Technology and self-directed learning: the perspectives of school staff.

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Overview

This thesis is divided into three chapters: a literature review, an empirical paper, and a reflective account of the research process. In the first chapter, I will present a narrative review of literature relating to the use of technology to facilitate self-directed learning. The review draws together several related but distinct areas of literature, in order to establish what is already known about the ways in which our understanding of educational technology can be applied to the facilitation of self-directed learning skills. This review was conducted in order to inform the design of an empirical research project in this area.

The second chapter comprises an empirical paper presenting the aforementioned research. I will introduce the research process, describe the study's aims, design and methodology, and then present and discuss my analysis of the research findings. I will end by discussing the main conclusions of the research and discussing their implications for practice and further research.

The final chapter is a reflexive account of each stage of the research process, including personal and professional reflections on what I have learned throughout. In this section I will reflect further on the philosophical underpinnings of my research decisions, and also include a brief discussion of my plans for dissemination of the research findings.

Literature Review

Introduction

In recent years, it has been suggested that the field of education must adapt to our modern, fast-paced digital world. Researchers have posited that technology is altering our societal landscapes, and that learners will require different sets of skills in order to succeed in their academic and vocational careers than previous generations did (Brandt, 2020). One such skill that is cited as becoming of greater and greater importance is the ability to direct one's own learning in an independent way. Self-directed learning (SDL) originated in the field of andragogy (Knowles, 1978) and was considered to apply primarily to adult education, however, in more recent years it has been suggested that it would be beneficial for young people to have opportunities to practice these skills during their school careers in order that they might leave formal education better prepared for higher education and the world of work (Fischer & Sugimoto, 2006). A recent scoping review has suggested that technology may be a useful tool with which to create learning experiences for young people that encourage the development of self-directed learning skills (Morris & Rohs, 2023), and the authors suggest that there is a strong need for further research in this area.

Review question. This literature review was conducted in order to draw together and summarise existing research around how technology is used to facilitate self-directed learning (SDL), with the aim of identifying areas in which further exploration would be beneficial. Given that the broad topic of research interest intersects multiple research areas, a narrative, thematic approach was selected in order to cohesively collate and present diffuse contextual information. Narrative reviews are often utilised to pull together broad perspectives and are useful in describing the evolution of a particular topic over time (Green et al., 2006).

In order to delineate the scope of the current review and guide the selection of relevant literature, the following review question was articulated.

What is known about the use of technology to facilitate self-directed learning?

Literature search method. I conducted a search for relevant literature between February 2023 and September 2023 in which a variety of online databases were accessed through Google

Scholar, the University of East Anglia library catalogue, and 'snowballing' - reviewing the reference lists of relevant research papers to identify other relevant studies (Jalali & Wohlin, 2012). I also conducted a search within the journal *Educational Psychology In Practice*. Search terms included "self-directed learning," "self directed learning education," "self-directed learning technology," and "educational technology," among others.

It has been suggested that due to the rapidity of sociocultural and technological development, reviews of literature concerning technology and its application must apply recency criteria to ensure that the conclusions drawn are relevant, timely and useful moving forwards (Morris & Rohs, 2023). Certainly there are circumstances and research questions for which this would be the case. However, given the aims and research question of the current review, in this case no recency criterion was applied, in order to ensure that the historical context underpinning modern conclusions could be included and examined.

Further searches were undertaken during the writing process as new areas of relevant research became apparent, in order to strengthen the review and ensure sufficient comprehensiveness to adequately answer the research question (Denney & Tewksbury, 2013). These included "self directed learning children," "covid learning technology," and "implementation science educational psychology."

The lack of a clear, consistent and widely agreed upon definition of what constitutes self-directed learning required consideration when determining inclusion criteria. In line with the relativistic epistemological orientations of the researcher, studies utilising differing operational definitions of SDL were included in order to provide a more comprehensive overview of the existing literature and to ensure that important and relevant insights were not excluded.

Outline of the review. The review will first explore the broader areas of research which are pertinent to the review question: self directed learning, and the use of technology in education. Sections outlining key historical context for the development of each of these areas of interest will be used to set the scene for how the two can be combined. Then, a more focused review of literature specifically relating to the use of technology to enhance, facilitate or foster self-directed

learning will be presented. Finally, a collection of recommendations for future research directions will be synthesised and shared.

Self-Directed Learning

The concept of self-directed learning emerged from the field of adult education in the 1960s (Morris, 2019), and for a long time was largely only discussed in relation to andragogy (Roberson, 2005). Since then it has been researched and discussed extensively both within its original context and in other disciplines, including psychology, sociology and pedagogy (Knowles, 1978; Loeng, 2020). Traditionally, a dividing line is drawn between pedagogy and andragogy, though whether this division is between differing teaching methods or simply refers to learners of different ages is not always clear (Palaiologos, 2011). Malcolm Knowles, one of the thinkers widely credited with originating the idea, states that many of the component ideas and principles that make up 'self-directed learning' had been documented prior to 1940, but that bringing them together inspired a wave of new research and knowledge creation (Knowles, 1978). Many theoretical approaches to self-directed learning exist, and a literature review conducted in 2002 described diverse orientations to SDL that originate from humanistic, behaviourist, critical and constructivist perspectives (Owen, 2002), though others suggest that the idea of self-directed learning is inherently tied to and informed by a humanistic perspective (Loeng, 2020). Research in this area has sought to outline and explore the underpinning philosophy of the concept, conduct empirical studies, characterise the self-directed learner, and comment on the social and political implications of the idea (Owen, 2002).

Definitions of self-directed learning. Many differing definitions of the term 'self-directed learning' exist, and it has been suggested that the idea is impossible to capture usefully in a single definition (Kerka, 1994). In a recent review, Loeng proposed that the term refers to instances in which an individual is responsible for their own learning goals and takes initiative to carry out that learning, whether it occurs within or outside of a formal educational institution. While Loeng acknowledges that this is merely one understanding of many, they conclude from reviewing relevant literature that most definitions contain the idea of personal control over the planning and goal setting and/or the management and monitoring of the learning process (2020). Another

recent literature review by Morris and Rohs describes it as a process in which learners take primary responsibility for the planning, execution and evaluation of their own learning process (2023).

Some definitions emphasise self-directedness as a continuum, where learning experiences can fall anywhere between totally other-directed and totally self-directed (Kerka, 1994). In his paper outlining the Staged Self-Directed Learning Model, Gerald Grow used the term “self-directed learning” to refer to the degree to which learners were able to make choices within their educational environment (Grow, 1991), suggesting that the distinction between self- and other-directed is not clean-cut or binary.

There is notable overlap between the idea of self-directedness and other related concepts such as self-regulation, metacognition, autonomy and personal responsibility, and these terms are used in relation to different constructs across different academic disciplines (Zhoc et al., 2018; Brandt, 2020). Terms such as “self-regulated learning” and “self-paced learning” are sometimes used in an attempt to distinguish between the different aspects of the learning process in which learners could exercise autonomy and responsibility. In a report produced by the Education Endowment Foundation in 2018, the term “metacognitive skills” is used to describe one’s ability to monitor, direct and review one's own learning, and effective metacognitive strategies are characterised as involving explicit reflection on the learning process, learning to set goals, and evaluating one's own academic progress (Quigley et al., 2013). This might suggest that only students who had been taught the requisite metacognitive skills would be able to engage in successful SDL.

Conversely, some authors define self-directed learning as learning which the learner pursues with minimal direction (e.g. Ponton et al., 2009), or simply define SDL as resulting from the ability to choose what to learn about (Partridge et al., 2015). Other authors use the term to describe unschooling, or elective home education that is carried out in a child-centred way, without external direction (Fisher, 2023). In some studies of self-directed learning, the teacher acts solely as a resource provider and classroom manager, and otherwise leaves the children to move through learning materials in an unguided way (e.g. Yang & Li, 2013). Fischer & Sugimoto (2006) conceptualise self-directed learning as: unstructured; often collaborative; intrinsically motivated; enjoyable; self paced; and with the topic, time and place having been selected by the learner. The

authors differentiate true SDL from environments in which the learner is assigned a task or problem by an external instructor.

For other authors, the idea of other-directed learning goals and planning are not incompatible with the idea of self-directed learning. Some researchers report as evidence of SDL the performance of learning behaviours such as planning and persistence while the learner is completing a completely teacher-assigned task (Glaubman et al., 2012). Others conceptualise self-directed learning as an experience designed by teachers, with the intention of fostering a feeling of student autonomy without actually ceding much control over the learning process (Tan & Koh, 2014)

Several instruments have been created to measure self-directed learning, most notably the Self-Directed Learning Readiness Scale (SDLRS) created by Guglielmino (1977). However, the construct validity of this particular measure has been questioned, and it has been suggested that the scale was more accurately a measure of attitude to learning in general rather than specifically learning that is self-directed (Bonham, 1991).

Importance and value of self-directed learning. The ability to learn in a self-directed way is often described as increasingly important for success in our fast-paced, digital world (Brandt, 2020). Given rapid progress in technology and the ease with which learners are able to access educational content online, some scholars propose that the role of the educator is likely to diminish further over time, creating with it a greater need for self-regulated learning and learner autonomy in the general population (Conradie, 2014).

***Educational attainment*.** Research has shown associations between the core elements of SDL and improved student attainment (Brandt, 2020). In order to explore the mechanisms by which SDL produces improved learning, Gureckis and Markant (2012) synthesised findings from cognitive science and computing literature and hypothesised that the ability to focus effort on specific knowledge that has not yet been acquired, in which each learner is creating a closely tailored learning programme for themselves, makes self-directed learning much more efficient than passive consumption of generic educational materials. The ability to learn in a self-directed way is also a significant advantage in situations in which a young person requires more

opportunities to practice a skill than the school environment and/or their teacher is able to provide (Yang & Li, 2013).

Schweder & Raufelder (2019) constructed a self-directed learning study in which adolescents (mean age 13.56) were encouraged to set their own learning objectives, plan and execute a learning schedule, and then reflect on the process over the course of five days. Students were guided by their teachers in selecting a learning question related to their previous knowledge and/or interests, and teachers also provided support throughout the week in terms of monitoring progress against their goals and making adjustments to the schedule as necessary. The authors found that choosing their own learning goals meant that students were on more equitable footing in terms of their developmental stage and prerequisite knowledge than when all learning the same material in a teacher-directed setting. However, this approach presumes that students will necessarily adopt goals that are optimised for their ability and prior knowledge - this idea may benefit from further study to ascertain whether this is ubiquitously the case.

