technology to help with the issue of SEND (Special Educational Needs and Disabilities) was also seen as positive in terms of personalisation, and this is an area that warrants further research as it was not strongly represented here, but was a clear finding in Haselhorst's (2017) study which found the Chromebook could be used to "meet each child's academic needs" (p.107). The same support can also be provided for students working in a second language, further extending the idea of personalisation, and strengthening relationships in the microsystem between student, teacher, technology and activities.

Overall, the personalisation of academic work seen in this research, whilst it may not be applicable to every student, does represent a significant finding and contribution to the engagement construct and one where students and teachers appear to be aligned in their thinking.

5.1.1.2 Student Interest in Learning.

Interest can be understood as being students desire to find out more about a particular subject. In the context of a classroom the aims of the lesson, and the activities set up to achieve those aims as provided by the teacher are an attempt to generate interest, which is an integral part of engagement and learning. If students are not interested, then engagement is difficult to achieve. Using the Chromebook in lessons as reported by Teacher 1 generated genuine interest when using the technology and prompted a response in students which the teacher had not witnessed before, where interest and participation in the lesson was noticeable. This may not have happened in such a way without the technology. This explanation suggested students experienced a near state of flow as explained by Lawson and Lawson (2013), whereby the affective engagement, led to behavioural engagement which could then lead to cognitive engagement, making the behavioural-cognitive link an important one (Ben-Eliyahu et al., 2018) whilst also showing how the affective-behavioural-cognitive (A-B-C) engagement continuum flow could work, in a more linear model than the one suggested in the Student engagement Framework.

Through the focus groups and interviews, students perceptions reflected their strong affection towards learning with the Chromebook, especially when it came to finding things out for themselves or checking information, and in so doing showing an interest in the work being covered, strengthening the affective dimension of engagement (Renninger & Bachrach, 2015). Like other affective indicators, interest is not always observable, but in this research can be seen to strongly connect to students taking responsibility (see below). When self-reported, as a feeling or response towards the teacher, other students or the objective of the lesson it provides evidence for engagement, in line with previous research which found students interest was stronger when using the Chromebook (Haselhorst, 2017).

Through the focus groups, students were clear in showing how the Chromebook generated an interest in their learning, as they explained how the Chromebook empowers them to be able to find things for themselves, whereas without the device they would have to either ask the teacher or struggle through alone. One student explained how skipping ahead in a lesson, or even checking for understanding of what has been said and catching up, meant less reliance on the teacher and an independence of thought that shows genuine interest in their learning. This links closely with students taking more responsibility (behavioural) for their own learning (A-B). Indeed, there is some evidence from the students how they turn to their Chromebook to maintain their own interest in the lesson, rather than the interest being established by the teacher as has been observed in previous research (Towndrow & Fareed, 2015). However, in the main, students place emphasis on the teacher to establish interest. This view is more in line with the teachers who see the interest from students more in terms of engaging with the work *they* have constructed and set up, as opposed to setting up a 'looser' classroom situation that gives students more autonomy. This is another difference in perception, where some teachers are perhaps not confident in setting up learning that allows students to make the key decisions when they need to, as this involves giving over some control. Students can and do want to be independent learners, but they need to be given the opportunities to be so, and this is potentially more possible then ever using technology. In this way the Student Engagement Framework is limited in what it can show us about the relative strength of relations between student and technology compared to student and teacher.

The teachers, however, have a different perception of their student's affective connection to the Chromebook, shown through the survey and the interviews, which could be explained by an unwillingness, either deliberate or unconscious, to acknowledge their role may be lessened in some way. Students were clear in their view the teacher was very

important in the classroom as Google via the Chromebook is not able to provide help for everything a student would need. The teacher is still crucial. This was explored further in the focus groups and the interviews where it emerged the Chromebook offered students an alternative means through which they can have their questions answered which in turn changes the relationships structure in the classroom but maintaining or possibly heightening student interest. Or it could be the relationship which is being strengthened is the one between the student and the Chromebook, if we accept students have a relationship with their technology which helps to keep them interested. It is in this area, and in these relationships that we see directly how the subtleties of the microsystem are infinitely more complex than anticipated.

5.1.2 Behavioural Engagement

Behavioural engagement relates to the participation, conduct and action that students take to learn (Bergdahl et al., 2020). As with the engagement literature (Bond, 2020b; Henrie et al., 2015) this was the strongest dimension to be reported across all three data collection methods and as such is a strong gauge as to the perceptions of students and teachers towards engagement in the classroom with a Chromebook device. The overall behaviour engagement score from the survey was statistically significant and suggests that teachers are not in tune with their students' behavioural connection to their learning when using the device. This supports other research which report concerns over technology as a distraction (Aagaard, 2015; Fiorillo, 2015; Haselhorst, 2017; Sahin et al., 2016). Whilst the survey, and other studies can often portray this as students v teachers, the focus groups and the interviews provided greater context where students discussed the problem of distraction openly and teachers appreciated this was not always done in a premeditated manner. The focus groups and interviews both showed the behavioural dimension to be influential, with students putting emphasis on the teachers practice in how to instruct and monitor students on Chromebook

use, and teachers recognising how they can help mitigate against the overwhelming behavioural aspect of distraction. Consistency across the school it appears, is lacking, as students reported differing approaches from teachers and teachers likewise explained their different approaches. A consistent approach would be a way forward to help diminish distraction.

From this research, four important behavioural engagement indicators are worthy of further discussion: participation, attention, taking responsibility and asking for help, in line with previous literature reviews that identified these indicators as important for engaging students in their academic work (Bond, 2020a; Henrie et al., 2015).

5.1.2.1 Student Participation in Chromebook Lessons.

Participation includes behaviours such as answering questions, collaborating, working with others and getting on with a task as required. Rather than a more passive participation such as listening (coded to behavioural indicator of attention) it involves being more proactive. This illustrates the importance of engagement as a multi-dimensional construct as although a student may be participating and behaviourally engaged, it cannot be assumed they are affectively and cognitively engaged (Qahri-Saremi & Turel, 2016). However, if students are not participating, it would be difficult to rationalise they are engaged in the learning activity (Ben-Eliyahu et al., 2018) and as such the behavioural – cognitive axis (B-C) would not function. Therefore, it is not the participation levels on their own that are the key to unlocking engagement, but how the behaviour connects with the affective and cognitive aspects of the engagement construct – that is *how* students are participating. It also suggests that some indicators may be more important than others. If students are not participating then how can they possibly be engaged, whereas students may not ask for help but can still be participating and therefore engaged. This line of argument perhaps lends itself to a hierarchy of indicators, a hierarchy that has yet to be established and is beyond the scope

of this work. In this way, the A-B-C continuum provides a useful tool, as to have strong engagement all three areas need to be present.

The findings of this research support previous studies (Ben-Eliyahu et al., 2018; Bond, 2020b; Wang et al., 2022) in terms of behavioural engagement, by showing that when students are engaged, they participate in the learning activity in the lesson, with one literature review paper showing that when the Google Classroom is used, 100% of studies as part of the analysis reported on behavioural engagement (Bond, Buntins, et al., 2020). When we examine the qualitative survey results of this research, we see how participation levels as reported by students and teachers in the survey, do not change significantly between non-Chromebook and Chromebook use. This suggests students participate in lessons is positive irrespective of whether a Chromebook is present or not and would raise questions with the suggestion that traditional classroom engagement is different to a TEL classroom engagement as suggested in the literature by Bergdahl et al. (2020).

On another level, the quantitative survey results showed the teachers' perception was students do not necessarily participate more when a Chromebook is being used, whereas students feel they do participate more or just as much when using the device, although this is not a strong result, as 51.2% of teachers, and 48.2% of students reported neither agreement nor disagreement when asked if students participate more with a Chromebook. This is surprising as in employing specific software (e.g., Pear Deck, SENSO) with the Chromebook device, teachers can see quickly should they wish to, who is and is not participating and therefore who may need extra support or refocussing having drifted off task. We may expect teachers in this context to be surer in the technological world if they are able to monitor more efficiently and effectively if students are on task or not, but this appears to not be the case. Perhaps the monitoring software is not being used by every teacher.

5.1.2.2 Student Attention in Chromebook Lessons.

Attention in this study relates to students listening and showing focus on the work in the lesson. An important change facilitated by the Chromebook in behavioural engagement relates to the attention indicator, which is higher when a Chromebook is not present to when the Chromebook is, specifically, regarding the student act of listening. It would appear students are less disposed to listen to the teacher and may be taking more responsibility for their learning (see below) by using the Chromebook device, as they know the Chromebook is there to help when needed. This was backed up by both the focus groups and the interviews where students and teachers explained how the Chromebook had helped to empower their learning experience in the classroom. Students feel less reliant on the teacher, as the Chromebook and the access it provides to a world of resources now empowers them to be able to take a lead in their own learning, 'freed' from the need to listen to the teacher, much in line with Haselhorst's (2017) findings.

This is another important result with implications for practice as the teachers' perception is student attention is weaker when a Chromebook is being used, and would support the idea of engagement in the traditional classroom as being different to engagement in a TEL classroom (Bergdahl et al., 2020). However, this may not necessarily be the case, as this indicator is very much about where the attention is directed, and it would appear as though students are directing the attention more towards the Chromebook, and as such the student technology relationship in the microsystem is strengthened. As students reported, teachers do not consistently ask for Chromebooks to be shut, so there may be times when attention is directed towards the device when it should be directed to the teacher. If this is the case, it supports the idea of more consistency in approach and more focus on getting student attention in the right place. If this is not the case, this finding should not be viewed as a

necessarily negative thing, given that if teachers have asked students to use their Chromebook, then that is where their attention should be directed.

5.1.2.3 Students Taking Responsibility for their Learning.

Taking responsibility in this context involves students looking for information, often extra information, independently from the teacher. The area of taking responsibility is more significant when the Chromebook is introduced. Without a Chromebook the idea of students taking responsibility for their own learning does not register in any of the qualitative survey data, however, once introduced, students and teachers provide evidence that suggests the Chromebook allows this to take place. Whether it is through students who are now empowered to research further, to check and verify their own understanding or else through collaboration with other students, the device allows students to do things as and when they need to, without having to ask for help (see below). They are very nearly, if not actually, autonomous learners when using the Chromebook in this way.

Whereas from a student point of view this is empowering, from a teacher perspective it seems to be a concern. Teachers in this case study demonstrate the same sentiments shown in Luo and Murray's (2018) study, where teacher concern over students inability to focus in a TEL environment was clear. However, it is a good reason why the use of the device should be encouraged freely as opposed to tightening up or restricting use, which would limit taking responsibility that most students and some teachers believe it to empower. If the teachers are unable to trust the students to not become distracted, the benefits of the use of the device could be curtailed and the underutilisation and missed opportunities will continue, with technology's potential remaining unfulfilled. As Luo and Murray (2018) found, students were keen to utilise their technology freely, whereas their teachers were more pessimistic about their ability to do so. This sentiment runs through this case study. Developing one-to-one technology use in the future will require teachers and the school to look at how they allow

students to use the device in lesson time and ensure that lesson construction is as engaging as possible. Students' ability to progress could be limited if they are only ever able to use the technology as directed by the teacher, with no scope to be able to use it for their own ends, or if they are pushed to the other extreme and cast out into the wilds of the Internet. Too much regulation has the potential to stifle this aspect of engagement it could be argued, yet there is a balance to be found.

5.1.2.4 Students Asking for Help.

Although the Likert scale results were not statistically significant regarding asking for help, students and teachers were of the view that students are less likely to ask for help when a Chromebook is being used, an aspect that students and teachers agreed upon more strongly than any other area. However, the question is of whom the questions are being asked. With a Chromebook, students and teachers reported a decline in students asking the teacher for help, not the Chromebook/ Google, which is a crucial distinction to make. The results here are therefore potentially misleading, as whilst the teachers realise there are fewer questions being asked of them to help, it is not because students are not interested or not in need of help, it is because they now appear to turn to Google whereas once they turned to the teacher for everything or struggled on in silence. Students appear more inclined to Google simpler questions to check for understanding or confirmation, which will potentially contribute to a decline in overall questions being asked of the teacher. These results fit in with the wider understanding of students looking at the Internet for answers and with previous research that identified students showing more independence in not asking the teacher but asking the Internet (Ng, 2015; Yankelevich, 2017).

The focus groups also showed how students were prepared to use the Chromebook to clarify something, where perhaps they had not understood an explanation from the teacher or else were embarrassed to ask, for fear of appearing 'stupid' or clearly showing they have not

paid attention. However, this does not mean the teacher is redundant as the student focus groups acknowledged, but in terms of allowing students to learn at their own pace and to have their own needs addressed, Chromebook technology has great potential that is not being fully realised by both groups. Furthermore, for some teachers the idea of 'just Googling it' is met with suspicion and concern as seen in the survey results, yet by the student body and to some teachers it is seen far more positively, as a way of maintaining progress in the lesson and ensuring peace of mind students are on the right track. Further work would be needed on this aspect to understand just how much intellectual traffic is going to Google as opposed to the teacher, as the literature is not helpful with this indicator. It appears the element of trust is needed if technology is to be fully realised.

5.1.3 Cognitive Engagement

Cognitive engagement is the psychological investment students make in their learning activities and is the least visible and understood of the three dimensions. This was reflected in the results of this research which showed a limited perception from both students and teachers of the cognitive aspect of engagement with technology, or else the use of the Chromebook elicits little or no cognitive engagement. Students often identify behavioural engagement as cognitive engagement (Ben-Eliyahu et al., 2018) and scholars can often use behavioural data to make inferences about cognitive engagement (Vongkulluksn et al., 2022). Teachers were uncertain of the cognitive implications of the use of the Chromebook, with cognitive quantitative results showing teachers in the main neither agreed nor disagreed with the survey items in this section. When asked if students learn more effectively with a Chromebook, over half of teachers opted for the middle non-committal option, which suggests that if teachers are uncertain as to whether the device aids more effective learning, there is a question about using them at all. This uncertainty can perhaps be attributed to the emerging theme of distraction, as when teachers were asked about cognitive engagement in

the interviews, their immediate thought was to talk about distraction. It is in line with an overall view that technology and cognitive engagement is still being underutilised, with their being greater scope to use technology to engage students at a deeper level (Crompton et al., 2019). Overall, the quantitative results for the cognitive dimension show a difference between the perceptions of the students and the teachers towards student cognitive engagement which was not by chance alone. The focus groups identified the cognitive dimension a little more strongly than the interviews, where teachers were mainly side-tracked into discussing distraction, as opposed to students who approached this area more positively, highlighted below.

From this research, two important cognitive engagement indicators are worthy of further discussion: trying to understand lesson content and self-regulation.

5.1.3.1 Students Trying to Understand Lesson Content.

In trying to understand the content of the lesson, students display a deeper cognitive engagement, and this came through from the student body in the survey and focus groups who explained how they use their device to seek clarification on issues, clear up any confusion they may have and to deepen their understanding of topics they are studying. Therefore, the device presents itself as an accessible way to achieve, to learn more and to further understanding. In this regard, the Chromebook is empowering the student body and is another way, along with traditional teacher and peer support, they can understand the material being taught, showing cognitive engagement at a level that is recognisable, in line with previous research findings (Crompton et al., 2019).

This was not replicated by the teaching body, who perceive the device differently. This may be because as teachers, they have traditionally been the font of all knowledge and have been the ones to provide the understanding when it has been problematic. We are now presented with a situation where the Chromebook can be viewed like a TA (Teaching

Assistant) in the classroom. A Chromebook has the potential, providing the user is of sufficient maturity and ability, to help students with their learning journey not only in discovering new information but also in helping to reinforce previous learning. Whilst students still need guidance and instruction in this regard, once they have been shown the way, they readily adapt and use the technology willingly (Wang et al., 2014). This research is supportive of their being cognitive engagement in this regard but to what degree is less certain.

5.1.3.2 Students Self-Regulation when using a Chromebook.

Self-regulation involves student self-discipline and being able to ignore temptation towards being distracted. This cognitive indicator did not feature prominently in the student's survey results, but it was explained in the focus groups as being a feature of successful Chromebook use. Persevering with problems is a form of self-regulation in which students were of the opinion the Chromebook does help, more so than the teachers recognised. The teachers also reflected on this aspect and provided examples of where the device needed to be managed carefully to ensure students were on task. The student body communicated that one possible antidote to distraction is self-regulation, where students who are keen to learn and want to learn, should be focused on the work in hand as opposed to giving in to temptation and doing other things with the device. This relies heavily on intrinsic motivation. As Bergdahl, Knutsson et al. (2018)write,

> …having access to technologies also challenges student's ability to self-regulate; e.g.
> students' ability to abstain from the desire, or compulsion, to play games or update
> social media sites and instead prioritise learning. Hence, teachers' pedagogical skills
> to engage students when learning with technologies are critical for successful
> education. (p. 101)

This would also suggest that whilst students' personal approach is key, so too is the teachers' practice, which must play its part in the engagement process. The fact that Chromebook devices for the students in this sample have been used for at least a year and that 60% of the student sample have used it for longer than a year, means the novelty of use in the classroom is not a feature of their use, and that we may infer they are becoming 'normalised' and a regular part of the learning equipment used by secondary students in a classroom context, making self-regulation normal. For students who would only use websites as instructed, or else remain engaged on the task in hand and explore other areas of the Internet, they are exercising a certain amount of self-regulation. However, as Boekarts (2016) reports, a student who is unwilling to employ self-regulation is unlikely to engage, and the findings here support this. However, whether they become distracted and stray off task is dependent upon the context of the lesson and the microsystem within which it is placed, which if it does not generate authentic engagement is in danger of seeing students drifting off task (Dietrich & Balli, 2014). This again places a high emphasis on the teachers' ability to engage students, alongside the use of technology.

The self-regulation indicator links closely to the concept of distraction and is one way identified to combat this threat to learning. Whilst students in this and previous research (Towndrow & Fareed, 2015) show admirable qualities in aiming to not be distracted and disrupt the lesson, this is not the case for all students where, becoming distracted and doing other things can then have a knock on effect to other students. Distraction is not a new phenomenon and has existed well before transformative technologies arrived in the classroom. The difference currently, is that a whole new world of distraction is available to a student who is bored or else would like to do something else, and this 'digital distraction' can allow students to do other things and essentially multi-task between their schoolwork and other things unrelated to their learning (Aagaard, 2015; Selwyn & Aagaard, 2020). Being

familiar with the technology is certainly positive in the drive to ensure the technology is used for what it is intended, from the start. Furthermore, self-regulation as a contextual factor is important through intra-individual factors as identified by Bundick et al. (2014), where personality is seen as an important factor in engaging students. This becomes a challenge for the teacher in how they manage the individuals personal use of the device in the classroom, also taking into consideration other individual factors in the microsystem, including relationships in the class (both teachers and peers), which links to the affective indicators of engagement.

5.2 Research Question 2: How do teachers report using Chromebook technology to engage students in their learning?

As explored in the literature review, one-to-one devices are used for a multitude of exercises with students in a secondary school classroom setting, far more than can be expected of any one teacher or any one school to utilise. This question set out to discover how teachers are using the Chromebook to engage their students, thereby understanding further what is happening in the classroom with the technology. It is taken that unless the Chromebook engages students in their learning, there would be a strong case for not using them. There being no compulsion to use the devices in this case study school, in contrast to previous research (Hur & Oh, 2012), to gather teacher views as to how they were used is important evidence to link teaching practice to perceived engagement. To achieve this, evidence was gathered via open ended questions in the survey, through the semi-structured interviews with four teachers and via inferences at every stage of data collection.

This research found there was a wide variety of uses being employed from investigative work to summative and formative assessment and the use of a variety of programmes, designed to engage students with their learning. This research shows that technology use has moved forward from Wang et al.'s (2014) findings that teachers rarely

used technology to develop productivity or creativity. The use of the Chromebook does impact the microsystem as found in other studies (Steffensmeier, 2016) and as such understanding this further will support teachers in how to manage their use to the maximum effect. The limited view of their use explained by the teachers came because of the concern for students being distracted by the technology, something that is shown in this research and a concern also expressed by Charleston (2017).

The uses teachers reported in this case study largely correspond to the uses as reported in Towndrow and Fareed's (2015) study of a laptop programme, where similar digital programmes are being used for learning and teaching, although teachers in this study are also utilising software that did not exist in 2015. The results in this study are also consistent with Reichert and Mouza's (2018) conclusion that after a four year period of use a wide number of applications were being employed in lessons, including teachers facilitating students collaboration with each other whilst having easy access to information for learning purposes. This is very much the sentiment of the teachers in this research who are mainly proficient and experienced users of one-to-one Chromebook devices in the classroom, and therefore can utilise them confidently. This is in contrast to Sahin's (2016) research that found teachers began to respond more negatively to Chromebook use after the first year of use in the classroom. This was attributed to lack of training and personnel/ institutional issues, which were not raised as an issue in this case study, which may be due to the technological skills developed during the COVID-19 pandemic lockdown period.