Meta-analysis of existing literature around the link between motivation and academic success suggests that only intrinsic motivation (when compared to identified, introjected or external regulation) was consistently positively correlated with attainment (Taylor et al., 2014). Given that many definitions of self-directed learning conceptualise the process as one that involves learning activities that the individual is intrinsically motivated to complete, a link can be drawn based on these results between increased self-directedness and improvements in attainment.

Research suggests that certain teaching methods which are effective for improving educational outcomes for students with higher levels of SDL readiness can actually be less effective than traditional teaching methods for students with low SDL (Sukardjo & Salam, 2020). Given the acknowledgement that high SDL is usually already associated with greater academic success (Brandt, 2020), this suggests that applying such teaching methods universally might serve to further widen an existing attainment gap. As it is likely that most people will encounter a situation that requires them to learn a new skill in a self-directed way at some point in their lives, this finding highlights the importance of explicitly teaching these skills to all students.

Future and vocational success. The pace of innovation and development in technology mean that learning one set of skills during formal education is now highly unlikely to serve people well throughout their lives and careers. Bidokht & Assare suggest that what is most important for lifelong success is now not what information is taught, but which self-directed learning and problem-solving behaviours are instilled (2011). The transition from industrial models of education to a creative, knowledge-based work environment is not easy for most young people, and researchers have argued that university graduates are not adequately prepared for the world of work by their traditional education (Fischer & Sugimoto, 2006).

Larson et al.'s exploration of the key features of a problem-based undergraduate engineering course in relation to SDL found that the unstructured learning ecology led to the students learning from diverse sources, including instructors, online resources, and each other (Larson et al., 2020). The authors also suggest that the fact that students completed the course in a familiar space and alongside familiar peers was a motivating factor, in that it nurtured self-efficacy. The course instructor reported that the projects produced during the course frequently exceeded the minimum requirements for successful completion, suggesting that the students were intrinsically motivated to produce high quality products.

Some authors also stress the importance of a population who are competent lifelong learners and problem-solvers as an important vehicle for creating positive social change (Bidokht & Assare, 2011).

Limitations of self-directed learning research. While studies have illustrated the potential for increased self-directed learning to lead to greater educational attainment and success, others suggest that there are circumstances in which a higher level of other-direction is a more appropriate approach. Grow (1991) proposed that it is the match between a teacher's level of directiveness and the learner's level of self-directedness that is most important for successful learning, and in her review paper *Self Directed Learning. Myths and Realities.*, Sandra Kerka lists examples of studies in which adult learners have requested greater directiveness from their educators (Kerka, 1994).

Research has shown that learners do not always select optimal strategies for self-directed learning (Gureckis and Markant, 2012). LaTour & Noel (2021) found that when online adult learners were given free rein to access course materials in a completely self-directed way, a majority of them 'binged' the content in short bursts, rather than engaging in spaced repetition, a method shown to support effective retention (Ebbinghaus, 1880, as cited in Murre & Dros, 2015). While this finding could be used to suggest the need for a knowledgeable instructor to appropriately pace learning, it could also illustrate the need for early educational experiences to prioritise psychoeducation around how to learn, as well as nurturing the development of learners' executive function so that students have the self-management abilities to put this knowledge into practice.

A persistent issue in the empirical study of self-directed learning is the availability of valid and reliable measures to assess learner attitudes and behaviour. The validity of self-report data for such purposes is widely challenged, for a wide range of reasons including the participant's social desirability, selective or poor recall, and imperfect self-awareness (Paunonen & O'Neill, 2010), though few reliable alternatives exist. For example, Wang et al., (2021) concluded from their research that SDL behaviours are linked to improved academic performance in an online learning environment; however, this conclusion was drawn from the qualitative portion of their mixed-methods study and was based in large part upon self-report data from a small number of participants. Zhoc et al. (2018) also drew conclusions about the links between emotional intelligence, self-directed learning and positive learning outcomes from entirely self-reported data.

Other studies present different methodological issues. In one study, preschool children (mean age 3y 11m) were tested on their recall of novel word-object pairings (Partridge et al., 2015). Half were assigned to an experimental condition in which they could choose which object was named by touching it, and half were given a central button which read the names in order. The children who selected the objects themselves showed stronger recall during the test phase, and the authors hypothesised that this was an indicator that the ability to self-direct (even in a fairly tokenistic way) increased engagement and performance on the task. However, given that one group of children touched the objects and half touched a central button that was spatially removed from the objects it is possible that this difference in the experimental design contributed to the findings. Further research exploring the same principle using different experimental mechanisms would strengthen the evidence that the ability to self-direct explains the observed increase in performance.

Self-directed learning in children. Drawing together literature relating to how SDL skills are taught in schools, Morris & Rohs (2023) note that there are a number of studies showing that many people do not acquire SDL skills during childhood. They describe this as disconcerting, considering that there is good evidence from the field of adult education for the importance of SDL for lifelong attainment and success.

To date, a high proportion of literature relating to self-directed learning remains focused on adults; there is a relative paucity of discussion around self-directed learning in children. For example, a literature review conducted by Morris & Rohs (2023) which searched for empirical research into facilitating SDL in children and adolescents found that only fourteen papers had been published between 2017 and mid-2019. The initial search found 691 articles within this time period relating to SDL, but a vanishingly small proportion related to fostering these skills before the onset of adulthood. Indeed, Malcolm Knowles wrote that the desire to be self-directed is a key dividing line between adults and children, and stated that it is only once we become adults that we develop a deep need to be treated as self-directing and with respect (Knowles, 1968). Throughout history, the philosophical distinction between children and adults has been delineated in a variety of ways (Sorin, 2005), and the above statement seems to be indicative of an assumption that children are beings who do not have any ability to be independent or agentic, rather than full people who would benefit from being afforded autonomy and respect. Many conceptualisations of children that are common in the field of education centre around the idea that children are incomplete and naturally inferior to adults (Wall, 2019), and some authors have argued that through these constructions children are marginalised, subjugated and silenced (Murris et al., 2020). It is a relatively new idea that children could be agentic beings, both capable and worthy of collaboration with adults to co-construct curricula and educational decisions (Sorin, 2005).

In contrast to the idea that SDL is an entirely adult phenomenon, Van Deur (2011) interviewed South Australian elementary school students (mean age 10.8) who had been identified as ‘gifted’ about their understanding of self-directed learning. They found that the young people were able to speak in detail about the nature of SDL, the potential future benefits of learning and practicing SDL skills, and the ability to improve these skills with practice. Most of the interviewees felt that they are more self-directed when they learn at home, rather than at school, and that their

opportunities to be truly self-directed at school are very limited. Most of the young people felt that SDL could be a social process, and could involve collaborating with friends or asking adults for help. The young people also emphasised intrinsic motivation as a key element of SDL.

Some authors have suggested that as long as the learner is cognitively and physiologically able to interact with and make sense of the environment, they are able to learn in an intentional, agentic way (Ponton et al., 2009). Ponton argues that while a child's SDL is likely to be limited by their lack of experience or personal resources, the theoretical construct of SDL should be thought of as independent of age.

Deci & Ryan (1981), the authors of self-determination theory, touch on the idea of self-directed learning in their work on intrinsic motivation. They write that when people first explore the world as small children, their high intrinsic motivation to learn about the things that they encounter can be clearly observed; however, as they grow older, they often come to see the learning process as something to be resisted, or only complied with following the application of demands, controls and rewards.

Acquisition and development of self-directed learning ability. Meta-analysis of research suggests that the constituent skills that enable successful self-directed learning can be acquired, practiced and improved (Brandt, 2020), and scholars have long theorised about the process by which this happens. The Staged Self-Directed Learning Model, developed by Gerald Grow in 1991, suggests that as they mature, learners move through the following stages: *Dependent*, *Interested*, *Involved* and finally *Self-Directed*. Grow suggested that teachers should both meet the learner where they are and also facilitate their progression to the subsequent stages, and suggested that the teachers themselves move through the following roles: *Authority/Expert*, *Salesperson/ Motivator*, *Facilitator* and finally *Delegator*. However, more contemporary reviews of the literature on self-directed learning suggest that there is not as yet any empirically validated trajectory of how SDL skills develop (Brandt, 2020), and that further research into this developmental process is required.

Ponton et al., (2009) state that in order to support children to become lifelong learners, adults must nurture their self-efficacy by supporting them in the belief that they are able to exert control

over their lives and their learning outcomes. They must also work to sever young people's dependence on adults and on educational institutions as the arbiters of their personal learning. Other authors in the field of adult education concur that self-directed learning experiences should contain as little external structure as possible; for example, Charokar & Dulloo propose a model of self-directed learning for adults whereby the facilitator bookends the learning period by presenting an initial introduction session and hosting a final student-led discussion session, with only minimal asynchronous monitoring and support offered in the intervening period (2022).

Evidence suggests that the ease with which learners acquire SDL skills may be related to their preexisting attitudes and beliefs. One study exploring correlations between learners' epistemological beliefs and their self-directed learning readiness (Boden, 2005) found that several of the measured beliefs were predictive of their scores on the SDLRS (Guglielmino, 1977). The study found that those who believed intelligence is static or that truth was absolute were less likely to engage in self-directed learning behaviours, a finding with significant implications for educators who wish to encourage SDL in their students.

Research has attempted to further understand how self-directed learning skills are acquired by itemising the specific abilities that enable the SDL process. A diagnostic tool developed at the Singapore University of Management to support adult learners to audit their own self-directed learning ability produced a list of ten study skills, including assignment management, seminar learning proficiency and comprehension competence (Khiat, 2015). Other authors conceive of the ability to learn in a self-directed way not only as a set of behavioural skills but also emotional ones. Zhoc et al. (2018) explored the link between emotional intelligence and SDL ability, conceiving of the suppression of distraction and generation of motivation that are essential to SDL as stemming directly from a student's level of emotional self-awareness and self-control.