The idea of technology being introduced into a traditional classroom is a situation that has been identified as potentially problematic, in terms of successfully integrating technology into the learning process (Bergdahl, Fors, et al., 2018; Håkansson-Lindqvist, 2015). The teachers' use of the Chromebook in this research suggests an advancement, as teachers report using technology for collaboration, research activities and feedback that form a part of the

lesson, not a bolt on, and one that is encouraging productivity and creativity, contrary to

Wang et al. (2014). Teacher 2's perception that technology enhances and streamlines certain

classroom activities but does not detract students from the main activity, suggests that

technology does not form the core of the lesson, which seems sensible, when the

Chromebook is viewed as a tool. This could be anticipated in practical lessons such as Design

Technology where perhaps the Chromebook would not help directly, but it also suggests a

peripheral use of the device rather than it being integrated as an essential part of the learning.

However, it has been shown that the more a one-to-one device is used the more positive the

outcomes from the use will be (Stone, 2017), suggesting that usage needs to be more than just

an add on or piecemeal, but needs to be consistent and regular.

The mixture of uses reported from teachers include two main approaches, with

content access and content production both featuring as they have in previous research

(Lindsay, 2016). Teachers providing material for their students to access allows for

differentiation and through this personalisation, allowing students to use their devices to

access and create work in their own way, increasing the propensity for students to

demonstrate deeper learning and thereby cognitively engage with material provided for them

(Haselhorst, 2017; Lindsay, 2016).

Teachers do not report using the Chromebook technology to develop student's skills

in their use (nor do students report being taught skills). There seems to be a void where no

skills are taught, with students using the device as they have been instructed to use it, without

any concerted effort to show or develop skills which they can take into the future. For

example, whilst teachers utilise the Chromebook for research, there is no reference in this

case study to teaching research skills using the Internet and different search engines. To

develop engagement using technology, a more co-ordinated approach to student skills would

be a sensible way forward that could yield great gains. This is not due to a lack of knowledge

or willingness on behalf of the teachers as in previous research, which suggests that teachers' pedagogical beliefs are holding them back from fully integrating technology into lessons (Steffensmeier, 2016). It therefore seems as though this case study relates closely to Hershkovitz and Arbelle (2020) who, "found that teachers in our study population use technology mostly to enrich their teaching, rather than to modify it" (p. 502), as teachers in this study, are using modern programmes via the Chromebook, to supplement their lessons rather than Chromebooks being the core.

Teachers in this research reported how the use of Chromebooks connected with the three dimensions of engagement, which contributes to the emerging picture of what is happening in the classroom regarding engagement and one-to-one technology. Each of these connections will be discussed by engagement dimension.

5.2.1 Affective Use

One clear use of the Chromebook relating to the affective dimension came through the personalisation of student learning as discussed above. Applications being used by teachers are wide and varied, including Pear Deck, Google Docs, Google Slides, Google Forms, Kahoot, Moat, Jamboards, QR Codes and the use of YouTube for instructional videos, all of which lend themselves to personalised and collaborative learning with students, strengthening peer relations and student teacher relations as they work together, something not identified by Towndrow and Fareed (2015) who found students responded negatively to teachers instruction with technology. Indeed, the variety and range of applications and uses is the real strength of the device, which holds great potential. These applications provide spaces for students to take some ownership of their learning, as they have some degree of autonomy that does not always exist in the analogue world, and this fosters productivity and creativity amongst the student body. According to the teacher respondents, these applications help to personalise the learning and additionally, provide further support for those students with

SEND, a feature highlighted by Shemshack and Spector (2020). Teachers therefore provide a crucial scaffold for students around which independent, personalised learning can be built.

Some of the applications via the Chromebook came into its own during the period of lockdown learning during the COVID-19 global pandemic, where teachers were forced online and, in many cases, adopted new ways of learning. The applications above represent several that were used for the first time in lockdown by teachers, and on return to the classroom, many have been maintained. This supports the theory set out by Sahin (2016) that greater familiarisation with technology has the possibility to result in teachers being more comfortable integrating technology into their teaching methods, and as such the global pandemic can be seen to have accelerated technology use for many teachers, as evidenced in this case study. The affective dimension is therefore reported to be relatively strong by the teachers who deploy the Chromebooks, and as such this leads to participation in the lesson when the technology is being used.

5.2.2 Behavioural Use

The use of the Chromebook in lessons has implications for the behavioural dimension of engagement as it has a large influence on the classroom space where the lesson is taking place. It impacts the context of the lesson. With the introduction of Chromebook technology there is an impact on the student, teacher, peer-to-peer relations, and on the activities being undertaken in the microsystem, which alter the context of the learning, sometimes for the worst according to Fiorillo (2015) and for the better according to both this research and Haselhorst (2017). As engagement is contextually bound (Fredricks et al., 2004) the use of technology takes on a certain importance for students, teachers and the learning which takes place. Teachers in the interviews explained how getting the classroom routines right is important, which suggests an awareness of the changes the Chromebook brings to the analogue lesson (Bergdahl & Nouri, 2020). Routines, however, is not something strongly

identified in the literature regarding technology use, although it may unhelpfully have been subsumed into pedagogical practices. Routines are an important way of controlling the TEL environment to mitigate against distraction and thereby impact behavioural engagement for the better.

Teachers reported far more strongly than Steffensmeier's (2016) research, which showed how teachers felt a one-to-one device empowered students, how collaboration enhances engagement and therefore the progress of students in their learning. Where students can collaborate with each other using the technology, the behavioural dimension is strong, as participation is also strong. One-to-one technology fosters greater collaboration (Haselhorst, 2017; Peterson & Scharber, 2017) which in turn has "a profound, positive influence on participation and commitment in the learning process" (Northey et al., 2018, p. 322). It therefore presents an opportunity that teachers in this case study seem to embrace. Collaboration helps students to learn in a way that is removed from a teacher led instruction, as the technology allows students to work together easily and seamlessly in a virtual space that is under their control and observable by the teacher. This approach also engenders a more autonomous student learner.

When the applications being used are interactive, the students appear to be enthusiastic about their use and participate authentically. For example, using the Kahoot application to engage students in a game that tests their knowledge and understanding is one example of how the behaviour of the students is influenced, as is the use of an online textbook where key terms can be searched, as each student can be seen to be participating in the learning activity taking place. As such, the A-B-C (Affective - Behavioural – Cognitive) learning engagement continuum is strengthened as students are enthusiastic, participating and then experiencing deep learning as it is checked or reinforced. This could especially be relevant for the behavioural-cognitive axis (B-C) as identified previously in science lessons

(Ben-Eliyahu et al., 2018) where positive behaviours can often lead to cognitive advances. When applied to the affective dimension as the starting point, we have A-B-C 'total engagement', if that is possible. Should an application be used that does not ensure the participation, then the axis breaks down and the engagement is not as strong. The findings from this research from the teacher interviews support Charleston's (2017) findings that one-to-one technology supports increased collaboration and thereby increased engagement. However, care must be taken in that the use of Kahoot can often by-pass the cognitive as students race to get to the top of the leader board, or else answer without thinking, which would then see no cognitive engagement taking place. For those who are disinterested, then affective engagement may also be impacted. Therefore, the use of the platform becomes instrumental, as if used in the right way by the teacher, all three engagement dimensions could be targeted, strengthening the relationships in the microsystem.

Where access to information is allowed via the Chromebook, the sheer vastness of the Internet has been seen to increase the possibility for distraction (Lindsay, 2016). This is not a surprise as with an overwhelming amount of information, this can be daunting. Whilst students can be behaviourally engaged in such a task, affectively and cognitively, this may not be the case. Secondary school students are far more likely to accept the first hit of an Internet search, uncritically accept information, or else give in as the task is too broad, which means the exercise is about finding information rather than understanding the information. If students know the right information is readily available, and they have this in front of them, they are more likely to engage and persevere, thereby engaging affectively and cognitively. Without the Chromebook this outcome is much harder to produce. As Teacher 4 contended, Chromebooks provide a better way forward that is more likely to secure strong engagement.

5.2.3 Cognitive Use

As suggested in the open-ended survey items, student's and teacher's acknowledgement and understanding of the cognitive aspects of Chromebook use is not wide-ranging, further supported by the quantitative survey results and the teacher interviews. When asked about the cognitive dimension of engagement, the teachers interviewed responded by focussing on the concept of distraction, and the negative as opposed to the positive connotations of Chromebook use to cognitively engage. This will be covered in challenges below.

Collaboration is considered to be a part of high order thinking and therefore holds huge potential for TEL (Lindsay, 2016; Peterson & Scharber, 2017), especially with a one-to-one Chromebook device. Teachers in this study reported using the Chromebook for collaborative learning and as such are using this more assuredly compared to when it was tentatively acknowledged in 2016 (Lindsay, 2016). The confidence of teachers in the application of collaborative learning that will engage students cognitively has made great strides, as collaboration fosters positive peer relations, encourages participation and encourages deeper learning and as such is an excellent way to achieve strong engagement in the microsystem. Therefore, collaboration can encompass many of the indicators across the A-B-C continuum, but especially the cognitive. As such teachers in this case study are using technology more in this regard, although it would seem they are doing so unknowingly in relation to the cognitive benefits and may choose to do it more should they be made aware of the cognitive benefits.

5.3 Research Question 3: What opportunities and challenges do students and teachers perceive the Chromebook to have on student engagement?

The focus of this question was to understand how the Chromebook could be used in the future to help improve student engagement, and what challenges may need to be

addressed to that end. In identifying areas where things can be improved and how the challenges could be overcome, this would help lead towards establishing the implications for practice and how teachers can further help students using Chromebook technology.

5.3.1 Opportunities

Students and teachers in this research did not suggest different ways of using the Chromebook devices, on top of what they are currently being used for. However, it is understandable that technology use in schools has advanced and continues to do so, especially considering increased technology use as part of the COVID-19 lockdown period, where this case study school was forced to introduce remote learning, using the Chromebook devices. It is therefore difficult to argue against the fact that use of one-to-one technology has developed and continues to develop over time, significantly boosted by the pandemic.

The key opportunities identified by the research, include access to information and increased personalisation and participation, both discussed below.

5.3.1.1 Students and Teachers Access to Information.

Chromebook technology allows seamless access to the world wide web and with it a huge range of resources to help with teaching and learning (Haselhorst, 2017). Whilst this can also be deemed a challenge, given the vast amount of material and the varying quality of it, there is an opportunity to open new learning pathways for students, beyond the scope of the traditional textbook, which contains a limited amount of relevant material, but also more that could be made available in a handout or textbook. Information accessed via the Chromebook can also be presented in multiple formats, using applications, written words and audio-visual materials that can help teachers work towards ensuring that affective, behavioural and cognitive engagement dimensions are being experienced by students.

Students and teachers both referred to the use of Chromebooks for research and accessing information, in the surveys, focus groups and interviews. But more so, access to

information was also mentioned regarding finding information when students were not sure or needed to confirm something. In this way, the Chromebook device provides a resource for students to independently check or find information they think will be useful, thereby also increasing personalisation through increased control of their learning and maintaining interest, which also supports previous findings (Haselhorst, 2017). This perception of the Chromebook from students and teachers did not appear to sit alongside a change in pedagogical practice, in that the use of the Chromebook device to access information came more strongly from student motivation to find or check things, rather than it being a built-in, pre-planned part of any lesson. From the findings it appears as though students are naturally now turning more to the Chromebook for information whereas they once turned to the teacher to ask for help. Teachers do not report that Chromebooks are helpful for students learning because they allow students to check or quickly look up information for clarification when they need it, thereby maintaining and encouraging student interest. This represents an advance from Haselhorst (2017) who found that student access to information increased, but this was mainly at the direction of the teacher. This links in with developing students' skills as discussed below, but in taking a lead from Teacher 4, resources, carefully curated for the students, can allow each child to access relevant materials as and when they need to, without needing to disrupt the flow of the lesson or take time from the teacher or the student, who can then busy themselves with higher order thinking and engagement strategies. This is not something found in previous research. In short, providing greater freedoms, within carefully designed perimeters will help to build strong engagement across the three dimensions (A-B-C).

5.3.1.2 Increasing Personalisation and Participation for Students.

The personalisation of education using the Chromebook came through strongly from the teacher interviews, but also to a degree in the student focus groups and the survey, albeit

in a more subtle way. By utilising the Chromebook effectively, there presents a wonderful opportunity to strengthen the participation levels of students through the increased personalisation of material, and more so, to positively reinforce this authentic participation through direct and personal feedback as well as through exciting and stimulating learning materials, therefore linking closely with 5.3.1.1 above. Where it was reported the Google Classroom was an excellent vehicle to deliver and share information, this was very much arranged by the teacher and presented to the students. Students also use this function to organise their work, and it provides them with a place to go to see what assignments have been set and when they are due, whilst also allowing teachers to post useful resources for students to access. It therefore provides an opportunity to further utilise a platform that could help with the engagement of students, irrespective of the subject matter, with the ability for each teacher to curate resources for their specialism and differentiate accordingly, which supports previous findings (Haselhorst, 2017). This would allow the harnessing of access to information and the personalisation and participation of students.

The personalisation of information was the strongest affective indicator recorded as part of this research and as such represents an opportunity to allow the school to build on this important dimension so that behavioural and cognitive engagement can also be firmly established, if we take the affective as the foundation for engagement (Wang & Degol, 2014). The personalisation of education represents a move towards a more bespoke and targeted approach to student's progress, and by utilising the Chromebook it could be possible to involve more children in more imaginative and bespoke ways (Shemshack & Spector, 2020). This would include, not only the provision of information, but also the crucial aspect of feeding back to students, to provide guidance on how to improve and make progress and allowing students the autonomy to make decisions about how they engage with their learning. Teachers in this study were particularly impressed with the ability to provide targeted

feedback to children, and where this can be personal to the child the greater the chances of authentic engagement to achieve better academic outcomes in line with previous research (Dietrich & Balli, 2014; Major et al., 2021; Prain et al., 2013).

5.3.2 Challenges

The challenges are distinct from the opportunities in that to one degree or another they provide a barrier to progress in the development of engagement with a Chromebook should they remain unchallenged. The challenges include technology as a distraction and students by-passing deep learning.

5.3.2.1 Distraction from Learning.

The overwhelming challenge to emerge from the data, from students and teachers, in the survey, focus groups and interviews was the perception of distraction due to Chromebook use. This comes as no surprise. Distraction is identified as a behavioural indicator for disengagement (Bond, Buntins, et al., 2020) and is not a new phenomenon (Aagaard, 2015). Whilst many students were candid about being distracted by the device, some students reported they would not use the device for anything other than learning in the lessons. Further probing revealed that for many the temptation and the ease at which it can happen means that it seems likely that students of all ages and abilities have been and continue to be, distracted at some point. This was reinforced by the teachers' perceptions. It is an ever-present 'threat'. There is clearly some challenge here to address, as students and teachers feel the Chromebook can be a distraction, albeit at a lower level similar to Haselhorst (2017) who also reported how distraction comes with the use of Chromebook technology. This includes gaming, having multiple tabs open and using tools in online textbooks that distracted from the task in hand. Distraction can come from the student, and from external stimuli, in this case the Chromebook (Aagaard, 2015) and as such 'controlling' these two aspects is the challenge.

Teachers should be encouraged to acknowledge explicitly the use of the Chromebook in the planning of lessons to include ways in which it can be shown, how students will be engaged and therefore how they will be monitored throughout the lesson to ensure they do not drift off task and became distracted. Charleston (2017) also reached the same conclusion, acknowledging how teachers need to be aware of the impact the Chromebook has and how effective lesson planning becomes crucial. Steffensmeier (2016) found all teachers to be cognisant of distraction and how classroom management and techniques to combat this was important in ensuring students remained on task and engaged, similar to the teachers in this study. This is in line with the literature where it has been noted, "Teachers who provide clear expectations and instructions, strong guidance during lessons, and constructive feedback have students who are more behaviourally and cognitively engaged" (Wang & Degol, 2014, p. 3). The teachers' skills, confidence and proficiency becomes instrumental and the challenge here is to ensure whole school training is provided, to share at the very least, basic skills to be able address the issue (Ertmer & Ottenbreit-Leftwich, 2010). Not all teachers may be willing or indeed see the need for this training, as one teacher in this case study explained, "Chromebooks are a learning medium, not an engagement tool". Previous studies reported teacher perceptions reflected a negative impact of technology on student engagement, possibly linked to a lack of expertise of the teacher (Johnson, 2017; Qahri-Saremi & Turel, 2016), however in this study, although there was a desire expressed for more training and sharing of ideas, this was not perceived to be a barrier to the good practice already in existence, and may be indicative of the nature of technology where there seem to be countless possibilities and a new confidence in the wake of the COVID-19 pandemic.

When this research examined the teachers' perceptions of the cognitive aspects of engagement in the interviews, the overwhelming response was to explain how the Chromebook device acts as a distraction. They said this quickly and without any probing.

This perception was clear – the potential for distraction is important. This study found that students did admit to playing games, in line with Towndrow and Fareed (2015), "The matter of engagement arises in connection with setting up and playing networked, multi-user games in class behind the teachers' backs" (p. 445) and Reichart and Mouza (2018) who also noted this, with students using their iPads to access Apps that were not part of the lesson, therefore being distracted from learning. Sahin et al. (2016) also see distraction as inevitable, offering little more than improved monitoring as a means to address it.

Technology and distraction is a growing area of research, increasingly aligned with multi-tasking (Aagaard, 2015; Selwyn & Aagaard, 2021), but viewed in this context, if the technology in the microsystem proves to be too much of a distraction, the answer could be to remove it. However, the response of both teachers and students in this research is to keep the technology which, despite the potential for distraction, they perceive is overwhelmingly a force for good and an opportunity for better learning. Students, whilst recognising the 'danger' of distraction, do show a willingness to address it, as they can see that in allowing it to go unchecked, the consequences will be real for them, once again showing a maturity of approach. It would seem as though the use of technology has advanced significantly since Steffensmeier's (2016) research sagely concluded that as students and teachers become more accustomed to the technology so the impact would be more positive. However, there seems to be in this and previous research from students and teachers a weary acceptance of distraction as being unavoidable, and something that needs to be accepted as part of technology use. However, given the undoubtable advantages the technology provides, it seems logical for practitioners to begin to explore ways to mitigate against the distraction using greater engagement strategies for greater educational gains, yet an explicit antidote to distraction is curiously lacking from any research papers which identify the dangers of distraction. The challenge therefore presented to us as educationalists, is to harness the technology for

attention, not distraction, and as such helps to create a blueprint for more effective future Chromebook use. In addressing this issue, more awareness of the complexities of the relationships in the microsystem would be beneficial.

5.3.2.2 Students By-Passing Deep Learning.

The Chromebook represents a tool that makes finding and retrieving information easy. This can result in a lack of critical thinking when it comes to assessing the quality of information and furthermore the temptation for students to use this information quickly, without engaging with it is very real. Sometimes, when using the technology for research purposes it can be more a question of speed and getting things done, rather than critically thinking about the information, as explained in the teacher interviews, which suggest students missing out vital steps in their learning. In this regard it presents another reason why some teachers were less sure about the technology and cognition. If students can access things quickly and uncritically, this means the cognitive aspects of learning may be bypassed. The findings do not suggest that all students are necessarily by-passing deep learning, but it is raised as a potential issue. Reichart and Mouza's (2018) iPad focused study found that students were able to, "access authentic Internet content, collaborate, and think critically about information", but in this case study there was less surety about this, especially when students access the Internet to find out information, the concern being they are not always engaging with the material to facilitate deep learning (p. 771). Where one teacher saw the creation of neural stimulation using the Chromebook as being a positive, another acknowledged how the Chromebook may be taking much of the cognitive load for students and further to this, one student also acknowledged how the Chromebook does not always help them to store things in the long-term memory. The temptation, implicit in these comments, for example to cut and paste others work and plagiarise or else not think about the material being studied is a concern (Fiorillo, 2015).

The results show that whilst the Chromebook may allow students to independently find information, the use of that information may impede rather than assist the cognitive learning taking place as the student fails to cognitively engage with the material and is more concerned with task completion. The teachers in this study are certainly unsure of the cognitive engagement dimension and as such believe their students are more inclined to be distracted than engaged. The students are more inclined to see the Chromebook as cognitively engaging and is a view that may be shared amongst the wider student body and some teachers.

5.4 Student Engagement Framework

Through this research, the Bioecological Student Engagement Framework and Student Engagement Framework presented in Chapter 2, have proved to be a valuable lens through which to view and understand student engagement in a TEL environment using one-to-one Chromebook technology. As Figure 5.6 below shows, the dimensions of student engagement and the microsystem are linked together, implying how important the microsystem is in fostering engagement. Through this framework we have acknowledged and explored each of the factors in the microsystem, to help further our understanding of these relationship and how each plays a part in engaging students using one-to-one Chromebook technology. Placing the student into the context of the classroom/ microsystem this model has allowed the interactions between the student, teacher and technology to become visible. These interactions within the microsystem, have been investigated to a degree by exploring the perceptions of the students and teachers in the case study, where students and teachers have explained how students have used technology, to complete activities as directed by the teacher, sometimes involving working with their peers. As such the model has allowed us to understand the perceptions of students and teachers of how use of the Chromebook impacts student engagement.