Self-directed learning and traditional education. Traditional formal education often includes a very high level of teacher direction and learning processes grounded in behaviourism (Morris, 2019), with limited opportunities for students to learn in an autonomous way. Educators, authors and researchers have advocated for the importance of fostering self-directed learning for a variety of reasons (as summarised earlier in this review); however, despite this, most classrooms retain a heavy emphasis on teacher direction. Mishra et al. (2013) point out that the design of

learning experiences in schools is almost always restricted by national requirements, teacher accountability and high-stakes testing, and they argue that this limits the extent to which learners are able to pursue their authentic interests in a deep or exploratory way. They also argue that most institutions draw disconnecting boundaries between academic areas of study, constraining students' ability to form "personalised, creative connections" with their learning materials (Mishra et al., 2013, p. 11).

Grow (1991) stated an assumption that the goal of education is to produce lifelong learners, yet acknowledged that contemporary educational practices often created or encouraged dependency instead. The fact that modern research still finds this to overwhelmingly be the case (Morris, 2019) indicates a significant tension between an idealised desire to foster self-directed learning and the significant challenges associated with doing so in a traditional learning environment.

Research into the SDL readiness of students who have been educated in traditional classrooms often shows that young people are ill-prepared to spontaneously transition to self-directed learning (e.g. Asfar & Zainuddin, 2015), suggesting that formal education indeed provides little opportunity for young people to practice or acquire competence with SDL. Bolhuis (1996) noted that the artificiality of the learning that takes place in a directive educational environment creates issues with student motivation, and there is substantial evidence that the kinds of external reward often used to motivate learners in schools can have a deleterious effect on self-determination and intrinsic motivation to learn - and the more directive and controlling the reward system is, the greater the harmful effect (Deci et al., 2001). There may also be significant impacts of formal education on creativity and originality; Morris (2022) suggests that our current dominant model of formal schooling, whereby educators design and closely direct the learning process, has created circumstances in which the outcomes that are rewarded are those that most closely mirror the knowledge constructions of the educator, completely disincentivising the generation of original, creative ideas. Ponton et al. (2009) writes that compulsory education may foster dependence on others to facilitate learning, and the requirement to acquire a broad formal education will generally reduce a young person's opportunities to exercise their agency in relation to what and how they learn (Ponton et al., 2009).

Shifting away from traditional teaching methods and towards those that support active, self-directed learning would be a significant and complex process for teachers, schools and perhaps even society as a whole (Bolhuis, 1996). Researchers continue to address this difficulty, with Mishra et al. (2013) noting that a focus on promoting self-directed learning could prompt significant reflection and change regarding the role and desired skills of the teacher.

Fostering SDL in classroom settings. While creating a classroom environment that successfully enables young people to develop SDL skills might be challenging, evidence suggests it is not impossible; particularly if approached from the standpoint that self-directedness is a continuum (Kerka, 1994) and that therefore every effort towards enhancing learner autonomy is valuable even if a significant proportion of activities remain teacher-directed. Given the decades-old and widely accepted idea that people should, at one point or another, learn to learn in a self-directed way, many authors have stated that there is a clear and vital need for further study into the facilitation of self-directed learning skills in childhood education in particular (Morris & Rohs, 2023).

Definitions of self-directed learning that emphasise intrinsic motivation and joy have much in common with academic definitions of play. Sturgess (2003), an occupational therapist writing on the necessity of play for child development, characterised play as activities which are opportunistic, engaging, creative and intrinsically motivated. At present, play tends to be incorporated into the school environment during the early years, but not beyond; this has been criticised by authors who cite the evidence-based benefits of continued play for cognitive development, motivation, creativity and more (Gray & Crittenden, n.d.). Play-based learning often entails greater autonomy and self-directedness for learners. A 2020 study evaluating a foundation phase of education for children aged 3-7, focused on play-based learning and learner autonomy, found that for tasks that children felt they had chosen to participate in, engagement and involvement with the learning was significantly greater (Wainwright et al., 2020). However, there are some concerns that play-based learning is becoming increasingly sidelined in favour of time spent on direct academic instruction (Bubikova-Moan et al., 2019), and one survey of Latvian preschool teachers suggests that despite an emphasis on play, early years educators may not necessarily prioritise the involvement of children in setting their own learning goals (Grava & Pole, 2021).

Some authors have highlighted the importance of a shift in the role of the teacher. Grow hypothesised that the impact of a teacher could play a mediating role in the self-directed learning process, either facilitating or hindering the development of SDL behaviours through their interactions with the student (Grow, 1991), and Deci and Ryan (1981) posit that teacher orientation towards student autonomy rather than control is vital for encouraging intrinsic motivation to learn and subsequent engagement in SDL.

Other research has foregrounded the process of actively teaching and modelling SDL skills. One study looked specifically at the effectiveness of SDL intervention for students aged eight and nine who were struggling academically (Sellars, 2006). The intervention involved holding discussions in which students were able to make choices around aspects of their learning environment, and the subsequent completion of reflective journals in order to evidence any changes in their thinking. Most of the students initially found the process difficult, and were not able to set their own learning goals without support. However, within six weeks teacher report data suggested marked improvements in the students' learning behaviours and work skills, and the students were more able to reflect upon and evaluate the strategies that worked best for them.

Research investigating the effectiveness of teaching metacognitive strategies to American high school students found that students with different learning preferences benefited from different strategies. For example, students who prefer to learn interactively found critiquing and revising their work most valuable, whereas for students who enjoy hands-on learning, the ability to select how they presented their work was rated most important (Shannon, 2008). This highlights the importance of teaching a variety of skills and strategies to enable students with varied preferences to acquire the metacognitive and self-direction skills needed to tailor their own learning in an informed and optimal way. The study also found that while the students were acquiring metacognitive skills, they became much more reflective and evaluative of their own learning process, checking in regularly with themselves to ensure that effective learning was taking place.

Similarly, in the UK, research by the Education Endowment Foundation found that the explicit teaching of metacognitive skills is among the most impactful and cost-effective teaching strategies recommended in their teaching toolkit (Quigley et al., 2018). A systematic literature review

published in 2019 stated that while the concept of metacognition was first studied in the 1980s and 90s, and there has been a steadily growing evidence base demonstrating the positive impact of teaching metacognition on academic performance, the authors feel there is still not enough emphasis on it in UK schools (Lundie & Golder, 2019). While some governments over the last 40 years have incorporated ideas relating to thinking skills and metacognition into their education strategies, others have sidelined it, and Lundie & Golder argue that it is suprising that there has never been a National Curriculum-level mandate to make use of metacognition given the strength of the evidence base (Lundie & Golder, 2019).

Van Deur & Murray-Harvey (2005) conducted a study in which Year 5 classes in six schools were taught about self-directed learning strategies. The schools were categorised by the extent to which they promoted the use of inquiry as a learning process. In all schools, regardless of inquiry promotion, teaching the strategies improved knowledge around the process of SDL for the young people. The researchers also collected data relating to the students' motivation for engaging in SDL, and found that while the intervention improved motivation in high inquiry schools, it seemed to decrease motivation in low inquiry schools. This suggests that schools wishing to foster SDL in their students should consider the broader context of their learning environment and ethos, as well as implementing interventions focused specifically on SDL.

Similarly, some authors suggest that any educator seeking to facilitate SDL should also consider a reevaluation of school structure including lesson length and staff team structure, as well as making different learning structures available to students including greater flexibility, increased independence, inclusion of problem-based learning and access to online learning (Mishra et al., 2013).

One such novel learning structure is the 'flipped classroom' model, a teaching method in which young people are provided with the materials to acquire theoretical information independently at home, and then apply what they have learned in a collaborative, guided and problem-based educational environment at school (Ceylaner & Karakuş, 2018). A study of 46 Turkish high school students found that an eight week flipped classroom English language programme was followed by improvements in the students' SDL readiness and attitudes towards the course overall (Ceylaner & Karakuş, 2018). Students reported finding the flipped classroom method fun, and found that it

increased their motivation to learn. For the control group, taught using traditional teacher-directed methods, the researchers measured a decrease in SDLR over the course of the eight weeks. The authors suggested that further research is needed to determine the effectiveness of the approach over longer periods of time.

These changes are radical and would require a great deal of work to implement on a large scale in a formal education system whose traditions are well established. It is very possible that an increase in learner autonomy would be uncomfortable for teachers who are used to a traditional learner-educator heirarchy (Morsink et al., 2011), and on a global level, cultural factors may affect the ease with which discussion, debate and role swapping can take place between teachers and learners (Fischer & Sugimoto, 2006).

Unschooling. Given the challenges implicit in creating a suitable environment for self-directed learning within a traditional school environment, some parents opt for an alternative. Elective home education, or homeschooling, is undertaken for a wide variety of reasons and using a wide variety of methods, and therefore homeschooling that has a particular focus on the absence of teacher-student hierarchy and on student freedom and autonomy has given itself a more descriptive name - unschooling (Petrovic & Rolstad, 2017). Naomi Fisher, a clinical psychologist who advocates strongly for child-led education, describes self-directed learning as presenting an alternative to the expectations around conformity and standardisation that are common in the formal school environment, and stresses the additional value of self-direction and unschooling environments for young people with traits that are typically conceptualised as neurodivergent (2023).

While unschooling is often conceptualised as home education without any structure, some advocates of self-directed learning argue that even without structure that is teacher-directed or externally imposed, young people will make use of the structures that are naturally present in their environment to enhance their learning. For example, Brennan (2021) suggests that comprehensive understanding of SDL requires examination of both the learners' actions and the internal and external structures that inform them, and suggests that even in contexts that appear unstructured, young people are likely to make use of contextual or environmental supports in order to achieve their goals.

Academic Noah Romero has written extensively around pedagogical approaches that are rooted in human rights education and social justice, and in his 2018 chapter *Towards A Critical Unschooling Pedagogy* he outlines a theoretical framework for critical unschooling. He highlights autonomy, the centrality of the learner, and the opportunity to learn in a way that is removed from underlying hegemonies and power structures. He presents several critiques of formal education, outlining the inherent oppressiveness of the teacher-student hierarchy that is ubiquitous in traditional education settings, and suggesting that one of its key purposes is to normalise a capitalist, colonialist status quo. Romero differentiates critical unschooling from its more generic namesake; while the term 'unschooling' used alone usually refers to a child-led form of home education, critical unschooling is about providing a decolonising, feminist and antioppressive environment in which self-directed learning can occur, whether that is in the home or in a classroom (Romero, 2018). He writes that central to critical unschooling is the belief that "human beings, even children, can and must be trusted to develop into the best possible versions of themselves," (Romero, 2018, p. 67).

Summary. Self-directed learning has been explored within the fields of adult education and, more recently, within pedagogy, as a learning experience that has the potential to stand learners in good stead for lifelong personal and professional development and academic and career success. It has been suggested that the ability to direct one's own learning is becoming ever more important as the pace of development of technology means that it is likely today's young people will need to acquire new skills throughout their careers as the digital environment around them shifts and evolves. The vast majority of studies pertaining to SDL are conducted with adult participants and there is a relatively small amount of research relating to SDL in children. At present, research suggests that most young people in formal education settings do not receive teaching that enables them to acquire these skills before they leave school, instead being required to shift from a highly directive school environment to higher education or work environments that require a level of self-directedness they have never needed before. It has been suggested that further research and development around how SDL can be facilitated in schools could be highly beneficial for young people and set them up for future success.

Technology and Education

Technology is contributing to rapid changes in educational environments, learner characteristics, and the vocational environments that learners are preparing to enter (Tan & Koh, 2014; Conradie, 2014; Brandt, 2020). Many new opportunities afforded by technology have radically transformed the way in which teaching and learning occurs. Karakas & Manisaligil (2012) highlight what they believe to be five particularly significant contributions of technology to the field of education, including: virtual collaboration; technological convergence; global connectivity; online communities; and digital creativity. The authors suggest that a key role for educators within this new landscape is to teach others *how to learn* to use new technologies, rather than spending time training learners in the use of specific tools only for them to be replaced by new and better alternatives.

Fischer & Sugimoto's 2006 paper outlining challenges and their potential solutions in relation to the future application of technology to support lifelong learning draws together some prescriptive goals for the purpose of such learning, including: situating learning in the context of authentic problems (Bruner, 1996, as cited in Fischer & Sugimoto, 2006); and preparing students to learn and relearn on demand, given that complete coverage is impossible and obsolescence is inevitable (Fischer, 1991, as cited in Fischer & Sugimoto, 2006).

Another study exploring teachers' use of digital technology found that across its three participants, seven potential uses of technology were identified (support and improvement; connectedness; experimentation; sharing; collective intelligence; empowerment; and multimodality) (Tour, 2015). However, the author observed that not all of the participants identified each of these, and that they conceptualised them in different ways.

Developments in technology have the potential to have mixed results in terms of student attainment. Rashid & Asghar (2016) found a positive relationship between undergraduates' total use of technology (including both use for work/study and for leisure purposes) and their engagement with course materials and their self-directed learning; however, they did not observe any correlation between overall use of technology and academic performance. The authors hypothesise that this may be because the positive effects of technology-enabled research and

communication were in this case masked by the effects of spending more time engaged in technology-based leisure activities such as smartphone use and watching television. Though conflating work activities and recreational activities in this way has produced some unclear results, the author's insights are useful in highlighting the idea that increased access to technology also provides access to activities that may distract from learning in some circumstances.

Since 2017, there has been a growing body of research exploring the use of artificial intelligence in education (AIED). A systematic literature review conducted in 2024 found that AIED research tends to cluster into four main areas: adaptive learning and personalised tutoring; intelligent assessment and management; profiling and prediction; and research into new and emerging products (Wang et al., 2014). Given the groundbreaking nature of AI technology, its implementation into education settings must be considered carefully. A Delphi study surveying the views of 33 international AIED researchers found that the three topics rated to be the most important and impactful areas of AIED were also found to be the most significant challenges, namely: privacy and ethical use of AI; the importance of trustworthy algorithms; and equity and fairness (Ifenthaler et al., 2024).

There are many inherent challenges created by the increased presence of technology in educational environments. The need to purchase new hardware and software in order to take advantage of technological developments creates tension between increasing the quality of educational experiences and effectively managing costs (Fischer & Sugimoto, 2006). Student competence with and attitudes towards the hardware and software used at school is also a factor; for example, educational experiences based around video game principles are likely to be differentially effective based on the students' prior experiences with and attitudes towards gaming. Outcomes will likely also be affected by the quality of the software, the time available to facilitate the process, and teacher experience with and attitude towards gaming (Jong et al., 2010). Research also suggests that teachers may develop their understanding of educational technology and their ability to apply it in the classroom at different rates and along diverse trajectories (Morsink et al., 2011).

In addition, some authors present concerns around digital safety, privacy and security, and stress the importance of student competence in these areas as well as with the information and communication technology they are using (Tlili et al., 2022). One example that particularly

illustrates this need was Edmodo, a social network designed to be accessible only to students and parents, which was lauded for its contributions to collaborative learning, student-teacher communication, user-friendliness and encouragement of self-directed learning behaviours (Khodary, 2017). Research suggested that overall students benefited from using the platform, citing that it indeed improved communication and saved time; however, when asked about barriers they felt that the mobile version of the platform placed significant demand on phone battery and phone storage space (Al-Said, 2015). At its height, the platform claimed to have 90 million users; however, in May 2017 Edmodo was hacked, resulting in a breach of tens of millions of user email addresses (Zaghoul et al., 2022). One study conducted in 2022 comparing the privacy policies of three technology companies suggested that in general these companies should aim to minimise the amount of data they collect that has been generated by minors (West, 2022). The author also suggests that adults supporting the learning of young people should consider data privacy when selecting educational technology approaches, not just effectiveness and cost.

Technology and education of school-age children. It has been suggested that today's young people, as a result of early and ubiquitous exposure to digital technology, are in some way fundamentally different from members of earlier generations; in 2001, Marc Prensky dubbed them *"digital natives."* Now a commonly used term, though not an uncontested one (e.g. Kirschner & De Bruyckere, 2017), the idea that younger people tend to be more proficient with technology than older people is widely accepted. Despite this, research suggests that teacher and parent supervision is a key element of successful engagement with educational technology (Tlili et al, 2022).

As well as more ubiquitous technology such as laptop, desktop and tablet computers, many schools are now incorporating more advanced forms of technology, including virtual reality headsets (Çankaya, 2019) and telepresence robots. While the use of remote telepresence in education is not new (Fletcher et al., 2023), devices such as the AV1 telepresence robot offer a novel approach to inclusion for students who are not able to physically attend school. The AV1 was incorporated into the DfE's 2021 alternative provision project, and can be used to provide an absent student with a livestream of their classroom and a variety of ways to interact and communicate with their teacher and classmates via remote operation of the robot (Fletcher et al., 2023).

A guidance report produced by the Education Endowment Foundation in 2019 (Stringer et al.) to support the use of technology in schools centred around four main recommendations. First, the authors highlight the need for new approaches to be implemented in response to a genuine need, with a clear plan for implementation and intentionality around the desired pedagogical benefits, rather than simply because they are new. Secondly, the guidance stated that technology may be used effectively to improve the ways in which teachers model and explain new ideas, however, the authors caveat this with the suggestion that technology should supplement, rather than replace, traditional forms of modelling. The guidance goes on to outline some ways in which pupil experience can be moderated using technology, including for improved differentiation, enhanced engagement and motivation, and the potential for "self-quizzing" to support information retrieval. However, this section also cautions that inadequate exploration of whether students have the skill to use technology effectively could inadvertently widen the attainment gap between "successful learners" and their classmates. Finally, the report discusses ways in which technology can be used to enhance the accuracy and rapidity of assessment processes, reducing teacher workload; again, this is caveated with the suggestion that technological approaches not replace existing procedures, and technologically-assisted feedback be monitored closely and/or given alongside that which is generated by the teacher. The guidance is based on rigorous meta-analysis, and overall its advice is well-founded and practical.

A literature review conducted of studies published between 2010 and 2021 found thirty five discrete instruments which had been used to measure the technological integration of educational settings, of which only two had been used more than once (Consoli et al., 2023). Additionally, the authors found that both these more commonly used scales were more appropriate for teachers who were adopting technology later in their careers, which, as technology becomes more ubiquitous in schools and teacher training from the offset, will render them less and less useful over time. The authors also found that across the variety of instruments they examined, there was little consensus around whether technology integration was a process, or a state of being, and advocated for greater precision when using this term in future research.

Some researchers highlight the importance of creating interesting and appealing online materials, in order to encourage student engagement (Zainuddin et al., 2019). However, researchers have

long cautioned against the use of “motivational embellishments” within digital instruction tools (Lieberman & Linn, 1991), citing that the use of external rewards has been associated with a loss of intrinsic interest in the learning material itself (Deci & Ryan, 1981). Other researchers differentiate between using the inherently engaging features of some technology-based approaches as ways of “sugaring the pill” - enticing learners to participate in lessons they might otherwise find boring - as compared with finding ways to harness students’ engagement with interactive technology in a way that genuinely and inherently creates an improved learning experience (Jong et al., 2010).

Previous evaluative research of new educational technology has gained much from employing the use of qualitative interviews with the school staff facilitating the intervention. For example, Jong et al.’s evaluation of their online game-based learning platform (2010) included teacher interviews, in which school staff highlighted several important considerations related to potential impediments or limitations they had noticed in the programme. The teachers highlighted the need for flexibility and innovation in developing the teaching approach that would sit alongside the new teaching method, and proposed their own solutions. For example, they suggested that the teacher role should include providing encouragement, facilitating off-game collaboration between students, and relating students’ online achievements to their offline learning attainment, in order to counteract concerns that learning may not otherwise be generalised outside of the virtual learning environment. These insights suggest that by gathering the views of school staff around how interventions are implemented, important additional data can be gathered about how to ensure effectiveness and efficiency.

A literature review conducted in order to collate and summarise information about primary teachers’ use of technology suggests that the main four factors affecting successful implementation of the technology are school culture, teacher attitudes, teacher skills, and teacher knowledge (Spiteri et al., 2020). The review suggests that schools should invest time and resources into a culture of support, feedback and training to enable teachers to make the best use of technology in their practice. In addition, previous research exploring teacher adoption of classroom technology suggests that some teachers feel that knowing less than their students about some forms of technology would make them hesitant to incorporate those resources into their lessons (Morsink et al., 2011).