Figure 5.6

Student Engagement Framework [with permission] (Bond, 2020a)
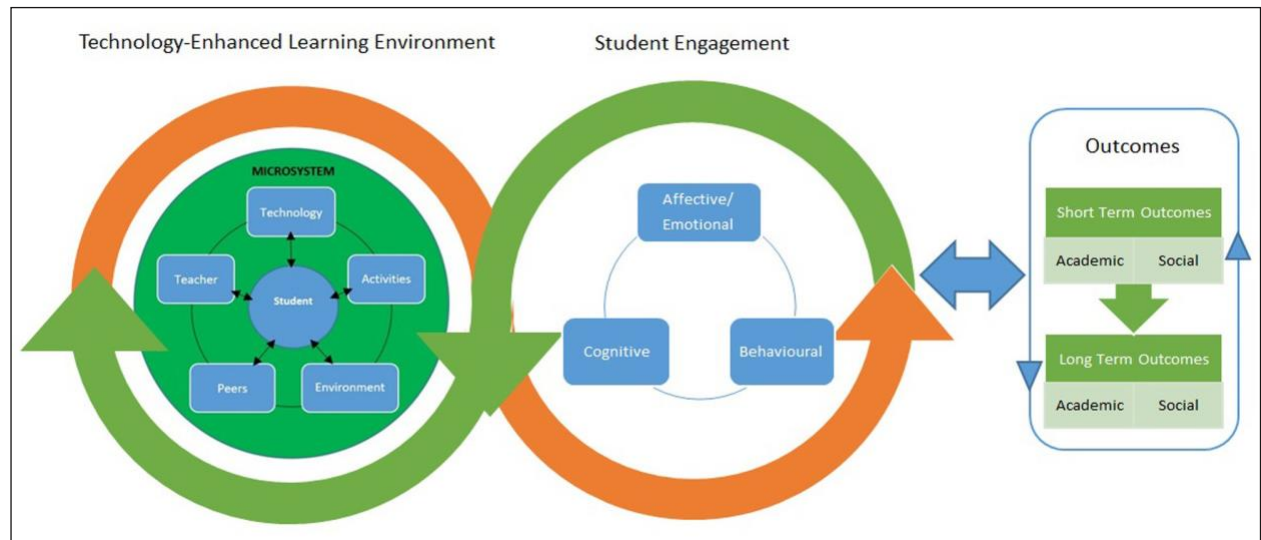
Via student and teacher surveys, student focus groups and teacher interviews, student engagement in all three dimensions; affective, behavioural and cognitive (A-B-C) emerged. This model has helped to show how student interactions with their teachers and the technology provides influential relationships in the microsystem, with activities being undertaken using the technology also featuring as important, and depending on the activities, relations with peers in collaborative learning as also being influential. This framework has therefore allowed these key aspects to be highlighted.

Whilst there are real strengths to this framework, this research also highlights where further adaptations to the model would be beneficial. The A-B-C continuum of engagement, where the affective engagement provides the starting point, which leads to behavioural and in turn to the cognitive, would also benefit from further development, illustrated in Figure 5.7, which shows a linear continuum rather than a more random approach.

Figure 5.7

Suggested Continuum of Student Engagement

Whilst the current model in Figure 5.6 shows the affective, behavioural and cognitive engagement dimensions, it presents them in a way that does not suggest a starting point or direction for engagement. It may therefore be helpful in viewing the engagement construct along an A-B-C (Affective-Behavioural-Cognitive) continuum more explicitly. That is, there is potential to understand the concept of engagement as having an order which may inform future practice, building on the idea of the affective being the foundation on which the other two dimensions are built (Skinner & Pitzer, 2012; Wang & Degol, 2014), as discussed above in Section 5.1.1.1. Teachers could look to affectively engage their students, to then impact their behavioural engagement leading to deeper cognitive learning, employing the Chromebook technology as the vehicle to facilitate this sequence. For example, it would not be feasible for students to be cognitively engaged without firstly displaying some behavioural engagement, and behaviours are often produced by being affectively engaged. This makes a logical order a possible way forward to understand the process of student engagement. In this way, the cognitive aspects could be explored further to understand this crucial aspect of the Student Engagement Framework.

Furthermore, the Student Engagement Framework model could also be developed by further examination of the complexities in the microsystem, for example by looking at relationships between the student, the teacher and technology. Whilst Bond and Bedenlier (2019) discuss aspects of the microsystem discretely, and how they impact on student

engagement, it is also the links *between* these aspects that brings about strong student engagement. For example, understanding how the technology links to the teacher, which in turn links to the activity which then links to student engagement. Following on from this, examining which dimensions and which indicators of engagement are connected most strongly to the different parts of the microsystem will be informative. In exploring this, a better idea of which activities to employ using one-to-one technology to bring about the strongest engagement may occur. Additionally, understanding which indicators and subsequently which dimensions of engagement feature strongly when specific activities are being undertaken with the technology, is another way in which gaining greater insight into the microlevel will be gained, especially so when exploring the dimension of cognitive engagement.

5.5 Chapter Summary

This chapter has discussed the results from the research and highlighted the differences between teacher and student perceptions of engagement in the multi-dimensional construct of engagement. As such it raises questions about the role of the teacher and the three-way relationship between student, teacher and technology and how this works in the context of the classroom. It has discussed how the behavioural dimension is the strongest of the three and how both students and teachers view this as central to engagement. The affective dimension forms a foundation on which to build the other two dimensions and as such, if strategies can be formed to lay solid affective engagement, then greater engagement can be found along the A-B-C continuum. Starting with the affective (A), which brings in the behavioural (B) and hopefully leads to the cognitive (C). The cognitive dimension is the weaker, but arguably the most important for learning, and such represents a dimension in which much more is still to be learnt.

Where previous research on student engagement and their use of learning technologies claim that using technology increases student engagement (Han & Finkelstein, 2013; Haselhorst, 2017) the findings of this case study are more in tune with Bergdahl et al. (2018) and Bond et al. (2020) where the use of the Chromebook does not automatically mean engagement is present, and with Fiorillo (2015) who agrees that after one year of use, greater engagement with technology can be seen.

Overall, there is a very positive view of Chromebook use in this case study school, from both students and teachers, although the students are more positive about this, with the teachers showing some reservations especially around the area of distraction, which seems to then influence their view of cognitive engagement. Key opportunities and challenges have been drawn out, which then form the basis of the implications for practice for the future. Finally, the theoretical and conceptual framework has been examined considering this research to identify where the strengths of the approach lie as well as identifying where adaptations in the future may be made.

Chapter 6 Conclusions

6.1 Key Findings

This research set out to discover the perceptions of students and teachers on student engagement with Chromebook technology in the classroom, and in so doing identify how the technology is being used and the opportunities and challenges it presents regarding engaging students in the future. It was framed through three research questions, each addressed below. There then follows an examination of the implications for practice, the limitations of the research and the future direction of study before finishing with some reflections on my EdD experience.

6.1.1 Research Question 1: How do students and teachers perceive student engagement with Chromebook technology?

Overall, the findings of this research suggest students and teachers perceive student engagement with Chromebook technology differently but positively, shown through survey data (quantitative and qualitative), student focus group data and semi-structured teacher interview data. Student perceptions suggest they are engaged across all three engagement dimensions to varying degrees, whereas teachers are not as sure regarding the cognitive dimension, but surer about the behavioural and affective dimensions of engagement.

Students like to use their Chromebook in a flexible and ad-hoc way to check facts, find new information and seek clarification in class, showing some affective and strong behavioural engagement, as they develop their interest and take responsibility for their learning. They also enjoy using them for more coordinated and focused activities as set by the teacher, where the use of an application such as a Google Doc to foster collaboration between students and the ability to personalise the content features strongly through and across the A-B-C (Affective-Behavioural-Cognitive) engagement continuum. However, students' perception does not reflect a desire to use the Chromebook all the time, as shown by

the affective results, where they show that the Chromebook is not as instrumental as the teacher in engaging them in learning. Displaying digital maturity (Begicevic-Redjep et al., 2021) means they have become discerning educational technology consumers where they can appreciate and understand when and when not to use the device, and appreciate the contextual factors. In what Peterson and Scharber (2017) term "student wisdom" (p. 68), students in this case study school show a maturity that can go unrecognised by their teachers in terms of their technology use.

The context of Chromebook use is important for student engagement. As has been suggested (Bergdahl et al., 2020), this research supports the idea that engagement in a TEL (Technology Enhanced Learning) environment presents itself differently to an analogue classroom, as shown by the differences in responses when a Chromebook is and is not present. Students appreciate the uses of the Chromebook, but they also understand it is not useful in all subjects, for all things, and how the teacher remains an important resource for learning. Therefore, they show a maturity that recognises that whilst the Chromebook is effective, it is contextually bound and that used for appropriate topics, for the right purpose, with the right teacher instruction, there is a valuable resource at their fingertips capable of engaging them. Furthermore, the context is also impacted by the nature of the lesson and what is being asked of students in that lesson, alongside the complex relationships between students and students and students and teachers. Altogether, this means the levels of affective, behavioural and cognitive engagement will be impacted. Context is therefore crucial.

This maturity goes further in that students acknowledge that distraction occurs, but also recognise that with distraction comes consequences which will be played out later, be that in the lesson or later with poorer academic achievement, potentially at public exam level. Students recognise that self-regulation is important, but it is known that some students

demonstrate this quality more strongly than others and those who find the distraction too great, need more assistance from the teacher, both through lesson construction and classroom routines. Distraction can occur in any classroom. In a non-Chromebook classroom, the teacher can address this distraction directly, whereas with a Chromebook device this is harder to achieve, as it is not always obvious any student is distracted at any given time. Finding a common ground for dealing with distraction will be important in the future, and further research will be needed in this area.

Teachers' views of their students' engagement are mixed, with areas of agreement and disagreement with the student body. They are similar in how they are keen to continue using the device for teaching and learning, although seemingly with greater caution. Teachers share the same perception of student engagement, with the presence of behavioural indicators as the strongest dimension, affective second followed by cognitive. The difference is teachers score their students lower across the engagement scale, and therefore do not recognise student engagement as strongly, possibly because the element of distraction seems to overwhelmingly cloud their view. Perceptions from teachers show that participation levels are not that different between Chromebook and non-Chromebook lessons, showing the device as a tool, not a vital element of a lesson. Teachers think using Chromebooks for collaboration and information provision is effective in engaging their students across the A-B-C continuum, but access to information and giving their students the ability to research and find new information is perhaps the biggest pull on engaging students. This is a double-edged sword as teachers recognise that whilst the Internet provides a rich seam of resources, the propensity to be distracted, and/ or to rush through material uncritically, is great, and this potentially means a lower cognitive engagement of students.

Teachers have been through a period of technological intensity, where the use of Chromebooks in this case study school were instrumental in the COVID-19 pandemic

lockdown period. As a result, teachers have developed their online skills and taken some of these elements into the classroom, where they feel more confident in getting students to collaborate, research and use other online learning platforms to engage them with their learning. As Teacher 2 expressed in the interview, "we had to learn very quickly" regarding lockdown learning. As such, the call for training in the use of technology seen in previous research such as Yankelevich (2017) is not represented as definitively, as teachers appear to be more empowered and confident. Training in the context of this research is about collaboration and sharing of ideas amongst teachers. In this school, teachers are still keen to learn, more so, they are assured in their ability to do so given their technological learning journey over the last two years. Whilst they cannot think of new ways in which the Chromebook could be used for engaging learners, they, like their students, are of the view the technology has a place but does not need to be used for everything in every lesson. It is therefore being more judicious about its use that will be the key in the future.

Overall, from a student and teacher perspective, the perception of student engagement with the Chromebook device is that it has a positive impact on the three main dimensions of the engagement construct, to varying degrees. Whilst this cannot be said to be 'total engagement', if this is ever achievable, it suggests that with further focus on teachers' practice with Chromebook technology could strengthen these areas further, especially where the student and teaching body is positive and receptive to its use. Teachers are understandably cautious with the device, with the shadow of distraction ever present, however, there have been advances, boosted by the global COVID-19 pandemic, that suggest along with student willingness, familiarity and maturity, could result in even more gains as TEL is embedded into individual schools and the Chromebook is viewed as an integral part of the classroom. As such this case study is very much in tune with previous research. The key perception from both groups is whilst the Chromebook is not an answer to all educational

questions, it is part of the armoury for teachers, senior leaders and students to deploy, as and when it is deemed appropriate to engage students in their learning.

6.1.2 Research Question 2: How do teachers report using Chromebook technology to engage students in their learning?

This research shows that teachers report using Chromebook technology in a variety of ways, shown through all three data collection methods. Whilst teachers have made great strides in their technology use during the COVID-19 global pandemic, there presents an opportunity to build for the future, especially as technology use continues to be an ever-evolving experience. Using skills that were rapidly developed during the lockdown period of the pandemic, teachers in this case study report using a wide range of applications that suggest an advancement in the use of Chromebook technology in the classroom. This shows progress in the use of technology has been made. With increased reliability comes opportunities, as teachers are engaging students with the Chromebook in lots of different ways across the curriculum and across the A-B-C continuum although teachers in the main report using the Chromebook in ways that do not show a large deviation from past or current research. That is, there are no revolutionary new uses of the devices, but there seems to be more confidence in the way teachers explain their use, with no references to teacher training, which may have hampered previous technology use (Yankelevich, 2017) as introduced above. As such, it seems as though Chromebook technology has embedded itself in the teaching and learning fabric of this school, as teachers have been allowed to explore the use of the device unhindered by senior leaders or restricted by prescriptive or instructed compulsory use. This is key. As the perceptions of students and teachers show, the Chromebook is better used as and when needed, for the most appropriate reasons, and is not to be viewed as the answer to every topic or learning task. Whilst there is a desire from

teachers to keep on learning, this is framed in a positive way, as opposed to one that suggests teachers have been set up to fail or are being given a device they cannot utilise.

Teachers reported use was strongest in the affective and the behavioural dimensions, especially regarding the personalisation of learning where the device helps to provide students with opportunities to become independent learners, and for those with SEND to access materials and learning in a personalised way that may not have been available otherwise. The Chromebook does have an impact on the context of the lesson, but if anything helps improve behaviour, even though the ever-present threat of distraction is near. Students are not necessarily misbehaving when distracted, they are engaged in other things using their device, which means the misbehaviour is more cognitive or affective and thereby harder for the teacher to see. Using the Chromebook regularly, across multiple subjects, over a period of years, has resulted in a student and teaching body that are more concerned with the learning than with the technology. The focus appears to be in the right place in this case study. That said, teachers as they report, do not have the same understanding of the students' perceptions and as such the cognitive dimension is one that would benefit from further research, unfettered by distraction.

Teachers expressed their views of using the device to engage their students, and it is focussing on the uses that have strong links to all three engagement dimensions more conscientiously, that could form the basis of future Chromebook use. For example, using Google docs to foster collaboration, which is acknowledged as a strong way to achieve student engagement (Northey et al., 2018), as it provides a link to the affective dimension (student relationships/ interest), behavioural dimension (participation) and the cognitive (deep learning). What seems to be most common, is the use of the device for research and finding information, which is important in two ways. Firstly, it means that students need to be critical consumers of information. Depending on their age, this is a difficult thing to ask,

especially when the behavioural dimension of completing work may well feature distraction. Secondly, students need to employ patience to look and then employ critical thinking to assess the usefulness of information, not simply use it uncritically. This is instructive as a main use of the Chromebook identified in this research is a direct link to two of the main challenges associated with its use, distraction and uncritical use of information, both of which are debated below in 6.1.3.

Instructively, the development of student skills to use the Chromebook is not mentioned by any teachers, which is surprising given the need for students to improve their digital literacy skills (Lindsay, 2016), and the call from teachers in this research to improve them, not only for school, but for a life beyond school when they leave, as expressed by teachers in this research. Chromebook use is therefore contextually bound to the subject being studied, rather than it being used as directed by senior leaders. Ensuring that students not only have the ability to utilise the technology but they are able to develop their technological skills will be important, but more so they need to have embedded routines in their school life so as to avoid the problems encountered in Radice's (2018) study, where teachers spent large amounts of lesson time showing students how to access and submit assignments.

Teachers in this research are cognisant of the need to employ routines that control the use of the device in the classroom. However, there appears to be an acceptance that students will be distracted and that this is an inevitable part of using the Chromebook in a lesson. Teachers already employ techniques such as standing behind students, asking for Chromebooks to be closed and using monitoring software, to try and ensure students remain on task, but this appears to not always have the desired effect. Students seem to be receptive to the idea of better teacher oversight of the Chromebooks to keep the learning positive. For teachers to employ Chromebooks effectively, this is an important area to develop.

6.1.3 Research Question 3: What opportunities and challenges do students and teachers perceive the Chromebook to have on student engagement?

There can be little doubt the potential of one-to-one technology remains an ever-evolving process, and student and teacher perceptions show both opportunities and challenges regarding Chromebook use and student engagement. This was shown through quantitative and qualitative survey data, student focus group data and semi-structured teacher interview data. Developments over the last five to ten years in terms of teacher confidence, frequency of use, student accessibility and lack of novelty is significant. Opportunities, such as personalisation and participation, students' and teachers' access to information and teachers' skills along with the challenges such as distraction, students bypassing deep learning and the differences in students and teaches perceptions will be discussed below.

Opportunities of personalisation of education in academic subjects in terms of content provision, content creation and of individualised feedback represent a resource that seems to be underutilised at the present time, but one in which huge leaps could be made quickly. The one-to-one device represents a resource with the ability to replicate resources easily and quickly and furthermore, resources that can be saved, updated and reworked as and when needed. In this way, these can be resources curated for each class, for each individual, year on year, presenting students with information relevant for them without having to become distracted by the process of searching for information that can itself prevent engagement in the focus of the lesson from occurring (Kolb, 2017). Furthermore, personalisation also allows students to create their own content more easily than in an analogue setting. This appeals to students, who can delete, add and format academic work in the way they like to, which all adds to create strong affective engagement through personalisation, often for what are seen to be more mundane tasks. Engagement in this way represents a departure from past research.

The opportunity to access information, not by looking into the abyss of the Internet, but using the Chromebook to access carefully assembled materials is a positive opportunity. It helps to maintain the focus on the goals of the lesson and on the materials presented rather than on the technology or the search itself, which may provide greater opportunities for distraction. Once engagement has taken place, the opportunity for teachers using any number of tools, to provide bespoke and personal feedback also presents itself, thereby engaging students further, helping them to make progress, which fosters greater cognitive engagement in the form of deep learning.

Finally, there is an opportunity to further capitalise on the emergency distance learning of the lockdown period, which catapulted many teachers on a steep trajectory towards technological mastery and may explain why the call for more training was not more concerted in this research. Building on this with continuous professional development (CPD), consistent with an approach for each subject is now a real opportunity. Whilst teachers do report a very confident use of technology, "The importance of regular, relevant, and ongoing teacher CPD is perhaps the most common and urgent theme throughout the literature" (Connolly, 2018, p. 8) still stands, although this does not have to automatically be formal. For this to happen, a digital strategy would help to co-ordinate not only teachers' skills and ideas, but also students, to build a more collaborative way forward and provide a conscious and consistent approach to achieve engagement across the A-B-C continuum, fully harnessing the student voice. Therefore, development of student skills, which in this case study sees students literally being left to their own devices, is also another important opportunity.

In terms of challenges, the overwhelming message from this research relates to the concept of technology as a distraction, in a way that other educational tools appear to not be subjected to. Whilst there are attempts to address this (monitoring software, teacher position in the classroom) there is a clear perception from students and teachers that it remains an

ever-present 'threat', yet seemingly lacking a concerted effort to provide a strategy to combat it. This could be incorporated into the overall strategy, agreed by students and teachers, to ensure best practice and a consistent approach across the school. For this to remain unchecked and accepted as an inevitable part of technology use would potentially limit future progress with technology. In this case study school, the novelty of Chromebook use has now faded, as the devices have been used by some students and teachers for four years, and as such it has become a main part of learning in the students' formal curriculum. As such looking at ways to design engaging lessons with technology, making clear the boundaries of technology use, may help to keep distractions to a minimum and the A-B-C continuum to the maximum.

Secondly, critically assessing material and not by-passing deep learning will be important for engagement using one-to-one technology in the future. This relates specifically to the cognitive aspect of the engagement continuum, where it is difficult to see if students are genuinely engaged. Where they may be behaviourally participating in the lesson, and be affectively engaged, this does not assure cognitive engagement. With the novelty factor removed, the chances of cognitively engaging students increase, although it cannot be assumed. By providing materials and taking the wild hunt for information away from the depths of the internet, where students are assured that materials are relevant and useful, the propensity for them to cognitively engage increases, as it becomes less about finding and more about learning. The challenge therefore is to critically engage students in this process to effect cognitive engagement along with affective and behavioural strategies.