Similarly, a survey that captured the views of 1234 early childhood educators around the use of educational technology found that teachers who were more confident in using technology also had higher opinions of its usefulness (Blackwell et al., 2014). The study also found that settings with a clear technology policy tended to have teachers who were more confident with technology and felt more positive about its use. Respondents with more teaching experience tended to report less favourable attitudes towards the use of technology to support learning. Teachers tended to feel more positive about the use of technology to support students from households with low socioeconomic status (SES), and the authors hypothesised that this might be because teachers feel they are providing learning opportunities that may not be available to these students at home.

Technology, education and COVID-19. In the UK, as in many other countries, the COVID-19 pandemic caused a seismic shift in the availability and necessity of digitally-enabled learning (Lucas et al., 2020); in March 2020, the majority of UK school aged children transitioned to learning remotely from home. A survey of more than 3000 school staff conducted by the National Foundation for Educational Research (Lucas et al., 2020) found that during the pandemic, teachers reported being in regular contact with only 60% of their pupils, and that only 55% of parents were engaged in supporting their children to learn from home. The survey also highlighted that not all students had access to the necessary technological hardware to access remote learning, and that teachers were particularly concerned regarding the engagement of disadvantaged pupils. The authors used statistical modelling to explore factors connected with reported student engagement, and found that regional differences, phase and school type, socioeconomic deprivation and the precise nature of the learning environment were all significant.

The COVID-19 pandemic prompted the creation by the Education Endowment Foundation of a guide for schools around implementing remote learning (Ellis-Thompson et al., 2020), produced by synthesising 60 existing reviews and meta-analyses. The guide emphasised the importance of ensuring access to technology for all pupils, the benefits of utilising peer interaction as a motivational element, and the importance of high quality teaching over and above the logistics of how the educational material is delivered. The guide also encouraged teachers to provide explicit instruction around metacognition and self-regulation, particularly for disadvantaged students, in response to the significantly increased demand on young people to carry out their learning independently.

In a qualitative survey conducted by Meisner & McKenzie (2023), teachers remarked on the usefulness of technology for differentiation, remediation, and extending the classroom, and highlighted the ongoing usefulness of the distance learning methods developed during the COVID-19 lockdowns to support students who are not able to be at school for medical or other reasons, enabling them to stay connected to their teachers, the curriculum and the school community.

Research conducted after the shift to online learning caused by the COVID-19 lockdowns suggests that the rapid development of remote learning capability that institutions necessarily underwent will have lasting effects and implications for the educational environments they provide moving forwards (e.g. Maphalala et al., 2021). This dramatic increase in technology use following the pandemic, and the sustained use of approaches developed during that time, has prompted calls for changes to initial teacher training or educator preparation programs, and some researchers have begun to gather the views of teachers in order to inform this (Meisner & McKenzie, 2023).

Researchers have before proposed that digital technology might be an avenue through which young people living in crisis might be able to access education, at times when the provision of typical schooling is not possible (Almasri et al., 2019). While in some cases technology is used to supplement and add to the learning environment, in others the entire learning experience takes place online, and this approach enables the provision of education to students who are geographically remote. It was also used to preserve the physical safety of students and educators during the COVID-19 pandemic. While synchronous and asynchronous contact with instructors and fellow learners usually forms a key part of online learning, it could be argued that there is inherently an increased demand for self-directedness for students enrolled in these programs.

Summary. This section has aimed to produce an overview of relevant research surrounding the use of technology in education, to provide context for the following section concerning how technology is used specifically to facilitate self-directed learning. Studies have suggested many benefits to the adoption of educational technology, as well as some key drawbacks including student distraction, safety concerns and cost. Current research around the use of technology in school classrooms suggests that there is strong potential for it to enhance both the experiences of

learners and the work-related wellbeing of teachers. In addition, the current context around teaching and learning post-Covid lockdowns was discussed in terms of its impact on education settings and their digital capabilities.

Using Technology to Facilitate Self-Directed Learning

The potential for technology to enhance learner motivation and self-directedness has been studied and explored for decades. For example, in 1991, authors Lieberman & Linn produced a review suggesting that computer-based educational tools may be uniquely placed to scaffold and motivate self-directed learning. They made several recommendations for how technology should be used in education, including to enhance cooperation, enable self-monitoring, provide scaffolding, and facilitate experiential or discovery-based learning experiences. They also suggested that technology provides a more varied and flexible instructional experience, with access to richer information, interactivity, adaptability and multiple sensory modalities. Another important use of technology is to reduce time spent on repetitive tasks, such as those related to information storage, management and retrieval (Lieberman & Linn, 1991).

Studies aiming to demonstrate a link between the use of technology-based approaches and the development of self-directed learning use a variety of experimental designs. Though studies can be designed that use pre- and post-intervention measures to determine change in SDL behaviours over time, as SDL readiness has historically been thought to be an ability linked to maturity that naturally improves over time (Grow, 1991), in studies without control conditions the extent to which the results are due to the intervention cannot be reliably determined. Similarly, studies in which the technology-based approach is hypothesised to facilitate SDL and the control group do not receive any specific input around SDL at all, it is less clear-cut to conclude that the technology played a significant part in the result. Yang & Li (2013) conducted a study that aimed to specifically examine the contribution of using technology in facilitating SDL by comparing a computerised SDL learning program with a paper version, and found that the computerised intervention had a significantly greater positive effect on learning outcomes than the same content delivered on paper.

While some technology-based educational approaches are focused on developing particular skills, other researchers argue that in order to engender the creativity and discipline that 21st century learning requires, educators should instead focus on the holistic architecture of the learning environment and ensure there is plenty of openness and opportunity for original ideas (Mishra et al., 2013). However, it could also be argued that totally open-ended learning environments, in which students can learn from success or failure, can be challenging, chaotic and lacking in guidance from the learner's perspective (Mishra et al., 2013).

While most of the research around technology-based interventions to support SDL focuses on changes that can be made to learning environments in particular, it has also been suggested that providing good quality, publicly accessible internet connectivity in communal hotspots and spaces such as libraries would be a powerful way to support self-directed learning in the population as a whole (Maphalala et al., 2021).

Adult learners. There have been many studies in which the potential for technology to support self-directed learning in adults has been explored. An Interpretative Phenomenological Analysis study exploring the views of student teachers around the use of an electronic portfolio assessment model found that in general, students enjoyed having the autonomy to self-direct the content of their e-portfolios, and found it to be a positive learning experience (van Wyck, 2017). However, as the data around the self-management skills that were developed during the process was primarily taken from documents which themselves formed part of the portfolio to be assessed, the students were strongly incentivised to report diligent learning behaviours and positive outcomes. It is possible that a research design that involved collecting student views independently of the assessment process might have produced more reliable results.

In another study, Alotaibi (2016) collected self-report data around academic achievement and SDL, the latter measured using the Self-Directed Learning Readiness for Nursing Education (SDLRNE) Scale (Fisher et al, 2001). Statistical analysis suggested a link between higher SDL readiness and positive academic outcomes. In addition, a survey of students enrolled in massive open online learning courses (MOOCs) conducted by Zhu et al. (2020) suggested that in the MOOC environment, there was a positive association between high learner motivation and improved self-management and self-monitoring. The authors speculated that more motivated learners might

draw upon more optimal cognitive, metacognitive and behavioural strategies when engaging in learning. They suggest that due to the high learner autonomy inherent to the MOOC environment, course designers may wish to focus on enhancing motivation as a method of indirectly improving students' self-monitoring and self-management skills.

Similar studies have also taken place which involve theoretical exploration of the kinds of self-directed learning that take place in technologically supported learning environments. For example, one study in which MOOC instructors were interviewed found that the majority of the instructors felt self-monitoring to be a crucial element of SDL (Zhu & Bonk, 2019). In this particular MOOC, the students' ability to self-monitor was facilitated using online quizzes, tutorials, learning aids, reflection questions and progress bars, and the authors concluded that these technology-enabled progress measures aided students in independently reviewing and planning their own learning. They conclude that those creating technology-based learning environments who wish to encourage SDL should ensure that the system contains methods by which students can easily monitor and continually evaluate their progress through the course material. Zhu and Bonk also suggest that further research should explore whether the SDL behaviours encouraged by well-designed MOOCs are typically generalised into other learning contexts.

University students learning English using the flipped classroom model reported in interviews that the implementation of an online learning management system (LMS) had a positive effect on their learning (Zainuddin et al., 2019). Students reported that the LMS facilitated the distribution of information (providing instant sharing between instructors and learners, and circumventing time and costs associated with printing resources), and supported the students to monitor their learning activities independently, prompting them to check for new material rather than passively receiving it. Providing teaching materials for independent study supported comprehensive understanding of the content by allowing students to spend as much time on the material as they needed, and the students felt that this subsequent deeper understanding engendered greater critical engagement. The students also felt that the online system prompted more frequent and higher quality collaborative interactions with peers, as well as benefiting from self- and peer-evaluation of their work. When learning using the flipped classroom model, students felt that they were better prepared to participate in more interactive learning activities in class, and therefore more engaged in doing so. Students also appreciated being able to pause and rewind lecture

content as needed. However, students who volunteered to be interviewed may have different learning preferences from those who do not volunteer to be interviewed, so it may be that other students have very different experiences of the LMS in question.

Technology and self-directed learning in children. Some researchers have suggested that by increasing student access to technology and supporting them to develop the necessary skills to use it effectively, schools could better prepare young people to become self-directed lifelong learners (Asfar & Zainuddin, 2015). In 2010, a scaling instrument was created in order to measure the SDL readiness of young people aged 10-12 in relation to technology (Teo et al., 2010). The Self-Directed Learning with Technology Scale (SDLTS) has seven items, four of which reference the use of computers. However, the scale was created at around the same time as the advent of mass market tablet computers, and at a time when smartphones were far less ubiquitous; it may be that young people aged 10-12 now would not use the word “computer” to refer to their digital technology of choice. The speed with which these changes to the landscape occur mean that the applicability of such measurement tools may decline rapidly with time, emphasising the need for regular evaluation, updating and reconceptualising in order to ensure that such instruments continue to measure the desired underlying constructs rather than becoming inaccurate due to outdated terminology.