Finally, the difference in student and teacher perceptions represents a challenge to be addressed and is one that could reap great rewards. By bringing students and teachers together to discuss ways of learning with and without the technology, there would be a greater understanding of how best to engage students in the classroom, that is mutually

understood. This research has shown that students and teachers do have different perceptions of students' engagement with one-to-one Chromebook technology and as such this non-alignment could well provide a barrier to greater engagement for a greater number of students. Where students are showing greater affective engagement, this is a reservoir to be tapped, where teachers can lay the affective foundation leading to stronger behavioural and cognitive engagement. Where students and teachers are more closely aligned, for example on the issue of personalisation, there would seem to be an opportunity to come closer together and strengthen this. This, however, is easy said than done, and in a busy school represents a real challenge.

6.2 Implications for Practice

As this research shows, the teachers' perception of student engagement is different to students' perceptions, shown through all three data collection methods. This has implications for practice as to align these perceptions would potentially help to utilise the technology to better effect in the microsystem of the classroom. We can therefore identify implications for teachers and implications for senior leaders at the school if one-to-one technology is to help increase student engagement in the future.

6.2.1 Implications for Teachers

6.2.1.1 Implication 1.

Implication 1 for teachers is to use the technology to consciously build affectively, to look for new opportunities to use the Chromebook to build positive affective engagement, which will provide the bedrock for behavioural and cognitive engagement to follow (A-B-C). Where students show an affective inclination towards their Chromebook technology, teachers are better placed to design learning which builds on this and generate interest and personalisation that establishes the affective foundation (Wang & Degol, 2014). From here, positive behavioural aspects can be addressed (participation, attention and taking

responsibility) and negative (distraction) to then build through to the cognitive (deeper learning, self-regulation and trying to understand). Whilst this does not always take place on a neat continuum which is cause and effect, it produces a model where this could be developed – the A-B-C model as introduced in Section 5.4, which accepts Bond, Buntins et al.'s (2020) engagement definition and Bergdahl's (2022) acknowledgement of engagement as being multi-layered. The view of the Chromebook as empowering, in that it allows students to do more for themselves and gives them more by the way of autonomy is a strong one, but this is largely based on students Googling answers and using search engines for research, which may not provide the cognitive engagement that is desired (Kolb, 2017). The use of the Chromebook would seem to have more potential to unleash greater engagement, with the use and pedagogical development of specific applications that can be used to target the A-B-C continuum of engagement, explicitly as part of lesson planning and preparation, starting with the affective and consciously building to the cognitive.

6.2.1.2 Implication 2.

For the future, linked closely to Implication 1, this research has identified the personalisation of learning is potentially an important way forward, which has not been identified as strongly or consistently in previous research. Any improvements here will tune in to the affective dimension and help to establish a solid engagement foundation base on which to then build the behavioural and cognitive dimensions. Implications for practice therefore point to designing greater personalisation of learning, through provision of information, greater independence for students to choose how they engage with their learning and more efficient and bespoke feedback on specific areas of learning. In short, giving more autonomy to the student, to lead their own learning as opposed to teachercentric activities. For example, the difference in perceptions around asking for help/ taking responsibility/ distraction – if students were able to access resources curated by the teacher as opposed to the

idea of students being allowed to roam free in the world wide web, this may help to firstly, avoid distraction and secondly, direct students to areas of resource that has been checked and is of use, safe in the knowledge that cognitive processes are not being bypassed. It could also provide a time and cost saving resource for the future. Exploring ways to personalise learning in a coordinated, open and accepted way has the potential to reap huge rewards in terms of autonomous learning.

6.2.1.3 Implication 3.

Teachers in the interviews were of the view that behaviour does change when a Chromebook is being used, and therefore the third implication for teachers is the establishment of consistent routines across the school when a Chromebook is being used. To address distraction and therefore improve the classroom environment, this needs carefully managing by the teacher, so that engagement and learning can take place. Teachers with clear vision and objectives will be able to utilise the technology to effect deeper engagement (Reichert & Mouza, 2018). Without this clarity of thought and a focus on routines and practices, fully utilising the device remains a challenge. This is even more important when a Chromebook is being used and teachers interviewed referred to making sure that routines and expectations were clearly set out. This was supported to a degree by the focus groups who indicated that teachers who insisted on "lids down" were more effective than those who did not. Students were positive in encouraging teachers to take greater control with Chromebook use, to maintain a focus on the learning although teachers in this study spoke of distraction with an air of resignation and inevitability which did not suggest any new solutions. This links closely to the idea of students and teachers collaborating on how best to deal with distraction. By coming together to address this aspect of TEL, both groups stand to gain. As a minimum teachers should now begin to build into lesson plans, explicit strategies on the use of the Chromebook and how to mitigate distraction.

6.2.2 Implications for Senior Leaders

6.2.2.1 Implication 1.

Underpinning the implications for teachers, is training on the use of the Chromebook technology to maximise its potential, through sharing of best practice, and striving for consistency across the teaching body, otherwise the dangers of failing and technology falling short are more likely (Bergdahl, Knutsson, et al., 2018). From this research the self-efficacy of the teachers in using this technology seems to be positive. Chromebook use is an important aspect of teachers' everyday working lives in this school, so helping to build the confidence for the future is important (Ertmer & Ottenbreit-Leftwich, 2010). Therefore, it is incumbent on senior leaders to provide the necessary training and direction, as there will never be a case, when working with technology, where there is nothing to be done, and so as Fiorrillo (2015) also concludes, "A good portion of teachers' professional development should be built around the sharing and discussion of best practices in a one-to-one environment" (p. 114).

Whilst there were no direct comments about the lack of teacher expertise, knowledge and application of technology from the students, it is nevertheless an area that will need to be worked upon if the Chromebook as a learning tool is to be employed successfully in the future (Bulfin et al., 2016). This training should embrace changing pedagogical practices where appropriate but also how teachers can work with the student body through and via classroom routines, to ensure time on task is high and distraction low, in line with previous studies such as Radice (2018). This links closely to the application of the technology to facilitate greater engagement as with more independence, learners can have a more personalised experience able to manage their learning and work at a pace that suits them. Pedagogical approaches targeting the dimensions of engagement are key, shared and agreed between students and teachers, to achieve consistency of approach across the school. This in turn links back to the teachers, who can help by designing lessons and learning with the

Chromebook to help specific needs, which all children have. This also suggests a desire to learn emerging, which should then engage the cognitive dimension of engagement, where deep learning particularly is embedded. This can only be embedded in school if it is led from the senior team.

6.2.2.2 Implication 2.

Students and teachers both view the one-to-one Chromebook as something that adds value to the educational experience in the school, and findings suggest the impact on engagement is a positive one, in line with other studies (Buck, 2019; Charleston, 2017; Haselhorst, 2017). As such, senior leaders would do well to bring the two groups, students and teachers, together to agree and establish a one-to-one charter to develop new skills with a view to increasing participation and personalisation and thereby increasing the levels of engagement using the device, whilst mitigating against the seemingly ever-present threat of distraction. The implications for senior leaders are therefore inextricably linked. Without this collaboration and focus, the future utilisation of the Chromebook will remain ad hoc, sporadic and therefore is more likely to not move forward. This is not to state that every teacher needs to use the device in the same way, more that each teacher needs to consider how they might use the device in their own context, understanding best practice and then adapting this within a whole school framework. In line with the sentiments expressed in this research, technology can be engaging but without other lesson ingredients (e.g. routines, classroom management, the right resources) the potential to have the opposite effect is heightened (Dietrich & Balli, 2014).

6.3 Limitations

The findings of this research are subject to limitations. Firstly, it would have been helpful to have spoken to more students in the focus groups and more teachers in the interviews during the second stage of the research process, to gather more views on the

engagement construct. As this was a voluntary study the numbers coming forward were not in the control of the researcher. The limitation around the small numbers who volunteered, meant that only 14 students and teachers were spoken with directly. It would have been beneficial to have greater numbers to stimulate debate and discussion around the key topics identified from the survey in the focus groups and gather a wider number of teacher perceptions in the interviews, to support or broaden the findings. Furthermore, connected to the limited sample is how this was largely self-selecting, in that it was drawing from a small number of students and teachers.

Secondly, as with research that gathers participant views, there are limitations as to what can be expressed via open ended survey items on a survey as acknowledged in the Methodology chapter. Perhaps some students wish to misreport and some teachers could be either not aware, in denial or just embarrassed to think students would for example become distracted in their lesson (Healy, 2016; Schuetz et al., 2018; Selwyn & Aagaard, 2020; Shernoff et al., 2016). Whilst the survey items were worded as such that respondents could not second guess the target items being aimed for, the students were not as expressive as many of the teachers and therefore do not provide as much insight, which may be expected from children completing a survey in their own time. In future, consideration as to how to ensure explanations are as full as possible would be beneficial, perhaps looking further at question wording and perhaps making time for students to complete in a controlled environment. It must be noted the set of questions which were asked of the students and teachers, produced a certain set of results and a different set of questions would have elicited a different data set, in this way the study is limited by the questions asked.

Limitations also came via the Cronbach Alpha reliability scale as part of the quantitative analysis, which showed the behavioural aspect as having the lowest score, and therefore not proving as reliable as the other two dimensions. This was offset to a degree in

that, the behavioural dimension, as identified in the literature, is the most recognisable of the three engagement dimensions. However, it represents a limitation in that the reliability was low. Furthermore, some items in the quantitative analysis results could have been by chance, which makes assessing the causality more challenging. The explanation for these anomalies is not clear but is a limitation in that not all results could be deemed to have not occurred by chance alone.

Regarding the cognitive dimension of engagement, limitations in the study proved to be frustrating, in that it was not fully explored due to the weak results which came back from the data collected. Despite this area being highlighted early in the initial analysis of the survey results, the focus groups and the interviews did not provide the necessary insights into the dimension to move the understanding in this area forward. Consequently, where there seems to be a desire from teachers to continue to use the Chromebook, which would suggest there is some cognitive engagement taking place, this was not grounded in data that shows us cognitive engagement is strong. Furthermore, the Student Engagement Framework did not allow the relationships in the microsystem to be explored fully, as the complexities of the classroom proved to be beyond the scope of this research. This is particularly pertinent to the issue of cognitive engagement, which would benefit from further exploration from a teacher and student perspective, working within an adapted Student Engagement Framework.

Finally, a limitation must be acknowledged in terms of my position as a senior leader in the school. As an insider researcher the potential of bias to come into the study, even though there were mitigations in place to counter this, is nevertheless a limitation to be acknowledged.

Notwithstanding these limitations, this study shows that there is potential to further engage students using one-to-one Chromebook technology, not least in collaborating openly with teachers to design lesson with technology at the forefront.

6.4 Future Research Direction

This research has raised several questions in need of further investigation relating to the use of one-to-one technology and student engagement. This case study has helped to take research of one-to-one technology and engagement in the classroom forward and as such builds on what has gone before.

The implications for research include further research on engagement in secondary school classrooms operating one-to-one Chromebook technology. This research should include further work that allows students and teachers to present their perceptions together to inform future technology use in the classroom. Whilst Bergdahl (2022) states it is, "critical to understand how teachers perceive engagement…to inform practices and research" (p. 1) this research contends it is just as critical to include student perceptions as well. Through collaborative research, technology has a better chance of engaging students, enabling stronger engagement and greater academic achievement. As technology allows greater collaboration in the classroom as part of the learning process, so it can also be used for students and teachers to collaborate on how best to utilise this powerful machine. When teachers are more aware of the perceptions of their students and how they operate with the technology, there is a greater opportunity to further engage students and address them with the aim of avoiding the distraction that poses the clear and present danger to greater technology use in the classroom. By looking at the suggested A-B-C continuum above, there is a possibility of exploring the cognitive aspect in more depth, which could also include looking more closely at developing the Student Engagement Framework. This would allow greater understanding of the relationships in the microsystem, which ultimately dictates the strength of student engagement across all three dimensions.

Leading on from this, further work to operationalise engagement is still needed. This research has gone some way to attempting to do this. Greater efforts, and more confidence in

understanding what affective, behavioural and cognitive engagement are in the classroom, and which parts of the engagement structure will be required to move beyond the generic 'engaged' labels that predominate much of the literature. Specifically, more investigation of the impact of personalisation on engagement would be welcome, especially a focus on those students with SEND needs. The indicators as identified in this research only go so far in helping assess self-reporting of what is happening in the classroom. Once this is understood, work to test the A-B-C continuum in terms of lesson planning would prove to be a useful framework. As indicated above in section 5.4, further adaptations of the Student Engagement Framework would also help in this regard. By understanding the complexities of the relationships in the classroom in greater understanding of the levels of engagement will be understood.

Finally, and perhaps most crucially, further research should look at how to address the overwhelming challenge identified in this research, the issue of distraction in relation to engagement. Seeking to address the antithesis of engagement would help to allay the concerns teachers using the technology clearly have whilst at the same time help students become more resilient and take responsibility for their learning with the Chromebook device.

6.5 EdD Reflections

This incredible journey has been an extraordinary one in several ways. As an intellectual journey it has pushed me to places, I never thought I could visit. It has asked questions of me, I never thought I would be able to answer. Every time I thought something was not possible, I found the vehicle to help me find a way. I have developed skills and strategies that are now a part of me. It has helped me to view the academic world in a way that has opened my eyes and helped me to see things in my own professional life, in a fresh way that is already bearing fruit on the students and colleagues with which I am privileged to work. As a personal journey, it has helped me to understand my own mind to a deeper level

and developed within me an appreciation that my own achievements are constrained only by my brain. Completing this alongside my role as a senior leader has instilled a greater discipline within me the likes I never thought I had, and over the years of study, reading, tears and sweat, the resilience to keep going, to keep chipping away, never left me. Finally, as a professional journey, I feel I am now empowered to understand what engagement looks like in the modern-day classroom with one-to-one technology and in so doing, it will help my school to look at ways in which engagement can be strengthened to help every child to fulfil their potential. Now this journey is at an end, a new one must begin.

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Appendices

Appendix A Ethical Application

University of Reading
Institute of Education
Ethical Approval Form A (version May 2019)

Tick one:

Staff project: _____ PhD _____ EdD __#__

Name of applicant (s): Eddie Falshaw

Title of project: One-to-One Technology and Student Engagement: A Case Study

Name of supervisor (for student projects): Yota Dimitriadi

Please complete the form below including relevant sections overleaf.

	YES	NO
Have you prepared an Information Sheet for participants and/or their parents/carers that:		
a) explains the purpose(s) of the project	#	
b) explains how they have been selected as potential participants	#	
c) gives a full, fair and clear account of what will be asked of them and how the information that they provide will be used	#	
d) makes clear that participation in the project is voluntary	#	
e) explains the arrangements to allow participants to withdraw at any stage if they wish	#	
f) explains the arrangements to ensure the confidentiality of any material collected during the project, including secure arrangements for its storage, retention and disposal	#	
g) explains the arrangements for publishing the research results and, if confidentiality might be affected, for obtaining written consent for this	#	
h) explains the arrangements for providing participants with the research results if they wish to have them	#	
i) gives the name and designation of the member of staff with responsibility for the project together with contact details, including email. If any of the project investigators are students at the IoE, then this information must be included, and their name provided	#	
k) explains, where applicable, the arrangements for expenses and other payments to be made to the participants		#
j) includes a standard statement indicating the process of ethical review at the University undergone by the project, as follows: 'This project has been reviewed following the procedures of the University Research Ethics Committee and has been given a favourable ethical opinion for conduct'.	#	
k) includes a standard statement regarding insurance: "The University has the appropriate insurances in place. Full details are available on request".	#	
Please answer the following questions		
1) Will you provide participants involved in your research with all the information necessary to ensure that they are fully informed and not in any way deceived or misled as to the purpose(s) and nature of the research? (Please use the subheadings used in the	#	

	YES	NO	N.A.
example information sheets on blackboard to ensure this).			
2) Will you seek written or other formal consent from all participants, if they are able to provide it, in addition to (1)?	#		
3) Is there any risk that participants may experience physical or psychological distress in taking part in your research?		#	
4) Staff Only - have you taken the online training modules in data protection and information security (which can be found here: http://www.reading.ac.uk/internal/humanresources/PeopleDevelopment/newstaff/humres-MandatoryOnlineCourses.aspx Please note: students complete a Data Protection Declaration form and submit it with this application to the ethics committee.	#		
5) Have you read the Health and Safety booklet (available on Blackboard) and completed a Risk Assessment Form to be included with this ethics application?	#		
6) Does your research comply with the University's Code of Good Practice in Research?	#		
	YES	NO	N.A.
7) If your research is taking place in a school, have you prepared an information sheet and consent form to gain the permission in writing of the head teacher or other relevant supervisory professional?	#		
8) Has the data collector obtained satisfactory DBS clearance?	#		
9) If your research involves working with children under the age of 16 (or those whose special educational needs mean they are unable to give informed consent), have you prepared an information sheet and consent form for parents/carers to seek permission in writing, or to give parents/carers the opportunity to decline consent?	#		
10) If your research involves processing sensitive personal data[1], or if it involves audio/video recordings, have you obtained the explicit consent of participants/parents?	#		
11) If you are using a data processor to subcontract any part of your research, have you got a written contract with that contractor which (a) specifies that the contractor is required to act only on your instructions, and (b) provides for appropriate technical and organisational security measures to protect the data?			#
12a) Does your research involve data collection outside the UK?		#	
12b) If the answer to question 12a is "yes", does your research comply with the legal and ethical requirements for doing research in that country?			#
13a) Does your research involve collecting data in a language other than English?		#	
13b) If the answer to question 13a is "yes", please confirm that information sheets, consent forms, and research instruments, where appropriate, have been directly translated from the English versions submitted with this application.			#
14a. Does the proposed research involve children under the age of 5?		#	

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[1] Sensitive personal data consists of information relating to the racial or ethnic origin of a data subject, their political opinions, religious beliefs, trade union membership, sexual life, physical or mental health or condition, or criminal offences or record.

14b. If the answer to question 14a is "yes": My Head of School (or authorised Head of Department) has given details of the proposed research to the University's insurance officer, and the research will not proceed until I have confirmation that insurance cover is in place.		#
If you have answered YES to Question 3, please complete Section B below		#

- Complete **either** Section A **or** Section B below with details of your research project.
- Complete a risk assessment.
- Sign the form in Section C.
- Append at the end of this form all relevant documents: information sheets, consent forms, tests, surveys, interview schedules, evidence that you have completed information security training (e.g. screen shot/copy of certificate).
- Email the completed form to the Institute's Ethics Committee for consideration.

Any missing information will result in the form being returned to you.

A: My research goes beyond the 'accepted custom and practice of teaching' but I consider that this project has **no** significant ethical implications. (Please tick the box.)	#

Please state the total number of participants that will be involved in the project and give a breakdown of how many there are in each category e.g. teachers, parents, pupils etc.

For the pilot study: 153 6th Form students invited via their school email, by the Head teacher to take the online survey and invited to feedback, online and as part of the focus group to the researcher.

Teachers total: 80 for stage 1 online survey, 50 (Y9 teachers) to be invited for stage 2 interview via their school email

Students total: Approx. 357 students in Y7 to Y11 for Stage 1 online survey – invited via school email

Teachers for interview: 5 teachers of Y9 students for Stage 2 out of a possible 50

Students for focus groups: 4 groups of 3 or 4 students for Stage 2 from Y9 (76 students in Y9, 51 male and 25 female)

Give a brief description of the aims and the methods (participants, instruments and procedures) of the project in up to 200 words noting:

1. **title of project;** One-to-One Technology and Student Engagement: A Case Study

2. **purpose of project and its academic rationale:** The purpose of the research is to explore and understand more about student and teacher perceptions of how one-to-one technology is used in the classroom and if and how it impacts student engagement in academic learning

3. **brief description of methods and measurements:** Following a pilot study, where 153 members of the 6th Form will be invited by the Head, to participate via their school email, in the questionnaire, data will be collected in a two-stage sequential mixed methods study. The first stage will involve an online survey of students and teachers (different surveys) across part of the school, Years 7 to 11 for students, and all teaching staff, to explore views on engagement and the use of one-to-one Chromebook technology. They will be invited by the Head to

participate. The online survey for each group will be open for completion for two weeks, with an email reminder at the end of week one, and a final reminder one day prior to closing. A link to the survey will be sent with the invitation to participate along with the relevant information sheet – for students, parents will have been informed prior to the survey in order to withdraw consent. The results will then be analysed, and key themes/ issues identified. Following this, the themes/ issues will be explored in stage two, using semi-structured interviews for Y9 teachers and focus groups with Y9 students. Y9 have been selected as they are the middle group in the junior and middle part of the school and contain a mixture of experienced 1:1 user and those who have only been using 1:1 since they joined the school. These will take place across a half term (approx. 5 weeks), in a school meeting room, to try and ensure neutrality, given the position of the researcher (i.e not the Deputy Head's Office). Interviews and focus groups will be audio recorded and transcribed. Interviews will take 30-45minutes and the focus groups should take 30-45minutes. Comparisons of teachers and students' views will be explored as well as understanding the perceptions of both groups as to how one-to-one technology impacts engagement in academic learning. Transcripts of interviews and focus groups will be coded to identify key themes, areas of agreement and areas of disagreement. Factor analysis will also be used across the study.

4. **participants: recruitment methods, number, age, gender, exclusion/inclusion criteria:** The pilot study will involve the Head inviting 153 members of the 6th Form, via their school email, (who will not participate in the main study) to take the online questionnaire and feedback. The stage one online questionnaire and stage two interviews/ focus groups will ask for both student and teacher participation on a voluntary basis (by the Head teacher), via their school email accounts. In stage one, students in Y7 to Y11 will be asked to participate via their school email. In stage two, the purposeful convenience sample of Y9 students to be interviewed as part of a focus group will be taken from volunteers from this year group. The number of focus groups will be determined by the number of volunteers, the aim will be four groups of 3 or 4, selected by purposeful sampling, taking gender and friendships into account in order to ensure students are comfortable in the setting. Where there are large numbers of volunteers the selection will be randomised, including the same ratio of boys to girls as there is in the year group. For teachers, the stage 1 questionnaire will be done voluntarily and the interviews in stage 2, a purposeful convenience sample will involve volunteers who teach a Y9 class(es), where possible having a spread of faulty representation and teaching experience. In the case of large numbers, the selection will be randomised, with no more than one teacher per faculty, and gender selected to reflect to ratio of male to female in the staff body at the time. Interviews will be with individual teachers. Both interviews and focus groups will be in a neutral setting in the school and will be audio recorded and transcribed.

5. **consent and participant information arrangements, debriefing (attach forms where necessary):** Please refer to the information sheets and consent/ assent forms.

6. **a clear and concise statement of the ethical considerations raised by the project and how you intend to deal with them. Power relations, vulnerable**

children, anonymity: The main ethical consideration is one of power relations. As an insider in a senior position this may prove important. Careful explanation of the nature of the research and the researcher's skill at putting people at their ease on top of the research subject should serve to mitigate this issue. Suitable preparation and training for the researcher will also take place prior to the interviews and focus groups. The voluntary nature of the research will also help to ensure that no one is being asked to participate unless they wish to do so, and no-one will be forced into participation. The initial contact pertaining to the research will be made by the Head teacher. There is no agenda for funding or for any other motive than to discover what is happening in situ with technology. The researcher has no vested interest in the outcomes of either part of the study. The focus groups and interviews will not take place in the Deputy Head's office but in a neutral meeting room. Survey responses will be anonymous, with no identifiers linking the respondent to the responses in both student and teacher surveys. It will be made clear to teachers that any involvement will not impact on their appraisal or any other aspect of their work at school.

7. **estimated start date and duration of project – data collection:** A pilot study will take place in March 2021 to allow for the refinement of the questions, using volunteer 6th Form students, as they are not connected with the main study and will be able to draw on their own experiences to help inform the questions. For the teacher survey, the IT Strategy group will be asked to comment on the questions – this is so as not to ask teachers to complete a survey twice. Stage one data collection will then begin in March 2021, ideally just prior to the end of term break. Stage 2 data collection will take place in April/ May 2021. Intended thesis submission in Spring 2022.

B: I consider that this project **may** have ethical implications that should be brought before the Institute's Ethics Committee.	

Please state the total number of participants that will be involved in the project and give a breakdown of how many there are in each category e.g. teachers, parents, pupils etc.

Give a brief description of the aims and the methods (participants, instruments and procedures) of the project in up to 200 words.
1. title of project:
2. purpose of project:
3. brief description of methods and measurements:
4. participants: recruitment methods, number, age, gender, exclusion/inclusion criteria:
5. consent and participant information arrangements, debriefing (attach forms where necessary):
6. a clear and concise statement of the ethical considerations raised by the project and how you intend to deal with then.
7. estimated start date and duration of project

RISK ASSESSMENT: Please complete the form below

Brief outline of Work/activity:	A two staged sequential mixed methods study. Following a pilot study, Stage 1, a survey of children and teachers (different survey for teachers and students) will be conducted. Once this data has been analysed a semi structured interview will be planned for individual teachers and for student focus groups. The interviews and focus groups will be audio recorded and transcribed. The surveys are attached below along with an initial guideline set of questions for the focus groups.

Where will data be collected?	In one independent day and boarding secondary school for children aged 11-18, in Reading in the United Kingdom.

Significant hazards:	No significant hazards. All and any rooms used will be safe and hazard free. All protocols regarding COVID19 will be followed, including the wearing of masks when entering and leaving the room and ensuring the room is spacious for social distancing and ventilated throughout the completion of interviews/ focus groups.
	There is minimum risk involved, given the nature of the research and the research questions. Anyone who may feel unable to answer any questions, especially so with SEND or vulnerable children in the school, will be supported, and the purposeful sampling taking place will help reduce this risk, as the students are known to the researcher. Support and help are at hand from peers, teachers and support staff, although the risk is deemed very low. The information sent to all parents will also help to mitigate any upset.
	As the researcher is the Deputy Head of the school in question, there is a risk that participants may feel pressured or coerced into taking part or in responding in a certain fashion. The initial approach for participation will be made by the Head and not the researcher, for both pilot and the actual research. The voluntary nature of the research will be emphasised at every step, so as to try and ensure no participants feel pressured. For teachers, it will be made clear there will be no repercussions on any information they volunteer. The questions are not related to their performance management cycle and information volunteered will not be used in any other school process but is limited to the research. The researcher has no vested interest in the outcome. This is in line with the information sheet and data protection below.

Who might be exposed to hazards?	Children and teachers, although the largest hazard relates to CV19.

Existing control measures:	Initial introduction and invitations to the research to be made by the Head teacher and not the researcher. All participants will be told they can stop at any time. Reassurance from the researcher who is known to all respondents. Health and safety of the site follows regulations for independent schools. Information sent to parents and children regarding the nature of the research and the emphasis that participants can withdraw at any time. Full COVID protocols to be followed in interviews and focus groups. Neutral venue for interviews and focus groups. For teachers and students, the nature of the research, the research questions and interview questions are such that the risk of any upset is very low.

Are risks adequately controlled:	Yes

If NO, list additional controls and actions required:	Additional controls	Action by:
	NA	

C: SIGNATURE OF APPLICANT:

Note: a signature is required. Typed names are not acceptable.

I have declared all relevant information regarding my proposed project and confirm that ethical good practice will be followed within the project.

Signed: …   ……Print Name…E. R. Falshaw…………………….
Date……01/01/21…….

STATEMENT OF ETHICAL APPROVAL FOR PROPOSALS SUBMITTED TO THE INSTITUTE ETHICS COMMITTEE

This project has been considered using agreed Institute procedures and is now approved.

Signed: …   Print Name……Holly Joseph
Date..26/3/2021

(IoE Research Ethics Committee representative)*

* A decision to allow a project to proceed is not an expert assessment of its content or of the possible risks involved in the investigation, nor does it detract in any way from the ultimate responsibility which students/investigators must themselves have for these matters. Approval is granted on the basis of the information declared by the applicant.

DATA PROTECTION DECLARATION FOR ETHICAL APPROVAL

By signing this declaration I confirm that:

- I have read and understood the requirements for data protection within the *Data Protection for Researchers* document located here:

  http://www.reading.ac.uk/web/files/imps/Data_Protection_for_Researchers__Aug_18.v1.pdf

- I have asked for advice on any elements that I am *unclear on* prior to submitting my ethics approval request, either from my supervisor, or the data protection team at: imps@reading.ac.uk

- I understand that I am responsible for the secure handling, and protection of, my research data

- I know who to contact in the event of an information security incident, a data protection complaint or a request made under data subject access rights

Researcher to complete

Project/Study Title: One-to-One Technology and Student Engagement: A Case Study

NAME	STUDENT ID NUMBER	DATE
E R Falshaw		16/11/20

Supervisor signature

Note for supervisors: Please verify that your student has completed the above actions

NAME	STAFF ID NUMBER	DATE

Submit your completed signed copy to your ethical approval committee.
Copies to be retained by ethics committee.

1.0	IMPS	Annually	IMPS

Head Consent

Permission to Conduct Research Study

Researcher:
Name: Eddie Falshaw
Phone: 01189879600
Email: E.R.Falshaw@pgr.reading.ac.uk

Supervisor:
Name Dr. Yota Dimitriadi
Phone: +44 (0)118 378 2688
Email: y.dimitriadi@reading.ac.uk

RESEARCH PROJECT

Title of project: One-to-One Technology and Student Engagement: A Case Study

Dear

I would like to invite you and your School to take part in a research study about one-to-one technology and student engagement. The purpose of the research is to further knowledge and understanding of the use of one-to-one technology in the classroom with a particular focus on the engagement of students. It is being conducted as part of my studies on the EdD programme at the University of Reading.

Why has the School been chosen to take part?

Your school is being asked to participate in this research study because of its experience in education and the experience it has in employing one-to-one Chromebook technology for students in Years 8 to 11. As such your students and teachers are well placed to contribute their perceptions of how technology is used and impacts on student engagement in the classroom.

Do I have to take part?

It is entirely up to you whether you give your consent for your School to participate. You may also withdraw your consent to participation at any time during the project, without any repercussions, by contacting me directly, on 01189879604 or E.R.Falshaw@pgr.reading.ac.uk.

What will happen if the School takes part?

If you agree to participate in this research, the following actions will take place:

- **A Pilot Study**

  To begin, a pilot online questionnaire with 6th Form students will take place in order to gain initial feedback and refine the questions for the actual study, which will focus on Years 8 to 11. Feedback will also be provided by 6th Form student participants electronically and volunteers will be asked to participate in a focus group discussion. Linked to this, the IT Strategy group will be invited to provide feedback on the teacher questionnaire during the IT strategy meeting, and further adjustments will be made to these questions based on any feedback given.

- **Stage 1: Student and Teacher Engagement Survey Y7 to Y11**

Information sheets, similar to this one, will be sent to students and parents/ guardians of students in Years 7 to 11, by you the Head, via email, informing them of the research taking place, inviting them to the study and offering the opportunity to ask questions. This will include a link to the questionnaire asking students in Y7 to 11 to complete it. At the same time a separate information sheet will also be sent to all teachers by the Head, via their school email, informing them of the research taking place, including the link to their survey. For both surveys, a period of two weeks will be given for participants to completion, with a reminder issued after one week and then one day prior to the survey closing.

- **Stage 2: Teacher Interviews**

  Following initial analyses of the survey data, teachers of Y9 will be asked to participate in an interview, to explore further ideas around engagement through the use of one-to-one technology. Interviews will be audio-recorded and transcribed and will last around 30-45mins. Depending on the number of teachers volunteering to take part in the interviews, a mixture of subject specialisms, gender, age and teaching experience will be selected, to elicit a broad range of views.

- **Stage 2: Focus Groups**

  Following initial analyses of the survey data, students in Y9 will be invited, via email, to take part in a focus group discussion, which will aim to elicit further details about perception of engagement with one-to-one technology. Both students and their parents will be sent a further information sheet with an assent and consent form to be signed. Groups will consist of 3 or 4 students and will be audio-recorded and transcribed. Students will be selected randomly if large numbers volunteer but will reflect the same gender ratio that exists in the year group, if possible. The aim is to speak to three or four groups. The discussions should last for around 30 minutes.

What are the risks and benefits of taking part?

Participants in similar studies have found it interesting to take part. I anticipate the findings will be useful in helping teachers to understand how the Chromebook can be used in a traditional classroom setting. The advantages of taking part also include helping the school to best utilise Chromebook technology for both students and for teaching staff.

Further to this, the research will be contributing to a global discussion on the use of technology in education and as such will be part of a wider educational debate about the place of technology in secondary school education.

We do not anticipate there being any risks, however a full risk assessment will be in place and the whole research project has been reviewed and approved by the Ethics Committee at the University of Reading. In the unlikely event of something going wrong or should you have any concerns, please feel free to contact my supervisor by emailing Dr. Yota Dimitriadi at y.dimitriadi@reading.ac.uk . The University has the appropriate insurances in place. Full details are available on request.

What will happen to the data? (see data Protection below)

The information gathered will be used for data analysis.

Any data collected will be held in strict confidence and no real names or any other identifiers will be used in this study or in any subsequent publications. Participants will be assigned an identification number/ name (ID) only to distinguish the responses from those of other participants. This ID is in no

way associated with the participant's name. The records of this study will be kept private. No identifiers linking participants to the study will be included in any sort of report that might be published. Research records will be stored securely in a locked filing cabinet and on a password-protected computer and the only additional people to see these will be my supervisors, Dr.Yota Dimitriadi, and co-supervisor, Dr. Natthapoj Vincent Trakulphadetkrai who will have access to the records. You may request an electronic copy of the results of the study if you wish. The project is not anticipated to involve you in any expense.

In line with the University's policy on the management of research data, anonymised data gathered in this research may be preserved and made publicly available for others to consult and re-use. All anonymised research data will be retained indefinitely whereas any identifying information such as consent forms will be disposed of securely after the research findings have been written up.

What happens if I change my mind?

Your decision to participate is entirely voluntary. Also, you are free to withdraw your consent at any time, without giving a reason, by contacting Eddie Falshaw, (01189879600) if you wish to withdraw from the study. At this point any data gathered as part of the research will be deleted appropriately.

Who has reviewed the study?

This project has been reviewed following the procedures of the University Research Ethics Committee and has been given a favourable ethical opinion for conduct.

Data Protection

The organisation responsible for protection of your personal information is the University of Reading (the Data Controller). Queries regarding data protection and your rights should be directed to the University Data Protection Officer at imps@reading.ac.uk, or in writing to: Information Management & Policy Services, University of Reading, Whiteknights, P O Box 217, Reading, RG6 6AH.

The University of Reading collects, analyses, uses, shares and retains personal data for the purposes of research in the public interest. Under data protection law we are required to inform you that this use of the personal data we may hold about you is on the lawful basis of being a public task in the public interest and where it is necessary for scientific or historical research purposes. If you withdraw from a research study, which processes your personal data, dependant on the stage of withdrawal, we may still rely on this lawful basis to continue using your data if your withdrawal would be of significant detriment to the research study aims. We will always have in place appropriate safeguards to protect your personal data.

If we have included any additional requests for use of your data, for example adding you to a registration list for the purposes of inviting you to take part in future studies, this will be done only with your consent where you have provided it to us and should you wish to be removed from the register at a later date, you should contact E.R.Falshaw@pgr.reading.ac.uk.

You have certain rights under data protection law which are:
- Withdraw your consent, for example if you opted in to be added to a participant register
- Access your personal data or ask for a copy
- Rectify inaccuracies in personal data that we hold about you

- Be forgotten, that is your details to be removed from systems that we use to process your personal data
- Restrict uses of your data
- Object to uses of your data, for example retention after you have withdrawn from a study

Some restrictions apply to the above rights where data is collected and used for research purposes.

You can find out more about your rights on the website of the Information Commissioners Office (ICO) at https://ico.org.uk.

You also have a right to complain the ICO if you are unhappy with how your data has been handled. Please contact the University Data Protection Officer in the first instance.

What do I do next?

I hope that you will agree that Leighton Park School can take part in the study. If you are happy, please return the attached consent form to me in hard copy. More information is available by emailing me at; E.R.Falshaw@pgr.reading.ac.uk

Signed:

Eddie Falshaw

Date:

Consent Form

University of Reading

Title of project: One-to-One Technology and Student Engagement: A Case Study

I have read and understand the information sheet relating to this project as provided to me by Eddie Falshaw.

I have had explained to me the purposes of the project and what will be required of me and my colleagues, and any questions have been answered to my satisfaction. I agree to the arrangements described in the Information Sheet in so far as they relate to my school's participation.

I understand that my school's participation is entirely voluntary and that I have the right to withdraw from the project any time, without giving a reason and without repercussions.

I have received a copy of this Consent Form and of the accompanying Information Sheet.

Please tick as appropriate:

1. I have read the information sheet about the project.
    ☐

2. I understand what the purpose of the study is and what you want me to do. All my questions have been answered.
    ☐

3. I agree to students and teachers in my School participating in the study, with their assent/ consent   ☐

Name:

Signed:

Date:

Pilot Study

The pilot study will involve sending the information sheet and online survey link for the student questionnaire (as set out below in the student survey questions section) to Sixth Form students via their school email. This will inform the refinement of the questions where responses allow – Specific feedback will be gathered electronically after each short section to gather feedback for cognitive understanding. Also, by inviting participants to volunteer to form part of a focus group via further email, the cognitive aspects of the questionnaire can be explored further. The focus groups will discuss the survey and probe for cognitive understanding to allow for the best comprehension, retrieval, judgement and response mapping. Information about the pilot study will be sent to all Sixth Form students as set out here. As all participants in this pilot study will be over 16, and have sufficient understanding, parental consent will not be requested, but individual consent from the participants participating in the focus groups will be gathered, as detailed below. Consent for the survey will be via the survey and completion of the survey. Information sheets for both stages are detailed below.

A pilot study for teachers will not be undertaken as it would then require teachers to take another very similar survey which could limit the number of responses and/ or the responses given. In its place, the survey and interview questions will be shared with the IT strategy committee which contains only three teaching staff. The rest are experts in their areas, have a good knowledge of the use of 1:1 and are well placed to inform the survey and interviews.

University of Reading

Researcher:
Name: Eddie Falshaw
Phone: 01189879600
Email: E.R.Falshaw@pgr.reading.ac.uk

Supervisor:
Name Dr. Yota Dimitriadi
Phone: +44 (0)118 378 2688
Email: y.dimitriadi@reading.ac.uk

Pilot Participation Information Sheet: 6th Form Students Survey

Title of the Pilot Project: One-to-One Technology and Student Engagement: A Case Study

I would like to invite you to take part in a pilot research study about one-to-one technology and student engagement. The purpose of the research is to further knowledge and understanding about the use of one-to-one Chromebook technology in the classroom at Leighton Park with a particular focus on the engagement of students. It is being conducted as part Eddie Falshaw's studies on the EdD programme at the University of Reading. The pilot study will help to inform the actual study.

Why have I been chosen to take part?

You have been asked to participate because you are a student at Leighton Park who uses one-to-one technology and has perhaps used a Chromebook in lessons at school. You are therefore well placed to contribute your views from a student perspective about how the technology is used and how engaging you find it, to inform the actual study which will focus on Years 7-11 and then specifically Y9.

Do I have to take part?

It is entirely up to you whether you participate. You do not have to complete the survey should you not wish to do so. Whichever option you take it will not have any impact on your learning or your grades at school.

What will happen if I take part?

If you agree to participate in this research, you will complete a survey using the link in the email. On completing the questions, you will be asked to provide some feedback as to how you found completing the process and give any ideas for how the questions may be improved. It may be that you have valuable comments to make that will help make the project stronger. You will also be asked in the survey if you would be prepared to form a small focus group to discuss the survey and the proposed interview questions for the real study.

What are the risks and benefits of taking part?
Participants in similar studies have found it interesting to take part. Your role will be crucial in helping to develop the data collection, so it is as strong as possible to inform future teaching and learning with one-to-one technology. I anticipate the findings will be useful in helping teachers to understand how one-to-one technology can be used in a traditional classroom setting, which in turn will make the lessons using the technology more engaging for students. The advantages of taking part also include helping the school to best use one-to-one technology for both students and for teaching staff to help improve the learning taking place.

Further to this, the research will be contributing to a global discussion on the use of technology in education and as such will be part of a wider educational debate about the place of technology in secondary school education.

We do not anticipate there being any risks, however a full risk assessment will be in place and the whole research project has been reviewed and approved by the Ethics Committee at the University of Reading. In the unlikely event of something going wrong or should you have any concerns, please feel free to contact Eddie's supervisor by emailing Dr. Yota Dimitriadi at y.dimitriadi@reading.ac.uk . The University has the appropriate insurances in place. Full details are available on request.

What will happen to the data? (see Data Protection below)
Any data collected will be held in strict confidence and no real names or any other identifiers will be used in this pilot study or in any subsequent publications. You will be assigned an identification number/ name (ID) only to distinguish your responses from those of other participants. This ID is in no way associated with your name. The records of this study will be kept private. No identifiers linking you to the study will be included in any sort of report that might be published. Research records will be stored securely in a locked filing cabinet and on a password-protected computer and the only additional people to see these will be the supervisor, Dr. Yota Dimitriadi, and co-supervisor, Dr. Natthapoj Vincent Trakulphadetkrai who will have access to the records. You may request an electronic copy of the results of the study if you wish. The project is not anticipated to involve you in any expense.