Problem-based learning (PBL) is often used in order to encourage learners to become more self-directed, and the research suggests that this teaching method is an evidence-based way to do so (Loyens et al., 2008). Technology presents significant opportunity for the facilitation and enhancement of more complex, detailed and lifelike problem-based learning, for example by incorporating virtual reality (VR). Abdullah et al. (2019) measured self-regulated learning skills in twelve year old students, before and after they accessed a four week intervention involving a virtual environment specifically designed to support engagement in a programme of PBL. The students were presented with a problem related to environmental science and biodiversity, and then spent time exploring a virtual environment in which various aspects of the natural world could be observed and interacted with. Time spent exploring in VR was bookended with whole-class discussion and group tasks to consolidate understanding of the presented stimuli. The study found that self-regulated learning skills and group work skills were both enhanced by the intervention, and that these increases were still observable a month after the intervention had

ended, suggesting that the acquisition of these skills was both lasting and generalisable. However, without comparison to a similar intervention in which the learning content was presented using traditional teaching methods, it is difficult to identify to what extent the use of VR was instrumental in producing these differences.

Research focused on gathering the views of young people around how they employ technology to facilitate their self-directed learning has provided useful insights into their perspective. Asfar & Zainuddin (2015) surveyed secondary school students regarding their use of technology for SDL and found that the students reported that technology made it easier to communicate and collaborate with others, explore and research new topics, and problem-solve roadblocks in their learning. The authors concluded that access to technology stimulates young people to become more self-directed in their learning, and enables them to learn in more adaptable and flexible ways. In another study, the researcher interviewed young people aged 8-17 about their engagement with the online coding tool Scratch (Brennan, 2021) in order to learn more about how young people manage self-directed projects. While all the interviewees expressed enthusiasm and enjoyment, they also spoke about moments where they had found it challenging to achieve their goals, and the interviewer found that this frustration had encouraged the development of problem-solving strategies that facilitated their self-directed learning, including experimenting, persevering, asking for help, compromising, adapting and creating with others. Brennan concluded that young people may have greater capacity for self-direction than they are typically credited with.

Choy and Cheung (2022) conducted a study in which two groups of primary school students in Singapore took part in a writing intervention. The experimental group's intervention was facilitated by technology, and the control group's was not. Following the intervention, the students were asked to complete the Motivated Self-Directed Learning and Collaborative Learning (MSDLCL) questionnaire, (Choy et al., 2016) in order to measure their attitudes towards SDL and collaborative learning both with and without technology. Their results suggested that students who had taken part in the technology-based intervention subsequently felt more positive regarding their ability to learn in a self-directed way aided by technology. A close reading of the stages of the intervention revealed that the students were able to select the topic of their writing and determine whether they accepted or rejected suggested revisions offered either by computer

software or by their teacher; however, the overall task, the steps, the order of the steps, and the pace of the learning were all dictated by the researchers.

A recent scoping review conducted by Morris & Rohs (2023) analysed fourteen articles describing empirical research into how self-directed learning is facilitated in children and young people. A notable feature of the resulting synthesis was that in most of the studies, digital technology was highlighted as a key method for achieving this. They found that while the studies described a diverse range of self-directed-learning-related practices, they shared a constructivist perspective and a commitment to ensuring that learning was meaningful for the young people. This was achieved by: incorporating situated, problem-based and real-world learning; ensuring that the learners took responsibility for their own learning process; and collaboration, both between the young people and between teachers and learners.

The review also collated some data around challenges associated with the use of technology to support young people to acquire self-directed learning skills. Among these were: the time consuming nature of providing support to students who are navigating both a novel level of self-directedness and a novel piece of technology; the need for clear educational policy to counter the risk of educational technology being used as a distraction rather than to enhance learning; technological issues including device battery life; issues with student competence in using technology; and a need for increased teacher training around the use of technology (Morris & Rohs, 2023).

Remote self-directed learning and COVID-19. The COVID-19 lockdowns required many students and teachers all over the world to switch from classroom instruction to remote learning almost overnight. Some researchers posited that because the switch to remote learning was so rapid, a substantial proportion of learners may not have been equipped with the necessary skills to become self-directed learners at short notice (Tlili et al., 2022).

Interviews conducted with teachers and parents to collect information about the strategies, tools and software that were used to enable remote learning in China during the pandemic suggested that in order to support effective self-directed learning, provision should be individualised, supported by parents at home, collaborative and encouraging (Tlili et al., 2022). Parent

interviewees also raised that they thought that remote learning provided important opportunities for their children to take initiative and develop an attitude of responsibility for their own learning. Another study found that during the pandemic, teachers reported that the use of specially created virtual learning environments (as opposed to delivering information solely via the school website or email) led to increased student engagement in independently accessing remote learning (Lucas et al., 2020).

A number of studies were conducted to explore the ways in which remote learning increased the demands for self-directedness in undergraduate learners. Many found that the abruptness of the shift and the lack of preparation meant that most students were poorly equipped to manage their own learning independently (Maphalala et al., 2021). The students felt that the teaching methods that had previously been used in their university were highly lecturer-directed, and required minimal SDL skills in order to succeed. Some students felt that the need to take responsibility for one's own learning was empowering and had pushed them to develop as learners, but others felt that lecturers were not available enough and were not providing sufficient guidance to enable their students to succeed. Students largely felt that an associated increase in self-assessment and peer assessment was a positive thing, and some sought out informal peer evaluation of their work as a tool to facilitate reflection and improvement. The authors felt that their findings highlighted the need for students to be well prepared to engage in SDL before they are expected to carry out significant amounts of work independently. However, other researchers suggested that the rapid development of self-directed learning skills made necessary by the abrupt transition to independent, remote learning during the pandemic could be generalised in a valuable way into other educational and vocational contexts for these young people (Tlili et al., 2022).

Similarly, Misra & Mazelfi (2021) surveyed university students to gather information about their communication with teaching staff, engagement in group work, ability to learn independently, and confidence in meeting desired learning outcomes while learning online during the pandemic. They found that the amount of lecturer communication and level of independent learning proficiency both had significant effects on student self-confidence, highlighting that these students felt both were important in order to achieve their educational goals. However, it must be taken into account that the COVID-19 lockdowns were a stressful and anxiety-provoking time for many people. Some researchers have highlighted the impact of this on studies conducted during this time, and

suggested that the emotional effects of the pandemic must be taken into account when evaluating data concerning any element of psychology that can be impacted by heightened anxiety or stress - including levels of self-confidence (Meisner & McKenzie, 2023).

Summary. This section has provided an overview of existing research around how technology can be used to foster and hone the skills required to learn in a self-directed way. There exists evidence that the use of technology to support adult learners can support the development of effective SDL practices, and while there are far fewer studies relating to children and young people there are some promising initial findings suggesting that extending this practice into classrooms may be a fruitful approach. Additionally, the potential for the developments in school technology use prompted by the COVID lockdowns has been explored specifically in relation to the insights generated around technologically enhanced self-directed learning.

Conclusions and Implications for Future Research

Self-directed learning and the use of technology to support educational goals are both research areas with rich histories and developing trajectories. In this review, I have attempted to synthesise the key points from each in a way that provides the background for a review of how educational technology can be harnessed in order to support the acquisition and practice of self-directed learning skills. Given that most educational technology is fairly new, this is a relatively young research area with much remaining to be explored and discovered.

In Morris & Rohs' 2023 scoping review into how self-directed learning is fostered in the digital age, they outline several important directions for future research. As there are very few studies focused specifically on fostering SDL in children and young people, it is likely that our understanding of the possible learning activities that might support this process is still very much incomplete. Further research that determines what sorts of teaching approaches are presently being used for this purpose, and also develops and evaluates new ones, will be important to remedy this. Secondly, many existing empirical trials of SDL-promoting teaching approaches are short term, and report that students find adjusting to self-directedness difficult; further research into the effects of long-term, embedded self-directedness are sorely needed to identify whether these adjustment difficulties are temporary. Morris and Rohs (2023) also found that overall many of the schools

involved in SDL research did not appear to prioritise the facilitation of SDL highly, suggesting that it may be useful to establish whether this is more broadly the case. Finally, they highlight as a key direction for future research the need to identify the key teacher competencies required for the successful facilitation of SDL in students, and how best to foster these teacher competencies.

The finding that formal education environments typically do not prepare students by incorporating opportunities for self-directed learning into their curricula (Asfar & Zainuddin) despite evidence of the potential importance for lifelong learning and success (Brandt, 2020) suggests that a great deal of further research is required in order to establish why this might be, and how the situation could be remedied. Research to determine whether there are mainstream education settings that do foster SDL in their settings could allow best practice to be analysed and shared, particularly in terms of determining what resources are necessary for this and whether technology is useful. If such settings cannot be identified, research attempting to discover why this is the case will be important in order to suggest courses of action by which this could be remedied. Research gathering the views of key stakeholders could also be used to identify potential facilitators and barriers to the use of technology to support self-directed learning in schools.

Empirical Paper

Abstract

At present, there is little research exploring how formal teaching environments can encourage self-directed learning (SDL) in their students. A review of recently published studies concerning SDL in school-aged children (Morris & Rohs, 2023) suggested that there is potential for educational technology to be harnessed to support young people to learn more independently. The current study explored the views of school staff around the use of technology to support SDL. I conducted unstructured interviews with nine members of staff in various roles, and analysed the interviews using reflexive thematic analysis. Five themes were generated from patterns of meaning across the dataset: 'Swiss Army Tech,' 'It's A Nice Idea, But…,' 'User Guide Not Provided,' 'Technology Tsunami,' and 'They Couldn't Cope.' These themes revealed a significant element of ambivalence in my participants' views; while they recognised the benefits of self-directed learning and the potential for technology to be useful in facilitating it, they also identified some significant barriers to the implementation of this approach in schools. Implications of these findings for future research and for educational psychology practice are identified and discussed.

Introduction

For decades, researchers and educators have explored educational practices that support learners to acquire new knowledge in intrinsically motivated, self-directed ways (Deci & Ryan, 1981). In recent years, scholars have argued that self-directedness is becoming increasingly vital for success in a modern working environment due to the ever-changing effects of new technology on the vocational landscape (Brandt, 2020). It has been suggested that technology-based teaching approaches could be uniquely placed to support young people to acquire the skills they need to learn more independently, and that these teaching practices could be useful in preparing students for future academic and vocational success (Morris & Rohs, 2023). However, there is still comparatively very little research exploring the concept of self-directed learning as it pertains to children. Research exploring the use of technology to facilitate self-directed learning has thus far been largely focused on young adults, leaving a significant gap in our understanding of best practice when attempting to implement these practices with school-age children. This introductory

chapter will provide a scene-setting overview of a literature review that was conducted in order to inform the design of the current research project.