In line with the University's policy on the management of research data, anonymised data gathered in this research may be preserved and made publicly available for others to consult and re-use. All anonymised research data will be retained indefinitely whereas any identifying information such as consent forms will be disposed of securely after the research findings have been written up.

What happens if I change my mind?

Your decision to participate is entirely voluntary. Also, you are free to withdraw your consent at any time, without giving a reason, by contacting Eddie Falshaw, (01189879600) if you wish to withdraw from the study. Should this be after the completion of the survey, it will not be possible to withdraw any responses as they are anonymous.

Who has reviewed the study?

This project has been reviewed following the procedures of the University Research Ethics Committee and has been given a favourable ethical opinion for conduct. The University has the appropriate insurances in place. Full details are available on request.

Data Protection

The organisation responsible for protection of your personal information is the University of Reading (the Data Controller). Queries regarding data protection and your rights should be directed to the University Data Protection Officer at imps@reading.ac.uk, or in writing to: Information Management & Policy Services, University of Reading, Whiteknights, P O Box 217, Reading, RG6 6AH.

The University of Reading collects, analyses, uses, shares and retains personal data for the purposes of research in the public interest. Under data protection law we are required to inform you that this use of the personal data we may hold about you is on the lawful basis of being a public task in the public interest and where it is necessary for scientific or historical research purposes. If you withdraw from a research study, which processes your personal data, dependant on the stage of withdrawal, we may still rely on this lawful basis to continue using your data if your withdrawal would be of significant detriment to the research study aims. We will always have in place appropriate safeguards to protect your personal data.

If we have included any additional requests for use of your data, for example adding you to a registration list for the purposes of inviting you to take part in future studies, this will be done only with your consent where you have provided it to us and should you wish to be removed from the register at a later date, you should contact E.R.Falshaw@pgr.reading.ac.uk.

You have certain rights under data protection law which are:
- Withdraw your assent, for example if you opted in to be added to a participant register
- Access your personal data or ask for a copy
- Rectify inaccuracies in personal data that we hold about you
- Be forgotten, that is your details to be removed from systems that we use to process your personal data
- Restrict uses of your data
- Object to uses of your data, for example retention after you have withdrawn from a study

Some restrictions apply to the above rights where data is collected and used for research purposes.

You can find out more about your rights on the website of the Information Commissioners Office (ICO) at https://ico.org.uk.

You also have a right to complain the ICO if you are unhappy with how your data has been handled. Please contact the University Data Protection Officer in the first instance.

What do I do next?

I hope that you will agree to take part in the study. If you are happy, please go ahead and complete the survey, using the link in this email. By completing the survey, you will be giving your assent (agreement) to participating in this part of the pilot study. More information is available by emailing Eddie Falshaw at; E.R.Falshaw@pgr.reading.ac.uk

Signed:

Head

Information Sheet and Consent Form Pilot: Students

Researcher: **Supervisor**:
Name: Eddie Falshaw   Name Dr. Yota Dimitriadi
Phone: 01189879600   Phone: +44 (0)118 378 2688
Email: E.R.Falshaw@pgr.reading.ac.uk   Email: y.dimitriadi@reading.ac.uk

Pilot Information Sheet and Assent Form: 6th Form Students Focus Group

Title of the Project: One-to-One Technology and Student Engagement: A Case Study

I would like to invite you to take part in a research study focus group about one-to-one technology and student engagement. The purpose of the research is to further knowledge and understanding about the use of Chromebook technology in the classroom with a particular focus on the engagement of students. It is being conducted as part of my studies on the EdD programme at the University of Reading.

Why have I been chosen to take part?

You have been asked to participate because you are a 6th Form Student who uses one to one technology in many of your lessons at school and you expressed an interest in participating in this stage of the research after completing the pilot survey. You are therefore well placed to contribute your views from a student perspective about how the technology is used and how engaging you find it. You are also well placed to provide feedback on the proposed study that is taking place with students in Y7 to Y11 and specifically students in Y9.

Do I have to take part?

It is entirely up to you whether you participate. You may also withdraw your assent to participation at any time during the project, without giving a reason by contacting me directly, on 01189879604 or E.R.Falshaw@pgr.reading.ac.uk

What will happen if I take part?

If you agree to participate in this part of the research, you will participate in a focus group with 2 or 3 others lasting between 30-45minutes. You will be asked questions about the survey and the questions, using you judgement to feedback how they will be understood in the live research. The focus group will take place at a mutually convenient time.

What are the risks and benefits of taking part?

Participants in similar studies have found it interesting to take part. I anticipate the findings will be useful in helping teachers to understand how the Chromebook can be used in a traditional classroom setting, which in turn will make the lessons using the technology more engaging. The advantages of taking part also include helping the school to best use Chromebook technology for both students and for teaching staff.

Further to this, the research will be contributing to a global discussion on the use of technology in education and as such will be part of a wider educational debate about the place of technology in secondary school education.

We do not anticipate there being any risks, however a full risk assessment will be in place and the whole research project has been reviewed and approved by the Ethics Committee at the University of Reading. In the unlikely event of something going wrong or should you have any concerns, please feel free to contact my supervisor by emailing Dr. Yota Dimitriadi at y.dimitriadi@reading.ac.uk . The University has the appropriate insurances in place. Full details are available on request.

What will happen to the data? (see Data Protection below)
Any data collected will be held in strict confidence and no real names or any other identifiers will be used in this study or in any subsequent publications. Participants will be assigned an identification number/ name (ID) only to distinguish their responses from those of other participants. This ID is in no way associated with their name. The records of this study will be kept private. No identifiers linking any participant to the study will be included in any sort of report that might be published. Research records will be stored securely in a locked filing cabinet and on a password-protected computer and the only additional person to see these will be my supervisor, Dr.Yota Dimitriadi, and co-supervisor, Natthapoj Vincent Trakulphadetkrai who will also have access to the records. You may request an electronic copy of the results of the study if you wish. The project is not anticipated to involve any expense. The information gathered will be used for data analysis. Should the final copy of the report be published, and confidentiality becomes an issue, then written consent for this will be requested.

In line with the University's policy on the management of research data, anonymised data gathered in this research may be preserved and made publicly available for others to consult and re-use. All anonymised research data will be retained indefinitely whereas any identifying information such as consent forms will be disposed of securely after the research findings have been written up.

What happens if I change my mind?

Your decision to participate is entirely voluntary. Also, you are free to withdraw your assent at any time, without giving a reason, by contacting Eddie Falshaw, (01189879600) or E.R.Falshaw@pgr.reading.ac.uk if you wish to withdraw from the study.

Who has reviewed the study?

This project has been reviewed following the procedures of the University Research Ethics Committee and has been given a favourable ethical opinion for conduct. The University has the appropriate insurances in place. Full details are available on request.

Data Protection

The organisation responsible for protection of your personal information is the University of Reading (the Data Controller). Queries regarding data protection and your rights should be directed to the University Data Protection Officer at imps@reading.ac.uk, or in writing to: Information Management & Policy Services, University of Reading, Whiteknights, P O Box 217, Reading, RG6 6AH.

The University of Reading collects, analyses, uses, shares and retains personal data for the purposes of research in the public interest. Under data protection law we are required to inform you that this use of the personal data we may hold about you is on the lawful basis of being a public task in the public interest and where it is necessary for scientific or historical research purposes. If you withdraw from a research study, which processes your personal data, dependant on the stage of withdrawal, we may still rely on this lawful basis to continue using your data if your withdrawal would be of

significant detriment to the research study aims. We will always have in place appropriate safeguards to protect your personal data.

If we have included any additional requests for use of your data, for example adding you to a registration list for the purposes of inviting you to take part in future studies, this will be done only with your consent where you have provided it to us and should you wish to be removed from the register at a later date, you should contact E.R.Falshaw@pgr.reading.ac.uk.

You have certain rights under data protection law which are:
- Withdraw your consent, for example if you opted in to be added to a participant register
- Access your personal data or ask for a copy
- Rectify inaccuracies in personal data that we hold about you
- Be forgotten, that is your details to be removed from systems that we use to process your personal data
- Restrict uses of your data
- Object to uses of your data, for example retention after you have withdrawn from a study

Some restrictions apply to the above rights where data is collected and used for research purposes.

You can find out more about your rights on the website of the Information Commissioners Office (ICO) at https://ico.org.uk.

You also have a right to complain the ICO if you are unhappy with how your data has been handled. Please contact the University Data Protection Officer in the first instance.

What do I do next?

I hope that you will agree to take part in a focus group discussion. If you are happy to do so, please complete the form below and return to me as soon as you are able via this link:
                                     using your school Google account. More information is available by emailing Eddie Falshaw at; E.R.Falshaw@pgr.reading.ac.uk

Many thanks,

Signed:

Eddie Falshaw

Assent Form: Students

Title of project: One to One Technology and Student Engagement: A Case Study

I have read and had explained to me by Eddie Falshaw, the Information Sheet relating to my participation in this project.

I have had explained to me the purposes of the project and what will be required of me, and any questions have been answered to my satisfaction. I agree to the arrangements described in the Information Sheet in so far as they relate to my participation.

I understand that I will be interviewed and that the interview will be recorded and transcribed.

I understand that my participation is entirely voluntary and that I have the right to withdraw from the project any time, without giving a reason and without repercussions.

I have received a copy of this Assent Form and of the accompanying Information Sheet.

Please tick as appropriate:

I assent to take part in this pilot study: yes ☐   no ☐

I assent to being interviewed in a focus group: yes ☐   no ☐

Name:

Signed:

Date:

Stage 1
Stage one of data collection will take place following the pilot study and involve:

- Sending an information sheet to all students and all parents/ guardians of students in Years 7 to 11 containing information about the research, including details about the survey and the *possibility* of the participating in a focus group (see below). The information to students will follow 5 days later to allow parents the time to withdraw their permission and request for the information not to be sent to their child/ children. The link to the survey will be contained within the information emailed to students. This initial contact will come from the Head teacher.

  Assent forms will not be sent at this stage, as completion of the survey, following acknowledgement of the information at the start of the survey will provide the assent. Assent forms will be issued and completed for those involved in Stage 2 focus groups (see below).

- Sending an information sheet to all teachers at the School about the research, including the survey and the *possibility* of interviews with those who teach Y9 (see below). The link to the survey will be included in this communication to all teachers. This initial contact will come from the Head teacher.

  Consent forms will not be sent at this stage, as completion of the survey, following acknowledgement of the information at the start of the survey, will be consent given. Consent forms will be issued and completed for those involved in Stage 2, interviews.

University of
Reading

Researcher: **Supervisor**:
Name: Eddie Falshaw   Name Dr. Yota Dimitriadi
Phone: 01189879600   Phone: +44 (0)118 378 2688
Email: E.R.Falshaw@pgr.reading.ac.uk   Email: y.dimitriadi@reading.ac.uk

Information Sheet: Students

Title of the Project: One to One Technology and Student Engagement: A Case Study

I would like to invite you to take part in a research study about one-to-one technology (one Chromebook for each student) and student engagement. The purpose of the research is to further knowledge and understanding about the use of Chromebook technology in the classroom with a particular focus on the engagement of students. It is being conducted as part of Eddie Falshaw's studies on the EdD programme at the University of Reading.

Why have I been chosen to take part?

You have been asked to participate because you are a student who uses a Chromebook in many of your lessons at Leighton Park. You are therefore well placed to contribute your views from a student perspective about how the technology is used and how engaging you find it.

Do I have to take part?

It is entirely up to you whether you participate. You may also withdraw your assent to participation at any time during the project, without giving a reason by contacting Eddie directly, on 01189879604 or E.R.Falshaw@pgr.reading.ac.uk

What will happen if I take part?

If you agree to participate in this research, you will complete an online questionnaire about Chromebook technology at Leighton Park School. The link to this questionnaire is contained in the body of this email. It is your decision to complete the questionnaire.

Following the completion of a questionnaire that asks for views about the use of Chromebook technology in the classroom, students in Year 9 will be asked if they would like to volunteer and participate in a focus group with 2 or 3 others lasting between 30-45minutes. Should you be in Y9 and volunteer, you will be asked further questions about your views on one-to-one Chromebook technology. The focus group will take place at a mutually convenient time and with your agreement will be audio recorded and transcribed. You will be sent further information about this if you decide to volunteer.

What are the risks and benefits of taking part?

Participants in similar studies have found it interesting to take part. I anticipate the findings will be useful in helping teachers in our school to understand how the Chromebook can be used in the

classroom, which in turn could make the lessons using the technology more engaging and therefore more beneficial for your academic studies. The advantages of taking part also include helping the school to best use Chromebook technology for both students and for teaching staff in the classroom in order to support the learning taking place.

Further to this, the research will be contributing to a global discussion on the use of technology in education and as such will be part of a wider educational debate about the place of technology in secondary school education.

We do not anticipate there being any risks, however a full risk assessment will be in place and the whole research project has been reviewed and approved by the Ethics Committee at the University of Reading. In the unlikely event of something going wrong or should you have any concerns, please feel free to contact Eddie's supervisor by emailing Dr. Yota Dimitriadi at y.dimitriadi@reading.ac.uk . The University has the appropriate insurances in place. Full details are available on request.

What will happen to the data? (see Data Protection below)

Any data collected will be held in strict confidence and no real names or any other identifiers will be used in this study or in any subsequent publications. Participants will be assigned an identification number/ name (ID) only to distinguish their responses from those of other participants. This ID is in no way associated with their name. The records of this study will be kept private. No identifiers linking any participant to the study will be included in any sort of report that might be published. Research records will be stored securely in a locked filing cabinet and on a password-protected computer and the only additional people to see these will be Eddie's supervisor, Dr.Yota Dimitriadi, and co-supervisor, Natthapoj Vincent Trakulphadetkrai who will also have access to the records. You may request an electronic copy of the results of the study if you wish. The project is not anticipated to involve any expense. The information gathered will be used for data analysis. Should the final copy of the report be published, and confidentiality becomes an issue, then written consent for this will be requested.

In line with the University's policy on the management of research data, anonymised data gathered in this research may be preserved and made publicly available for others to consult and re-use. All anonymised research data will be retained indefinitely whereas any identifying information such as consent forms will be disposed of securely after the research findings have been written up.

What happens if I change my mind?

Your decision to participate is entirely voluntary. Also, you are free to withdraw your assent at any time, without giving a reason, by contacting Eddie Falshaw, (01189879600) or E.R.Falshaw@pgr.reading.ac.uk if you wish to withdraw from the study.

Who has reviewed the study?

This project has been reviewed following the procedures of the University Research Ethics Committee and has been given a favourable ethical opinion for conduct. The University has the appropriate insurances in place. Full details are available on request.

Data Protection

The organisation responsible for protection of your personal information is the University of Reading (the Data Controller). Queries regarding data protection and your rights should be directed to the University Data Protection Officer at imps@reading.ac.uk, or in writing to: Information Management & Policy Services, University of Reading, Whiteknights, P O Box 217, Reading, RG6 6AH.

The University of Reading collects, analyses, uses, shares and retains personal data for the purposes of research in the public interest. Under data protection law we are required to inform you that this use of the personal data we may hold about you is on the lawful basis of being a public task in the public interest and where it is necessary for scientific or historical research purposes. If you withdraw from a research study, which processes your personal data, dependant on the stage of withdrawal, we may still rely on this lawful basis to continue using your data if your withdrawal would be of significant detriment to the research study aims. We will always have in place appropriate safeguards to protect your personal data.

If we have included any additional requests for use of your data, for example adding you to a registration list for the purposes of inviting you to take part in future studies, this will be done only with your consent where you have provided it to us and should you wish to be removed from the register at a later date, you should contact E.R.Falshaw@pgr.reading.ac.uk.

You have certain rights under data protection law which are:
- Withdraw your assent, for example if you opted in to be added to a participant register
- Access your personal data or ask for a copy
- Rectify inaccuracies in personal data that we hold about you
- Be forgotten, that is your details to be removed from systems that we use to process your personal data
- Restrict uses of your data
- Object to uses of your data, for example retention after you have withdrawn from a study

Some restrictions apply to the above rights where data is collected and used for research purposes.

You can find out more about your rights on the website of the Information Commissioners Office (ICO) at https://ico.org.uk.

You also have a right to complain the ICO if you are unhappy with how your data has been handled. Please contact the University Data Protection Officer in the first instance.

What do I do next?

I hope that you will agree to take part in the study. If you are happy, please access the survey in the email or below and complete the questions giving your views as fully as you can. More information is available by emailing Eddie Falshaw at; E.R.Falshaw@pgr.reading.ac.uk

Best wishes,

Signed:

M.L.S. Judd

Head

Survey link: [to be inserted]

Parent

Researcher:
Name: Eddie Falshaw
Phone: 01189879600
Email: E.R.Falshaw@pgr.reading.ac.uk

Supervisor:
Name Dr. Yota Dimitriadi
Phone: +44 (0)118 378 2688
Email: y.dimitriadi@reading.ac.uk

Information Sheet: Parents

Title of project: One to One Technology and Student Engagement: A Case Study

I would like to invite your son(s)/ daughter(s) to take part in a research study about one-to-one technology and student engagement here at Leighton Park School. The purpose of the research is to further our knowledge and understanding about the use of one-to-one Chromebook technology in the classroom with a particular focus on the engagement of students. It is being conducted as part of Eddie Falshaw's studies on the EdD programme at the University of Reading and is designed to provide useful data to inform future Chromebook/ technology use at Leighton Park School.

Why has my child been chosen?

Your child(ren) will be asked to participate in this research study because of their experience in using a Chromebook as part of their everyday lessons here at Leighton Park School. As such their experiences, views and ideas regarding the use of this technology in the classroom is potentially useful in furthering our understanding of technology use in the classroom.

Does my child have to take part?

The study will request that students give their views via an online survey, but there will be no compulsion in this – that is, students will not be made to do anything they do not want to do. You are free to withdraw your consent at any time, without giving a reason, by contacting Eddie Falshaw (01189879600 or E.R.Falshaw@pgr.reading.ac.uk) and the survey will not be sent, or you can ask that your child does not complete the survey.

What will happen if my child takes part?

If you agree for your child/ children to participate in this research, they will be invited to complete an online survey via their school email address, in no less than five days' time.

Following the collation of results from the survey, volunteers from Y9 will be asked to take part in a series of focus groups of between 3 and 4 students, to further explore their perceptions of Chromebook use at School. The conversation will be audio recorded and transcribed. Should your child volunteer, a separate communication will be sent to you asking for your consent for their participation in this stage of the research.

What are the risks and benefits of taking part?

The advantages of taking part include helping the school to best utilise Chromebook technology for both students and for teaching staff, by furthering our understanding of what is happening in the classroom. In doing so, it will help teachers to help our students utilise this technology more effectively. Further to this, the research will be contributing to a global discussion on the use of technology in education and as such will be part of a wider educational debate about the place of

technology in secondary school education. Participants can often find it interesting to take part in research that is relevant to their daily experiences.

We do not anticipate there being any risks, however a full risk assessment will be in place and the whole research project has been reviewed and approved by the Ethics Committee at the University of Reading. In the unlikely event of something going wrong or should you have any concerns, please feel free to contact my supervisor by emailing Dr. Yota Dimitriadi at y.dimitriadi@reading.ac.uk . The University has the appropriate insurances in place. Full details are available on request.

What will happen to the data? (see Data Protection below)

Any data collected will be held in strict confidence and no real names or any other identifiers will be used in this study or in any subsequent publications. Participants will be assigned an identification number/ name (ID) only to distinguish their responses from those of other participants. This ID is in no way associated with their name. The records of this study will be kept private. No identifiers linking any participant to the study will be included in any sort of report that might be published. Research records will be stored securely in a locked filing cabinet and on a password-protected computer and the only additional people to see these will be Eddie's supervisor, Dr.Yota Dimitriadi, and co-supervisor, Natthapoj Vincent Trakulphadetkrai who will also have access to the records. You may request an electronic copy of the results of the study if you wish. The project is not anticipated to involve any expense. The information gathered will be used for data analysis. Should the final copy of the report be published, and confidentiality becomes an issue, then written consent for this will be requested.

In line with the University's policy on the management of research data, anonymised data gathered in this research may be preserved and made publicly available for others to consult and re-use. All anonymised research data will be retained indefinitely whereas any identifying information such as consent forms will be disposed of securely after the research findings have been written up.

What happens if I change my mind?

You are free to withdraw your consent at any time, without giving a reason, by contacting Eddie Falshaw, (01189879600) if you wish to withdraw your child from the study.

Who has reviewed the study?

This project has been reviewed following the procedures of the University Research Ethics Committee and has been given a favourable ethical opinion for conduct. The University has the appropriate insurances in place. Full details are available on request.

Where can I get more information?