Self-directed learning. The term 'self-directed learning' is used to refer to a variety of linked but subtly differing concepts. There exists a consensus in the literature that the term is difficult to define in a concrete way, with some authors going so far as to suggest that capturing the concept usefully in a single definition is not even possible (Kerka, 1994). In order to inform the design of the current study, a broad swath of literature was reviewed in which varied operational definitions of the term were used; given the initial exploratory aims of the project I felt it important to capture the variety that was present in the preexisting literature.

Some authors stipulate that in order to be classified as self-directed, the learning experience must be entirely initiated and controlled by the learner, undertaken for intrinsically motivated reasons (e.g. Fischer & Sugimoto, 2006; Ponton et al., 2009; Fisher, 2021; Fisher, 2023). Other studies that discussed self-directed learning reported measures such as students' ability to move independently towards a teacher-directed goal (Glaubman et al., 2012), or even the extent to which students perceived themselves to be independent while moving towards a teacher-directed goal (Tan & Koh, 2014). Broadly, most definitions center around the idea of a learning process that is planned, executed and/or evaluated by the learner (Loeng, 2020; Morris & Rohs, 2023).

The idea of self-directed learning was first discussed within the field of adult learning, and the concept is widely associated with the theory of andragogy developed by Malcolm Knowles in the 1970s (Knowles, 1978). Knowles proposed that the ability and even the desire to acquire knowledge independently and autonomously is unique to adults (Knowles, 1968), however this view is widely contested, with other authors asserting that human beings are born with curiosity about the world around them and an innate drive to explore (e.g. Deci & Ryan, 1981; Ponton, 2009; Fisher, 2021). Critical unschooling proponent Noah Romero advocates for breaking down oppressive power structures within educational environments, fostering student autonomy, and placing the same trust in young people that we place in adults to shape their own development (Romero, 2018). Research conducted in Australia that involved interviewing elementary schoolers (mean age 10.8) demonstrated that children are able to express and reflect on their desire to learn and their ability to learn independently (Van Deur, 2011). In light of this evidence, it could be

argued that continuing to restrict the study of autonomous learning to adults would constitute adultism, a form of prejudice based on the idea that all adults are inherently superior to all children. Scholars such as Romero and Fisher who call for increased opportunities for self-directed learning that originate from a desire to empower young people could be said to be acting from a childist perspective. The terms 'childist' and 'childism' are used throughout this paper to refer to a theoretical framework intended to critique the pervasive marginalisation and disenfranchisement of young people relative to adults, in a way that is analogous to the terms 'feminist' and 'feminism.'

In addition to the ethical arguments for increasing opportunities for self-directed learning for young people, there exists some evidence that this could lead to improved personal and academic outcomes for learners who are afforded an autonomy-promoting educational experience. Researchers have suggested that a movement towards greater levels of self-directedness could lead to: more efficient identification and remedying of knowledge gaps (Gureckis & Markant, 2012); improved retention of new material (Partridge et al., 2015); the ability to build effectively on taught lessons through additional independent study (Yang & Li, 2013); more tailored and appropriate goal-setting (Schweder & Raufelder (2019) and overall greater academic success (Brandt, 2020). In addition, the presence of intrinsic motivation - considered by some researchers to be an integral component of self-directed learning - has been linked to increased attainment in and of itself (Taylor et al., 2014; Guay, 2022.). As well as academic success, the ability to learn in a self-directed way has also been suggested to be advantageous in a vocational sense. Bidokht & Assare (2011) posit that due to the rapid pace of change and development in technology, having a single set of skills is no longer likely to be sufficient throughout one's career and it is more important than ever that educators instil the ability to solve problems and learn new things efficiently. Conradie (2014) predicts that creating learning environments that support and nurture self-directed learning skills will only become more and more important, as over time the role of the educator will diminish in favour of learners accessing resources independently via the use of technology.

Self-directed learning, education and technology. For several decades, researchers have explored the potential for digital technology to be useful in supporting the acquisition and practice of self-directed learning skills (e.g. Lieberman & Linn, 1991; Gabrielle, 2003). For the purposes of

this paper, the terms ‘digital technology,’ ‘technology’ and ‘tech’ will be used to refer to electronic devices that store and process data, as well as the software and information networks they allow access to. Research has suggested that due to the rapid pace of technological development and innovation, it will be increasingly important to teach today’s learners the skills they need to become competent with new technologies, as the software and hardware they are expected to use will likely shift considerably over their lifetimes (Fischer & Sugimoto, 2006). This emphasis on learning how to learn suggests that self-directed learning skills will only become more instrumental to success in the digital age (Brandt, 2020).

Research has explored the unique contributions of digital technology to the field of education as a whole, and highlighted the access it provides to collaboration, connectivity and creativity (Karakas & Manisaligil, 2012), as well as increased opportunities for experimentation, sharing, improvement and empowerment (Tour, 2015). A report produced by the Education Endowment Foundation suggests that technology can be used to enhance students’ learning experience, as well as supporting teachers and reducing teacher workloads by facilitating the processes of difficulty differentiation and assessment (Stringer et al., 2019). The use of technology in education also has some clear disadvantages and limitations, from the costs of hardware and software (Fischer & Sugimoto, 2006) to concerns around safety and privacy (Tlili et al., 2022). Several researchers have investigated the importance of staff and student competence and their familiarity with the forms of technology that are incorporated into the educational environment (Jong et al., 2010; Morsink et al., 2011), and suggested that this has the potential to be an important limitation of the effectiveness of tech-based approaches if not properly addressed. If technology is to be successfully harnessed to facilitate the development of self-directed learning skills in schools, it is important that the inherent features of tech-based learning approaches are considered and accounted for.

There is promising evidence to suggest that technology is uniquely useful in developing learning activities that promote and support the development of self-directedness in learners. Yang & Li (2013), when directly comparing a computerised SDL learning program against the same material delivered on paper, found that the use of technology significantly enhanced the results. Studies have shown that online learning spaces that provide opportunity for independent, self-directed engagement with learning activities are linked with an improved learning experience,

characterised by increased self-monitoring and the ability to progress through the material at a pace that supports greater critical engagement (e.g. Zainuddin et al., 2019; Zhu & Bonk, 2019).

While the majority of research into self-directed learning is still conducted using adult participants (Morris & Rohs, 2023), there is also promising evidence that young people can be supported to engage in meaningful self-directed learning experiences. For example, problem-based learning (PBL), an evidence-based teaching strategy that encourages learners to independently apply new knowledge to solve a presented problem (Loyens et al., 2008), is an existing teaching method that supports self-directed learning and that has the potential to be improved with the use of technology. A study by Abdullah et al. (2019) showed that students who engaged in a PBL intervention that incorporated the use of virtual reality subsequently showed a long-lasting improvement in their self-directed learning skills. While further research is needed that explicitly contrasts tech-enhanced approaches with their analogue counterparts, other research suggests that technology does provide unique avenues for exploration, research and problem solving (Asfar & Zainuddin, 2015) as well as engendering enthusiasm, engagement and intrinsic desire to persevere in the face of difficulty (Brennan, 2021). Indeed, research evidence suggests that merely the act of exposing middle school students to a technology-rich, exploratory learning environment can lead to an increase in self-directed learning behaviours (Mishra et al., 2013).

A scoping review conducted in 2023 aiming to discover how SDL is facilitated in young people in the digital age suggests that there is significant potential for technology to be used in formal education settings to successfully foster SDL skills (Morris & Rohs, 2023). While the authors found very few (n=14) studies of self-directed learning that involved children and young people, the majority of the studies they reviewed involved some aspect of technology, suggesting that the potential value of this application of educational technology is becoming more widely recognised. While the review synthesised some interesting conclusions about our current understanding of how SDL skills are nurtured in education settings, the authors were clear about the fact that the dearth of related research means that our understanding of the topic is far from saturated and further exploratory research will be necessary. The study concludes with a general call for future research to expand upon our knowledge around how SDL can be fostered in young people, as well as some more specific areas. Through several of the studies discussed, Morris and Rohs discuss the role of teachers in promoting SDL, and they conclude that a key direction for research will be to

deepen our understanding of the teacher competencies that are required to support the process and how these could be successfully developed. Additionally, the authors hypothesise that the current lack of research into self-directed learning in formal education settings may be because the majority of such settings are reliant on a teacher-directed learning model, and do not consider the facilitation of self-directed learning as a priority, a theory that requires further exploration to determine its validity and transferability.

Current context. It has been suggested that in order to properly prepare today's young people to become capable lifelong learners, schools must increase students' access to technology and support them to develop the skills to make use of it in a self-directed way, in order to achieve their own educational and vocational goals (Afar & Zainuddin, 2015). However, as discussed above, a recent scoping review did not find evidence that developing and implementing learning activities that support self-directed learning is something that educational settings are prioritising at present (Morris & Rohs, 2023). Indeed, research has long suggested that students' intrinsic motivation to learn in a self-directed way may actively decline as young people progress through their school careers (Deci & Ryan, 1981; Deci et al., 2001; Scherrer & Preckel, 2018). At time of writing, most formal education settings still subscribe to a highly teacher-directed learning style, based on clear teacher-student heirarchies (Romero, 2018), and research suggests making changes to this has the potential to be challenging for school staff (Morsink et al., 2011). This suggests that the process of creating a formal school environment in which self-directed learning skills can actually be learned and practiced is still in its infancy, and further exploratory research is required in order to establish stakeholder constructions of current practice and provide a springboard for future development in this area.

It must be noted that this research is being carried out in the aftermath of the global COVID-19 pandemic, an event which necessitated nationwide lockdowns during which the majority of UK school aged children were required to learn remotely from home (Lucas et al., 2020). While this was not the first time remote learning had been explored as a way of enhancing young people's access to education in times of crisis (Almasri et al., 2019), it prompted a rapid and widespread shift in mainstream practices (Maphalala et al., 2021), the creation of new guidance for schools providing remote learning (Ellis-Thompson et al., 2020) and calls for lasting changes to both classroom practice and initial teacher training (Meisner & McKenzie, 2023). The field of education

is still in the process of developing a shared understanding of what it means to integrate technology into a learning environment (Consoli et al., 2023), but as digital software and hardware becomes more ubiquitous and a more salient part of the educational and vocational landscape (Brandt, 2020), it will only become more important to explore the ways in which technology can be harnessed to achieve key educational goals. In addition, this research is taking place in the UK where there are currently significant issues with teacher stress, wellbeing and retention (Jerim et al., 2021), highlighting the importance of taking their views into account when researching educational approaches that have the potential to significantly impact the working lives of school staff.