More information is available by emailing Eddie Falshaw at; E.R.Falshaw@pgr.reading.ac.uk
The organisation responsible for protection of your personal information is the University of Reading (the Data Controller). Queries regarding data protection and your rights should be directed to the University Data Protection Officer at imps@reading.ac.uk, or in writing to: Information Management & Policy Services, University of Reading, Whiteknights, P O Box 217, Reading, RG6 6AH.

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public interest and where it is necessary for scientific or historical research purposes. If you withdraw from a research study, which processes your personal data, dependant on the stage of withdrawal, we may still rely on this lawful basis to continue using your data if your withdrawal would be of significant detriment to the research study aims. We will always have in place appropriate safeguards to protect your personal data.

If we have included any additional requests for use of your data, for example adding you to a registration list for the purposes of inviting you to take part in future studies, this will be done only with your consent where you have provided it to us and should you wish to be removed from the register at a later date, you should contact E.R.Falshaw@pgr.reading.ac.uk.

You have certain rights under data protection law which are:
- Withdraw your consent, for example if you opted in to be added to a participant register
- Access your personal data or ask for a copy
- Rectify inaccuracies in personal data that we hold about you
- Be forgotten, that is your details to be removed from systems that we use to process your personal data
- Restrict uses of your data
- Object to uses of your data, for example retention after you have withdrawn from a study

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What should I do next?

There is nothing for you to do at this moment if you are happy for your child to take part and complete the survey. If you do not want your son/ daughter to complete the survey, please do let Eddie know and he will not send them the information.

Best wishes,

Signed:

M.L.S. Judd

Head

Date:

University of Reading

Researcher:
Name: Eddie Falshaw
Phone: 01189879600
Email: E.R.Falshaw@pgr.reading.ac.uk

Supervisor:
Name Dr. Yota Dimitriadi
Phone: +44 (0)118 378 2688
Email: y.dimitriadi@reading.ac.uk

Information Sheet: Teachers

Title of project: One to One Technology and Student Engagement: A Case Study

I am inviting you to take part in a research study about one-to-one technology and student engagement at Leighton Park School. The purpose of the research is to further our knowledge and understanding of the use of Chromebook technology in the classroom with a particular focus on the engagement of students. It is being conducted as part of Eddie Falshaw's studies on the EdD programme at the University of Reading.

Why have I been chosen to take part?

You have been asked to participate in this research study because of your experience in education and your experience as a teacher in a classroom that employs one to one Chromebook technology. As such you are well placed to contribute your perceptions of how technology is used and impacts student engagement in the classroom. You are also a teacher at Leighton Park School and as such understand the context of the use of this type of technology.

Do I have to take part?

It is entirely up to you whether you participate. You may also withdraw your consent to participate at any time during the project, without any repercussions to you, by contacting Eddie directly, on 01189879604 or E.R.Falshaw@pgr.reading.ac.uk.

What will happen if I take part?

If you agree to participate in this research, you will complete a survey that asks for views about the use of one-to-one Chromebook technology in the classroom, with a focus on engagement. The link to the survey is contained in this email below.

Following this, if you teach a Year 9 class, you will be asked to volunteer to participate in a one-to-one interview with Eddie lasting between 30-45minutes, during which specific areas, as shown by the survey analysis, will be explored for greater depth and understanding. The interview will take place at a mutually convenient time and with your agreement will be audio recorded and transcribed. Further information will be sent to you should you agree to participate in this part of the research.

What are the risks and benefits of taking part?

Participants in similar studies have found it interesting to take part. We anticipate the findings will be useful in helping teachers to understand how the Chromebook can be used in a traditional classroom

setting. The advantages of taking part also include helping the school to best utilise Chromebook technology for both students and for teaching staff.

Further to this, the research will be contributing to a global discussion on the use of technology in education and as such will be part of a wider educational debate about the place of technology in secondary school education.

We do not anticipate there being any risks, however a full risk assessment will be in place and the whole research project has been reviewed and approved by the Ethics Committee at the University of Reading. In the unlikely event of something going wrong or should you have any concerns, please feel free to contact my supervisor by emailing Dr. Yota Dimitriadi at y.dimitriadi@reading.ac.uk . The University has the appropriate insurances in place. Full details are available on request.

What will happen to the data? (see data Protection below)

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Should the final copy of the report be published, and confidentiality becomes an issue, then written consent for this will be requested. In line with the University's policy on the management of research data, anonymised data gathered in this research may be preserved and made publicly available for others to consult and re-use. All anonymised research data will be retained indefinitely whereas any identifying information such as consent forms will be disposed of securely after the research findings have been written up.

What happens if I change my mind?

Your decision to participate is entirely voluntary. Also, you are free to withdraw your consent at any time, without giving a reason, by contacting Eddie Falshaw, (01189879600) if you wish to withdraw from the study.

Who has reviewed the study?

This project has been reviewed following the procedures of the University Research Ethics Committee and has been given a favourable ethical opinion for conduct. The University has the appropriate insurances in place. Full details are available on request.

Data Protection

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University Data Protection Officer at imps@reading.ac.uk, or in writing to: Information Management & Policy Services, University of Reading, Whiteknights, P O Box 217, Reading, RG6 6AH.

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If we have included any additional requests for use of your data, for example adding you to a registration list for the purposes of inviting you to take part in future studies, this will be done only with your consent where you have provided it to us and should you wish to be removed from the register at a later date, you should contact E.R.Falshaw@pgr.reading.ac.uk.

You have certain rights under data protection law which are:
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- Access your personal data or ask for a copy
- Rectify inaccuracies in personal data that we hold about you
- Be forgotten, that is your details to be removed from systems that we use to process your personal data
- Restrict uses of your data
- Object to uses of your data, for example retention after you have withdrawn from a study

Some restrictions apply to the above rights where data is collected and used for research purposes.

You can find out more about your rights on the website of the Information Commissioners Office (ICO) at https://ico.org.uk.

You also have a right to complain the ICO if you are unhappy with how your data has been handled. Please contact the University Data Protection Officer in the first instance.

What do I do next?

I hope that you will agree to take part in the study. If you are happy, please complete the survey using the link in the body of the email below. More information is available by emailing Eddie Falshaw at; E.R.Falshaw@pgr.reading.ac.uk

Best wishes,

Signed:

M.L.S. Judd

Head

Date

Survey link: [to be inserted]

Students Survey Questions
Survey information and Assent: Students

I would like to invite you to take part in a 'One-to-one Chromebook Technology' research project. I would like to understand the perceptions/ views/ opinions of students about the use of the Chromebook in lessons. Findings from this project will provide important knowledge of how Chromebooks are being used in the classroom and how engaging students and teachers think they are. It is hoped the findings will help inform future use at the school. The project is led by Eddie Falshaw, Institute of Education, University of Reading and teacher at Leighton Park School.

You have been invited to take part because you are a member of the student body at Leighton Park School. At the school, all students in Y7-11 and all teachers are invited to participate in the survey. It is entirely up to you whether you take part and there will be no repercussions if you choose not to.

The survey will take approximately 15 minutes to complete. The survey is being conducted via a secure survey platform and any data collected will be held securely and in strict confidence for the purposes of the research survey only. Participants will be assigned a unique number whilst the study is undertaken. Combined with contributions from interviews and focus groups, the results of this survey will be written up as a report for the University and may also be used presented at national and international conferences and published in written articles. The results of the study will not be presented in a way that will identify you.

This project has been reviewed following the procedures of the University Research Ethics Committee and has been given a favourable ethical opinion for conduct. The University has the appropriate insurances in place. Full details are available on request. By completing this survey, you are consenting to your participation in this research study.

If you would like more information, please contact Eddie on: 0118 9879600: Email: E.R.Falshaw@pgr.reading.ac.uk.

If you have any queries regarding protection of your personal data, please contact imps@reading.ac.uk.

[A tick box to acknowledge the above will be included, which will acknowledge the participant has read and understood the information provided. A tick 'Yes' will take the respondent to the survey, a tick 'No' will end their participation in the survey]

Survey Questions:
Personal Information
Male/ Female/ Prefer not to say
Year Group
English as and Additional language
Years at the School

Engagement Meaning
Open ended responses

Understanding of Engagement	RQ
If you are described as being 'engaged' in your academic work, in a lesson, what does that mean to you?	1
Please complete the following sentence in your own words: 'When I am engaged in my schoolwork using my Chromebook, I…'	1

Chromebook Use
Open ended responses

How are Chromebooks Used?	RQ
When in lessons how is the Chromebook used to help engage you with your learning? Please explain as fully as you can.	2
What do you think the Chromebook could be used for in your lessons that it is not currently used for?	3
What do you think are the challenges of using Chromebooks for learning in your lessons?	3

Engagement Self Report

All on 1-5 Likert scale: strongly disagree/ disagree/ neither agree nor disagree/ agree/ strongly agree

Affective

Affective Questions	RQ	Indicator
I think we should use our Chromebooks to support learning more than we currently do.	1	Interest Desire to Achieve
When we use the Chromebook in a lesson, I feel better about what we are learning.	1	Excitement Enjoyment
My engagement in schoolwork would increase if Chromebooks were used to personalise the content for me.	1	Positive att. Desire to ach
When we work on something in class with a Chromebook, I feel less interested than when we do not use a Chromebook (reverse coded)	1	Interest

Behaviour

Behaviour Questions	RQ	Indicator
I am less likely to ask the teacher for help if I am using my Chromebook.	1	Asking for help
I often do other things on my Chromebook in class when I am supposed to be paying attention on my academic work (reverse coded).	1	Attention/ focus
If we are using the Chromebook, I participate more in the lesson.	1	Participation
I try harder in lessons when we use the Chromebook.	1	Effort Time on Task

Cognitive

Cognitive Questions	RQ	Indicator
Concentrating on my work is difficult when using my Chromebook for learning in class. (reverse coded)	1	Focus/ Con. Self reg
I learn more effectively when I use the Chromebook	1	Deep learn.
The Chromebook allows me to reflect on my learning	1	Reflection
Using my Chromebook helps me to persevere with difficult problems.	1	Purposeful, deep learn.

Teachers Survey Questions
Survey information and Consent: Staff

I would like to invite you to take part in a 'One-to-one Chromebook Technology' research project, by completing this survey. I would like to understand the perceptions of teachers about the student use of Chromebooks in lessons to help student engagement with their learning. Findings from this project will provide important knowledge of how Chromebooks are being used in the classroom and how engaging students and teachers think they are in the process of learning. It is hoped the finding will inform future teaching practice. The project is led by Eddie Falshaw, Institute of Education, University of Reading.

You have been invited to take part because you are a member of the teaching body at Leighton Park School. All students in Y7 to 11 and all teachers are being invited to participate in the survey. It is entirely up to you whether you take part and there will be no repercussions if you choose not to.

The survey will take approximately 15 minutes to complete. The survey is being conducted via a secure survey platform and any data collected will be held securely and in strict confidence for the purposes of the research survey only. Participants will be assigned a unique number whilst the study is undertaken. Combined with interviews and focus groups, the results of this survey will be written up as a report for the University and may also be used to present at national and international conferences and published in written articles. The results of the study will not be presented in a way that will identify you.

This project has been reviewed following the procedures of the University Research Ethics Committee and has been given a favourable ethical opinion for conduct. The University has the appropriate insurances in place. Full details are available on request. By completing this survey, you are consenting to your participation in this research study.

If you would like more information, please contact Eddie on: 0118 9879600: Email: E.R.Falshaw@pgr.reading.ac.uk.

If you have any queries regarding protection of your personal data, please contact imps@reading.ac.uk.

[A tick box to acknowledge the above will be included, which will acknowledge the participant has read and understood the information provided. A tick 'Yes' will take the respondent to the survey, a tick 'No' will end their participation in the survey]

Survey Questions:

Personal Information

Male/ female/ prefer not to say
Their Age Range (from a choice of ranges not an exact number)
Teaching Experience (Years rounded up)
Years teaching at the School
Faculty area
Self-report: IT skills/ competence
Experience using 1:1laptops in the classroom (years rounded up)

Engagement Meaning
Open ended response

Understanding of Engagement	RQ
If students are described as being 'engaged' in their academic work, in a lesson, what does this mean to you?	1
Please complete this sentence in your own words: 'When students are engaged in their schoolwork using their Chromebook, they…'	1

Chromebook Use
Open ended response

How are Chromebooks Used?	RQ
When in lessons how do you use Chromebooks to engage students with their learning? Please explain as fully as you can.	2
What do you think the Chromebook could be used for in your lessons that it is not currently used for?	3
What do you think are the challenges presented by using Chromebooks in lessons?	3

Engagement Observation Report
Affective
1-5 scale: strongly disagree/ disagree/ neither agree nor disagree/ agree/ strongly agree

Affective Questions	RQ	Indicator
I think we should use Chromebooks more to support learning than we currently do.	1	Interest Desire to achieve
When using Chromebooks in lessons, it helps students to feel better about their learning.	1	Excitement Enjoyment
Student engagement in schoolwork would increase if Chromebooks were used to personalise the content for students.	1	Positive att. Desire to ach
When we work on something in class with a Chromebook, students feel less interested than when we do not use a Chromebook (reverse coded)	1	Interest

Behaviour
1-5 scale: strongly disagree/ disagree/ neither agree nor disagree/ agree/ strongly agree

Behaviour Questions	RQ	Indicator
Students are less likely to ask for help if they are using their Chromebook.	1	Asking for help
Students often do other things on their Chromebook in class when they are supposed to be paying attention on their academic work (reverse coded).	1	Attention/ focus
If students are using their Chromebook, they participate more in the lesson.	1	Participation
Students try harder in lessons when we use the Chromebook.	1	Effort Time on Task

Cognitive

1-5 scale: strongly disagree/ disagree/ neither agree nor disagree/ agree/ strongly agree

Cognitive Questions	RQ	Indicator
Students find it difficult to concentrate when using their Chromebook for learning in class. (reverse coded)	1	Focus/ Con. Self reg
Students learn more effectively when they use the Chromebook.	1	Deep learn.
The Chromebook allows students to reflect on their learning	1	Reflection
Using the Chromebook helps students to persevere with difficult problems.	1	Purposeful, deep learn.

Stage 2
Stage two of data collection will involve:

- Sending a Participation Information Sheet and Assent Form to all students in Y9 via their school email, asking them to volunteer to be part of a focus group (see below).

- Sending a Participation Information Sheet and Consent Form via email, to the parents/ guardians of children who have volunteered to be part of a focus group and have been selected (see below).

- Sending a Participation Information Sheet and Consent Form to all teachers, via their school email, asking them to volunteer to be interviewed (see below)

Whilst much of the information is repeated in the information sheets below, this will serve to reaffirm the project and ensure the voluntary nature of the research is made clear.

Researcher:
Name: Eddie Falshaw
Phone: 01189879600
Email: E.R.Falshaw@pgr.reading.ac.uk

Supervisor:
Name Dr. Yota Dimitriadi
Phone: +44 (0)118 378 2688
Email: y.dimitriadi@reading.ac.uk

Information Sheet and Assent Form: Students

Title of the Project: One to One Technology and Student Engagement: A Case Study

I would like to invite you to take part in a focus group discussion about one-to-one technology and student engagement. The purpose of the research is to further knowledge and understanding about the use of Chromebook technology in the classroom with a particular focus on the engagement of students. It is being conducted as part of my studies on the EdD programme at the University of Reading.

Why have I been chosen to take part?

You have been asked to participate because you are a student in Year 9 who uses one to one technology (a Chromebook) in many of your lessons at school. You are therefore well placed to contribute your views from a student perspective about how the technology is used and how engaging you find it.

Do I have to take part?

It is entirely up to you whether you participate. You may also withdraw your assent to participation at any time during the project, without giving a reason by contacting me directly, on 01189879604 or E.R.Falshaw@pgr.reading.ac.uk

What will happen if I take part?

If you agree to participate in this part of the research, you will participate in a focus group with 2 or 3 others lasting between 30-45minutes. You will be asked questions about one-to-one technology and what you think about its use here in school. The focus group will take place at a mutually convenient time and with your agreement will be audio recorded and transcribed.

What are the risks and benefits of taking part?

Participants in similar studies have found it interesting to take part. I anticipate the findings will be useful in helping teachers to understand how the Chromebook can be used in a traditional classroom setting, which in turn will make the lessons using the technology more engaging. The advantages of taking part also include helping the school to best use Chromebook technology for both students and for teaching staff.

Further to this, the research will be contributing to a global discussion on the use of technology in education and as such will be part of a wider educational debate about the place of technology in secondary school education.

We do not anticipate there being any risks, however a full risk assessment will be in place and the whole research project has been reviewed and approved by the Ethics Committee at the University of

Reading. In the unlikely event of something going wrong or should you have any concerns, please feel free to contact my supervisor by emailing Dr. Yota Dimitriadi at y.dimitriadi@reading.ac.uk . The University has the appropriate insurances in place. Full details are available on request.

What will happen to the data? (see Data Protection below)

Any data collected will be held in strict confidence and no real names or any other identifiers will be used in this study or in any subsequent publications. Participants will be assigned an identification number/ name (ID) only to distinguish their responses from those of other participants. This ID is in no way associated with their name. The records of this study will be kept private. No identifiers linking any participant to the study will be included in any sort of report that might be published. Research records will be stored securely in a locked filing cabinet and on a password-protected computer and the only additional people to see these will be my supervisor, Dr.Yota Dimitriadi, and co-supervisor, Natthapoj Vincent Trakulphadetkrai who will also have access to the records. You may request an electronic copy of the results of the study if you wish. The project is not anticipated to involve any expense. The information gathered will be used for data analysis.

Should the final copy of the report be published, and confidentiality becomes an issue, then written consent for this will be requested. In line with the University's policy on the management of research data, anonymised data gathered in this research may be preserved and made publicly available for others to consult and re-use. All anonymised research data will be retained indefinitely whereas any identifying information such as consent forms will be disposed of securely after the research findings have been written up.

What happens if I change my mind?

Your decision to participate is entirely voluntary. Also, you are free to withdraw your assent at any time, without giving a reason, by contacting Eddie Falshaw, (01189879600) or E.R.Falshaw@pgr.reading.ac.uk if you wish to withdraw from the study.

Who has reviewed the study?

This project has been reviewed following the procedures of the University Research Ethics Committee and has been given a favourable ethical opinion for conduct. The University has the appropriate insurances in place. Full details are available on request.

Data Protection

The organisation responsible for protection of your personal information is the University of Reading (the Data Controller). Queries regarding data protection and your rights should be directed to the University Data Protection Officer at imps@reading.ac.uk, or in writing to: Information Management & Policy Services, University of Reading, Whiteknights, P O Box 217, Reading, RG6 6AH.

The University of Reading collects, analyses, uses, shares and retains personal data for the purposes of research in the public interest. Under data protection law we are required to inform you that this use of the personal data we may hold about you is on the lawful basis of being a public task in the public interest and where it is necessary for scientific or historical research purposes. If you withdraw from a research study, which processes your personal data, dependant on the stage of withdrawal, we may still rely on this lawful basis to continue using your data if your withdrawal would be of significant detriment to the research study aims. We will always have in place appropriate safeguards to protect your personal data.

If we have included any additional requests for use of your data, for example adding you to a registration list for the purposes of inviting you to take part in future studies, this will be done only with your consent where you have provided it to us and should you wish to be removed from the register at a later date, you should contact E.R.Falshaw@pgr.reading.ac.uk.

You have certain rights under data protection law which are:

- Withdraw your consent, for example if you opted in to be added to a participant register
- Access your personal data or ask for a copy
- Rectify inaccuracies in personal data that we hold about you
- Be forgotten, that is your details to be removed from systems that we use to process your personal data
- Restrict uses of your data
- Object to uses of your data, for example retention after you have withdrawn from a study

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You also have a right to complain the ICO if you are unhappy with how your data has been handled. Please contact the University Data Protection Officer in the first instance.

What do I do next?

I hope that you will agree to take part in a focus group discussion. If you are happy to do so, please complete the form below, via this electronic link as soon as you are able to do so
                                    More information is available by emailing Eddie Falshaw at; E.R.Falshaw@pgr.reading.ac.uk

Signed:

Eddie Falshaw

Assent Form: Students (shared electronically for ease of return)

University of **Reading**

Title of project: One to One Technology and Student Engagement: A Case Study

I have read and had explained to me by Eddie Falshaw, the Information Sheet relating to my participation in this project.

I have had explained to me the purposes of the project and what will be required of me, and any questions have been answered to my satisfaction. I agree to the arrangements described in the Information Sheet in so far as they relate to my participation.

I understand that I will be interviewed and that the interview will be recorded and transcribed.

I understand that my participation is entirely voluntary and that I have the right to withdraw from the project any time, without giving a reason and without repercussions.

I have received a copy of this Assent Form and of the accompanying Information Sheet.

Please tick as appropriate:

I assent to take part in this study: yes ☐   no ☐

I assent to being interviewed in a focus group: yes ☐   no ☐

I assent to this interview being audio recorded and transcribed: yes ☐   no ☐

I agree to the use of anonymised quotes: yes ☐   no ☐

Name:

Signed:

Date:

Information Sheet and Consent Form: Parents

University of Reading

Researcher:
Name: Eddie Falshaw
Phone: 01189879600
Email: E.R.Falshaw@pgr.reading.ac.uk

Supervisor:
Name Dr. Yota Dimitriadi
Phone: +44 (0)118 378 2688
Email: y.dimitriadi@reading.ac.uk

Information Sheet: Parents

Title of project: One to One Technology and Student Engagement: A Case Study

What is the project?

The purpose of the project is to further knowledge and understanding of the use of Chromebook technology in the classroom, with a particular focus on the engagement of students. It is being conducted as part of my studies on the EdD programme at the University of Reading and is designed to provide useful data to inform future Chromebook use at Leighton park School.

Why has my child been chosen?

Your child has been asked to volunteer in this research study because of their experience in using a Chromebook as part of their everyday lessons here at Leighton Park School. As such their experiences, views and ideas regarding the use of this technology in the classroom is potentially useful in furthering our understanding of technology use in the classroom. They have now volunteered to take part in a focus group and have been selected to do so.

Does my child have to take part?

Your decision to allow your child to participate is entirely voluntary. Also, you are free to withdraw your consent at any time, without giving a reason, by contacting Eddie Falshaw, (01189879600/ E.R.Falshaw@pgr.reading.ac.uk) if you wish to withdraw your child from completing the survey. The study will request that students give their views but there will be no compulsion in this – that is, students will not be made to do anything they do not want to do.

What will happen if my child takes part?

If you agree for your child to participate in this research, they will take part in a focus group of between 3 and 4 students, to explore their perceptions of Chromebook use at School. The conversation will be audio recorded and transcribed. The discussion should last between 30-45minutes.

What are the risks and benefits of taking part?

The advantages of taking part include helping the school to best utilise Chromebook technology for both students and for teaching staff, by furthering our understanding of what is happening in the classroom. In doing so it will help teachers to help our students utilise this technology more effectively. Further to this, the research will be contributing to a global discussion on the use of technology in education and as such will be part of a wider educational debate about the place of technology in secondary school education.

We do not anticipate there being any risks, however a full risk assessment will be in place and the whole research project has been reviewed and approved by the Ethics Committee at the University of Reading. In the unlikely event of something going wrong or should you have any concerns, please feel free to contact my supervisor by emailing Dr. Yota Dimitriadi at y.dimitriadi@reading.ac.uk . The University has the appropriate insurances in place. Full details are available on request.

What will happen to the data? (see Data Protection below)

Any data collected will be held in strict confidence and no real names or any other identifiers will be used in this study or in any subsequent publications. Participants will be assigned an identification number/ name (ID) only to distinguish their responses from those of other participants. This ID is in no way associated with their name. The records of this study will be kept private. No identifiers linking any participant to the study will be included in any sort of report that might be published. Research records will be stored securely in a locked filing cabinet and on a password-protected computer and the only additional people to see these will be my supervisor, Dr.Yota Dimitriadi, and co-supervisor, Natthapoj Vincent Trakulphadetkrai who will also have access to the records. You may request an electronic copy of the results of the study if you wish. The project is not anticipated to involve any expense. The information gathered will be used for data analysis.

Should the final copy of the report be published, and confidentiality becomes an issue, then written consent for this will be requested. In line with the University's policy on the management of research data, anonymised data gathered in this research may be preserved and made publicly available for others to consult and re-use. All anonymised research data will be retained indefinitely whereas any identifying information such as consent forms will be disposed of securely after the research findings have been written up.

What happens if I change my mind?

You are free to withdraw your consent at any time, without giving a reason, by contacting Eddie Falshaw, (01189879600) if you wish to withdraw your child from the study.

Who has reviewed the study?

This project has been reviewed following the procedures of the University Research Ethics Committee and has been given a favourable ethical opinion for conduct. The University has the appropriate insurances in place. Full details are available on request.

Data Protection

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If we have included any additional requests for use of your data, for example adding you to a registration list for the purposes of inviting you to take part in future studies, this will be done only

with your consent where you have provided it to us and should you wish to be removed from the register at a later date, you should contact E.R.Falshaw@pgr.reading.ac.uk.

You have certain rights under data protection law which are:
- Withdraw your consent, for example if you opted in to be added to a participant register
- Access your personal data or ask for a copy
- Rectify inaccuracies in personal data that we hold about you
- Be forgotten, that is your details to be removed from systems that we use to process your personal data
- Restrict uses of your data
- Object to uses of your data, for example retention after you have withdrawn from a study

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You can find out more about your rights on the website of the Information Commissioners Office (ICO) at https://ico.org.uk.

You also have a right to complain the ICO if you are unhappy with how your data has been handled. Please contact the University Data Protection Officer in the first instance.

What do I do next?

I hope that you will agree your son/ daughter can take part in a focus group discussion. If you are happy to do so, please complete the form below via this electronic link,
                                                    as soon as you are able. More information is available by emailing Eddie Falshaw at; E.R.Falshaw@pgr.reading.ac.uk

Many thanks,

Signed:

Eddie Falshaw

Date:

Consent Form: Parents (sent electronically for ease of return)
Title of project: One to One Technology and Student Engagement: A Case Study

I have read the Information Sheet relating to this project.

I understand the purposes of the project and what will be required of my child, and any questions have been answered to my satisfaction. I agree to the arrangements described in the Information Sheet in so far as they relate to my child's participation.

I understand that my child may be interviewed as part of a focus group and that the interview will be audio recorded and transcribed.

I understand that my child's participation is entirely voluntary and that I and they have the right to withdraw from the project any time, without giving a reason and without repercussions.

Please tick as appropriate:

I consent to my child being part of a focus group: yes ☐   no ☐

I consent to the focus group being audio recorded and transcribed: yes ☐   no ☐

I agree to the use of anonymised quotes: yes ☐   no ☐

Name:

Signed:

Date:

University of Reading

Researcher:
Name: Eddie Falshaw
Phone: 01189879600
Email: E.R.Falshaw@pgr.reading.ac.uk

Supervisor:
Name Dr. Yota Dimitriadi
Phone: +44 (0)118 378 2688
Email: y.dimitriadi@reading.ac.uk

Information Sheet: Teachers

Title of project: One to One Technology and Student Engagement: A Case Study

I am inviting you to take part in a research study about Chromebook technology and student engagement. The purpose of the research is to further knowledge and understanding of the use of Chromebook technology in the classroom with a particular focus on the engagement of students. It is being conducted as part of my studies on the EdD programme at the University of Reading.

Why have I been chosen to take part?

You have been asked to participate in this research study because of your experience in education and your experience as a teacher in a classroom that employs one to one Chromebook technology. As such you are well placed to contribute your perceptions of how technology is used and impacts on student engagement in the classroom. You have also been chosen because you teach a Year 9 class, and the study focuses on this year group.

Do I have to take part?

It is entirely up to you whether you participate. You may also withdraw your consent to participation at any time during the project, without any repercussions to you, by contacting me directly, on 01189879604 or E.R.Falshaw@pgr.reading.ac.uk.

What will happen if I take part?

If you agree to participate in this research, you will participate in a one-to-one interview with me lasting between 30-45minutes, during which specific areas, as shown by the survey analysis, will be explored for greater depth and understanding. The interview will take place at a mutually convenient time and with your agreement will be audio recorded and transcribed.

What are the risks and benefits of taking part?

Participants in similar studies have found it interesting to take part. I anticipate the findings will be useful in helping teachers to understand how the Chromebook can be used in a traditional classroom setting. The advantages of taking part also include helping the school to best utilise Chromebook technology for both students and for teaching staff.

Further to this, the research will be contributing to a global discussion on the use of technology in education and as such will be part of a wider educational debate about the place of technology in secondary school education.

We do not anticipate there being any risks, however a full risk assessment will be in place and the whole research project has been reviewed and approved by the Ethics Committee at the University of Reading. The interviews will not impact in any way on your appraisal or any other aspect of your work. In the unlikely event of something going wrong or should you have any concerns, please feel free to contact my supervisor by emailing Dr. Yota Dimitriadi at y.dimitriadi@reading.ac.uk . The University has the appropriate insurances in place. Full details are available on request.

What will happen to the data? (see data Protection below)

Any data collected will be held in strict confidence and no real names or any other identifiers will be used in this study or in any subsequent publications. Participants will be assigned an identification number/ name (ID) only to distinguish their responses from those of other participants. This ID is in no way associated with their name. The records of this study will be kept private. No identifiers linking any participant to the study will be included in any sort of report that might be published. Research records will be stored securely in a locked filing cabinet and on a password-protected computer and the only additional peple to see these will be my supervisor, Dr.Yota Dimitriadi, and co-supervisor, Natthapoj Vincent Trakulphadetkrai who will also have access to the records. You may request an electronic copy of the results of the study if you wish. The project is not anticipated to involve any expense. The information gathered will be used for data analysis.

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What happens if I change my mind?

Your decision to participate is entirely voluntary. Also, you are free to withdraw your consent at any time, without giving a reason, by contacting Eddie Falshaw, (01189879600) if you wish to withdraw from the study.

Who has reviewed the study?

This project has been reviewed following the procedures of the University Research Ethics Committee and has been given a favourable ethical opinion for conduct. The University has the appropriate insurances in place. Full details are available on request.

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significant detriment to the research study aims. We will always have in place appropriate safeguards to protect your personal data.

If we have included any additional requests for use of your data, for example adding you to a registration list for the purposes of inviting you to take part in future studies, this will be done only with your consent where you have provided it to us and should you wish to be removed from the register at a later date, you should contact E.R.Falshaw@pgr.reading.ac.uk.

You have certain rights under data protection law which are:
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You also have a right to complain the ICO if you are unhappy with how your data has been handled. Please contact the University Data Protection Officer in the first instance.

What do I do next?

I hope that you will agree to take part in the study. If you are happy, please return the attached consent form to me directly, via the attached electronic form,   . More information is available by emailing Eddie Falshaw at; E.R.Falshaw@pgr.reading.ac.uk

Many thanks.

Signed:

Eddie Falshaw

Date:

Information Sheet and Consent Form: Teachers (sent electronically for ease of return)

Title of project: One to One Technology and Student Engagement: A Case Study

I have read the Information Sheet relating to this project.

I have had explained to me the purposes of the project and what will be required of me, and any questions have been answered to my satisfaction. I agree to the arrangements described in the Information Sheet in so far as they relate to my participation.

I understand that I will be interviewed and that the interview will be audio recorded and transcribed.

I understand that my participation is entirely voluntary and that I have the right to withdraw from the project any time, without giving a reason and without repercussions.

Please tick as appropriate:

I consent to be interviewed: yes ☐   no ☐

I consent to this interview being audio recorded and transcribed: yes ☐   no ☐

I agree to the use of anonymised quotes: yes ☐   no ☐

Name:

Signed:

Date:

Focus group schedule – students

Focus group meetings to take place after phase one collection and analysis of survey answers– to take place in April/ May 2021. The focus group will use semi-structured questions, to try and elicit thick descriptions and explanations linked closely to the survey – answers may prompt further questions to explore certain areas further. These may be altered in light of the survey results and analysis, but the broad themes for questions will include:

- What does the term engagement mean to you in the context of your academic studies? RQ1
- Is it easier or harder to concentrate on your schoolwork when you use the Chromebook? Why do you think this is/ is not the case? RQ1
- What do you use your Chromebook for in your lessons? RQ2
- Do you think Chromebooks are used effectively for learning – if yes, why, if no, why not? RQ2
- What do you think Chromebooks could be used more for to help your learning? RQ3
- What are the limitations of using the Chromebook? RQ3

- Do you think you learn more effectively with a Chromebook than without a Chromebook?
- If you go to a lesson and you realise you are not going to be using a Chromebook, how do you feel?
- Which lessons do you use the Chromebook the most? What do you use it to do? Do you think it is effective in helping you learn?
- If you had to choose – traditional books OR Chromebook – which would you choose and why?

Interview schedule – teachers

Interviews to take place after phase one collection of survey answers – to take place in April/ May 2021. The interviews will use semi-structured questions, to try and elicit thick descriptions and explanations linked to the survey – answers may prompt further questions to explore certain areas further. These may be altered in light of the survey results and analysis, but the broad themes for questions will include:

- What does the term engagement mean to you in the context of students' academic studies? RQ1
- Is it easier or harder for students to concentrate on their schoolwork when they use the Chromebook? Why do you think this is/ is not the case? RQ1
- What do you use the Chromebook for in your lessons? RQ2
- Do you think Chromebooks are used effectively for learning – if yes, why, if no, why not? RQ2
- What do you think Chromebooks could be used more for to help student learning? RQ3
- What are the challenges of using the Chromebook? RQ3

- Does the Chromebook feature heavily in your planning for lessons in the classroom?
- Do you feel the Chromebook helps engage students more effectively than other teaching tools?
- Do you believe that Chromebooks help you to be a better teacher

Appendix B Affective Crosstabulation Tables

Table B1

<table>
<tr><td colspan="2"></td><td colspan="6">I think we should use Chromebooks to support learning more than we currently do</td></tr>
<tr><td></td><td></td><td>Strongly Disagree</td><td>Disagree</td><td>Neither Agree or Disagree</td><td>Agree</td><td>Strongly Agree</td><td>Total</td></tr>
<tr><td>Students</td><td>Count</td><td>4</td><td>16</td><td>65</td><td>63</td><td>20</td><td>168</td></tr>
<tr><td></td><td>%</td><td>2.4</td><td>9.5</td><td>38.7</td><td>37.5</td><td>11.9</td><td>100</td></tr>
<tr><td>Teachers</td><td>Count</td><td>2</td><td>16</td><td>19</td><td>4</td><td>2</td><td>43</td></tr>
<tr><td></td><td>%</td><td>4.7</td><td>37.2</td><td>44.2</td><td>9.3</td><td>4.7</td><td>100</td></tr>
<tr><td>Total</td><td>Count</td><td>6</td><td>32</td><td>84</td><td>67</td><td>22</td><td>211</td></tr>
<tr><td></td><td>%</td><td>2.8</td><td>15.2</td><td>39.8</td><td>31.8</td><td>10.4</td><td>100%</td></tr>
</table>

Table B2

<table>
<tr><td colspan="2"></td><td colspan="6">When using Chromebooks in lessons, it helps students to feel better about their learning.</td></tr>
<tr><td></td><td></td><td>Strongly Disagree</td><td>Disagree</td><td>Neither Agree or Disagree</td><td>Agree</td><td>Strongly Agree</td><td>Total</td></tr>
<tr><td>Students</td><td>Count</td><td>6</td><td>17</td><td>52</td><td>71</td><td>22</td><td>168</td></tr>
<tr><td></td><td>%</td><td>3.1</td><td>10.1</td><td>31</td><td>42.3</td><td>13.1</td><td>100</td></tr>
<tr><td>Teachers</td><td>Count</td><td>1</td><td>9</td><td>23</td><td>9</td><td>1</td><td>43</td></tr>
<tr><td></td><td>%</td><td>2.3</td><td>20.9</td><td>53.5</td><td>20.9</td><td>2.3</td><td>100</td></tr>
<tr><td>Total</td><td>Count</td><td>7</td><td>26</td><td>75</td><td>80</td><td>23</td><td>211</td></tr>
<tr><td></td><td>%</td><td>3.3</td><td>12.3</td><td>35.5</td><td>38.0</td><td>10.9</td><td>100</td></tr>
</table>

Table B3

| | | Student engagement in schoolwork would increase if Chromebooks were used to personalise the content for students. | | | | | |
		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree	Total
Students	Count	6	17	71	56	18	168
	%	3.6	10.1	42.3	33.3	10.7	100
Teachers	Count	2	9	15	15	2	43
	%	4.7	20.9	34.9	34.9	4.7	100
Total	Count	8	26	86	71	20	211
	%	3.8	12.3	40.8	33.6	9.5	100

Table B4

| | | When we work on something in class with a Chromebook, students feel less interested than when we do not use a Chromebook (reverse coded) | | | | | |
		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree	Total
Students	Count	9	19	56	64	20	168
	%	5.4	11.3	33.3	38.1	11.9	100
Teachers	Count	2	7	17	15	2	43
	%	4.7	16.3	39.5	34.9	4.7	100
Total	Count	11	26	73	79	22	211
	%	5.2	12.3	34.6	37.4	10.4	100

Table B5

		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree	Total
				Affective Totals			
Students	Count	25	69	244	254	80	672
	%	3.7	10.3	36.3	37.8	11.9	100
Teachers	Count	7	41	74	43	7	172
	%	4.1	23.8	43.0	25.0	4.1	100
Total	Count	32	110	318	297	87	844
	%	3.8	13.0	37.7	35.2	10.3	100

Appendix C Behavioural Crosstabulation Tables

Table C1

		Students are less likely to ask for help if they are using their Chromebook.					
		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree	Total
Students	Count	5	29	46	75	13	168
	%	3.0	17.3	27.4	44.6	7.7	100
Teachers	Count	2	10	8	20	3	43
	%	4.7	23.3	18.6	46.5	7.0	100
Total	Count	7	39	54	95	16	211
	%	3.3	39	25.6	45.0	7.6	100

Table C2

		Students often do other things on their Chromebook in class when they are supposed to be paying attention on their academic work (reverse coded)					
		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree	Total
Students	Count	44	65	43	13	3	168
	%	26.2	38.7	25.6	7.7	1.8	100
Teachers	Count	0	8	2	21	12	43
	%	0.0	18.6	4.7	48.8	27.9	100
Total	Count	44	73	45	34	15	211
	%	20.9	34.6	21.3	16.1	7.1	100

Table C3

		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree	Total
		If students are using their Chromebook, they participate more in the lesson.					
Students	Count	6	31	81	40	10	168
	%	3.6	18.5	48.2	23.8	6.0	100
Teachers	Count	4	10	22	7	0	43
	%	9.3	23.3	51.2	16.3	0.0	100
Total	Count	10	41	103	47	10	211
	%	4.7	19.4	48.8	22.3	4.7	100

Table C4

		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree	Total
		Students try harder in lessons when they use the Chromebook.					
Students	Count	7	24	90	36	11	168
	%	4.2	14.3	53.6	21.4	6.5	100
Teachers	Count	3	9	27	4	0	43
	%	7.0	20.9	62.8	9.3	0.0	100
Total	Count	10	33	117	40	11	211
	%	4.7	15.6	55.5	19.0	5.2	100

Table C5

		Behaviour Totals					
		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree	Total
Students	Count	62	149	260	164	37	672
	%	9.2	22.2	38.7	24.4	5.5	100
Teachers	Count	9	37	59	52	15	172
	%	5.2	21.5	34.3	30.2	8.7	100
Total	Count	71	186	319	216	52	844
	%	8.4	22.0	37.8	25.6	6.2	100

Appendix D Cognitive Crosstabulation Tables

Table D1

		Students find it difficult to concentrate when using their Chromebook for learning in class.					
		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree	Total
Students	Count	29	70	44	21	4	168
	%	17.3	41.7	26.2	12.5	2.4	100
Teachers	Count	2	5	20	13	3	43
	%	4.7	11.6	46.5	30.2	7.0	100
Total	Count	31	75	64	34	7	211
	%	14.7	35.5	30.3	16.1	3.3	100

Table D2

		Students learn more effectively when they use the Chromebook.					
		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree	Total
Students	Count	6	22	58	65	17	168
	%	3.6	13.1	34.5	38.7	10.1	100
Teachers	Count	3	10	25	4	1	43
	%	7.0	23.3	58.1	9.3	2.3	100
Total	Count	9	32	83	69	18	211
	%	4.3	15.2	39.3	32.7	8.5	100

Table D3

		The Chromebook allows students to reflect on their learning					
		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree	Total
Students	Count	6	25	66	62	9	168
	%	3.6	14.9	39.3	36.9	5.4	100
Teachers	Count	4	6	20	12	1	43
	%	9.3	14.0	46.5	27.9	2.3	100
Total	Count	10	31	86	74	10	211
	%	4.7	14.7	40.8	35.1	4.7	100

Table D4

		Using the Chromebook helps students to persevere with difficult problems.					
		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree	Total
Students	Count	4	15	64	65	20	168
	%	2.4	8.9	38.1	38.7	11.9	100
Teachers	Count	4	6	25	8	0	43
	%	9.3	14.0	58.1	18.6	0.0	100
Total	Count	8	21	89	73	20	211
	%	3.8	10.0	42.2	34.6	9.5	100

Table D5

		Cognitive Totals					
		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree	Total
Students	Count	45	132	232	213	50	672
	%	6.7	19.6	34.5	31.7	7.4	100
Teachers	Count	13	27	90	37	5	172
	%	7.6	15.7	52.3	21.5	2.9	100
Total	Count	58	159	322	250	55	844
	%	6.9	18.8	38.1	29.6	6.5	100

Full dataset can be found via (Falshaw, 2023)