Research aims. Given the clear need for further research exploring the ways in which self-directed learning can be fostered in young people, and the promising literature suggesting that technology may be a key resource enabling this process (Morris & Rohs, 2023), this study seeks to further explore and enhance understanding of this area.

When discussing any novel approach to achieving an educational outcome, it is vitally important to consider how any proposed change or intervention will be implemented in practical terms. The field of implementation science is concerned with identifying contextual barriers to the successful uptake of new approaches, and developing strategies that will enable the successful translation of research insights into practice (Bauer & Kirchner, 2020). Guidance has been produced in order to guide the application of implementation science to psychology in education (Kelly & Perkins, 2012; Sanetti & Collier-Meek, 2019), in part in response to the finding that in general, psychologists working in schools tend to focus on intervention outcomes rather than implementation outcomes (Forman et al., 2013).

Drawing together multidisciplinary implementation science literature, Forman et al. list personal factors that are thought to impact the effective use of evidence-based approaches, including: implementer skill, beliefs and attitudes regarding the intervention; attitudes and behaviours of managers; organisational context such as policies that pertain to the intervention; and the external environment of the organisation (Forman et al., 2013). Citing another literature review focused on the implementation of mental health promotion programs, they also highlight the importance of: community factors including politics and funding; implementer self-efficacy; characteristics of the

intervention, including adaptability; organisational capacity; and technical support and training (Durlak & DuPre, 2008, as cited in Forman et al., 2013).

Within the research around the use of technology to foster self-directed learning in both adults and children, the voices of those working directly with students are sometimes included, but are very rarely the focus of the research. As scientist-practitioners, educational psychologists must be concerned not just with empirical evidence generated under research conditions but also the implementation of novel approaches; if what we suggest is unlikely to be implemented successfully by educators working directly with students, there is very little point recommending it at all (Beaver, 2011; Gutkin & Conoley, 1990). Research suggests that the preexisting beliefs and attitudes of those implementing an intervention can significantly affect fidelity and effectiveness (Moir, 2018; Grebing et al., 2023), which makes clear the importance of understanding any potential barriers to adoption of new interventions in the form of school staff views. Research suggests that teacher attitudes towards technology use in their personal lives may parallel their attitudes towards the incorporation of technology in their teaching practice, and influence the kinds of technology-enhanced experiences they offer their students (Tour, 2015).

The current study therefore aims to explore the views of school staff regarding the use of technology to facilitate self-directed learning. The research will be intentionally very broad, drawing on diverse facets of the participants' thoughts and experiences, in order to illuminate and generate potential directions for more targeted research in the future. In addition, this research aims to elevate the views of school staff into the research space, and diversify the perspectives that are made available in the academic arena. It is hoped that the current project will support a larger movement towards promoting the widespread facilitation of self-directed learning in school environments, and that the findings can be useful in advancing this broader goal.

The research question(s) evolved over the course of the study in order to ensure that they remain clear, connected to the purpose of the research, and coherently answered by the analysis (Robson & McCartan, 2016; Braun & Clarke, 2022). The current study aims to answer the following research question and subquestion.

RQ1: What are the views of school staff regarding the use of technology to foster self-directed learning?

RQ1a: What do school staff think may be facilitators and barriers to the effective use of tech to facilitate SDL?

The use of a primary question and a subquestion reflects the fact that, while discussion of facilitators and barriers falls under the general heading of views, particular attention was paid to data relevant to this during the analysis, in line with the stated aim of producing research insights that might contribute to our understanding of how SDL could be more widely facilitated using technology.

Methodology

Researcher positions.

Ontology. The discipline of ontology is concerned with philosophical questions about the nature of reality; what sorts of things can be said to exist. The ontological beliefs held by researchers guide decision-making about the kinds of things they are able to study, and they therefore determine the epistemological and methodological strategies can be employed in order to generate new knowledge (Teo, 2009). This piece of research is situated within a relativist ontology; one that seeks not to shed light on an absolute truth, but to explore the subjective realities that are created through human action and interaction (Braun & Clarke, 2022). Relativism exists in contrast to realism, the belief that there exists a single, objectively true reality, and while the two are often positioned as opposing camps, it is probably more useful to think of realist-to-relativist as a sliding scale; most realists acknowledge the impact of language and culture on our perceptions of reality, and most relativists do not deny the existence of a material world entirely (Burr, 2015).

Epistemology. Epistemology concerns the nature of knowledge, what sorts of things can be known, and how new knowledge can be acquired. This piece of work was undertaken using a social constructionist lens. Constructionism is a cross-disciplinary concept which can be defined in different ways. Author Vivien Burr lists the following as the key features of social constructionism: a critical stance towards established ‘knowledge; historical and cultural specificity; and knowledge as a social process (Burr, 2015). Constructionist epistemology is typically linked with a relativist ontology (although constructionist research within a critical realist paradigm is possible) and therefore knowledge generated by constructionist research is necessarily located within its particular historical, social and cultural context, rather than claiming to be objective truth. The use of a constructionist epistemology has guided my decision-making process throughout this research, from the decision to include multiple differing definitions of self-directed learning in my literature review, to the formation of my research question, through to the analysis and the conclusions drawn from it.

Research paradigm. *The term Big Q is used by Braun and Clarke (2022) to refer to the use of qualitative tools and techniques within a truly qualitative paradigm, rather than one that is more aligned with positivist-empiricist research. The ontological and epistemological positions of relativism and social constructionism form an important part of what Braun & Clarke refer to as a qualitative sensibility, and I drew heavily on the other constituent qualities they list in order to construct my own researcher positionality; I made an effort to engage actively and analytically with my data, and to reflect on the invisibilised, normalised assumptions within my social and cultural environment.*

While quantitative methods can absolutely be used in critical ways that are compatible with a nuanced view of human subjectivity (Teo, 2009), in this instance I felt that qualitative methods within a qualitative sensibility was the most appropriate way to achieve my research aims.

Theoretical frameworks. My positionality as a researcher and indeed as a trainee psychologist has been strongly influenced by the work of critical psychologists. For example, my analysis was conducted while bearing in mind that highly situated, culturally specific psychological concepts can become significant parts of a person's identity or very real sources of power or oppression despite their socially constructed origins, and that it is possible to advance social justice by critiquing ideas that appear to create or serve unjust imbalances of power, regardless of how culturally embedded and therefore self-evident they seem (Teo, 2009).

In addition to a more broadly critical position, this analysis was conducted with particular attention to the concept of childism. The construction of childism as a unique critical lens, is still fairly new; it arose from a critical branch of childhood studies around the 1980s, pioneered by academics who saw the potential for their work to blend with social activism through raising awareness of and challenging the presence of adult-dominant norms (Wall, 2019).

Childism, as defined by Wall (2019), involves working to promote the inclusion of children and also to challenge their marginalisation by opposing the normative assumption that adults are inherently superior. Though there exists an alternative use of the term that is used to refer to discrimination against children (in a way analogous to racism and sexism, rather than to feminism

and environmentalism), I have chosen to use Wall's definition because it centres the child, rather than focusing on adult attitudes or actions towards them.

Situations in which data is interpreted in such a way as to produce either statements suggesting the inferiority of a marginalised group, or recommendations that disadvantage a marginalised group, can be described as epistemological violence (Teo, 2009).

Participants.

Participant characteristics. The study sought to recruit members of school staff who identified themselves as having had experience using technology to facilitate self-directed learning. The selection criteria were intentionally left broad, so as to create space for a diverse collection of voices from within each school. Overall nine participants were interviewed from two participating schools, both in my home county within the East of England. Both schools were situated in areas of relatively high socioeconomic deprivation compared to the rest of the country, with one rated in the top 20% of deprived localities in England (though surrounded by areas ranging from 20%-80%) and the other in the top 10% (surrounded by other areas with similar ratings). (Higher Education Statistics Agency, 2024). Participants had a range of experience; six had been working in schools for ten to fifteen years, and three had qualified or taken up their positions within the last five years. Four of my participants mentioned working or volunteering in other schools prior to taking up their current post.

I did not formally collect demographic information about my participants (such as age, gender, ethnic origin or specific role within the school) for a variety of reasons. I chose not to collect information about the participants' gender identity as I had no plans to use this information as part of my analysis, and I had no way of knowing whether the experience of being asked to define their gender might be uncomfortable or sensitive for my potential participants (Floreani, 2021). For trans, non-binary, gender non-conforming or questioning people, the process of collecting this data can be stressful as it can require making a decision about whether to out themselves or misrepresent themselves, and therefore it is my belief that this data should only be collected when clearly relevant and necessary to the research question. Additionally, it was always my intention to use gender neutral pronouns to refer to my participants throughout the analysis chapter; given the small number of participants I felt this was important in order to preserve their anonymity.

Regarding other demographic information such as age and ethnic origin, I am aware that different demographic categories will likely be accompanied by particular connotations in the mind of readers, and I wanted to present the views of each participant in a way that avoided unintentionally privileging the views of one participant over another. I also chose not to record each participant's particular role within the school, for the same reason. Historically in education research, the voices of support staff are rarely afforded the same opportunities to be heard as qualified teachers and school leaders (Roffey-Barentsen, 2014), and it was important to me to elevate their views alongside their colleagues without demarcation.

Recruitment process. Participants were recruited with the help of gatekeepers. The schools were selected using purposive sampling in that they were identified and approached based on the researchers' awareness of their possession and frequent use of educational technology. Purposive sampling was used in order to create as close a match as possible between the characteristics of the participants and the aims of the research (Campbell et al., 2020). I approached the schools and asked the gatekeepers to help me schedule a visit during which I could speak directly to members of school staff who might want to participate, hand out information and consent forms and answer any questions potential participants might want to ask before signing up. During the visits I gave a brief overview of the aims and process of the research, and provided potential participants with my contact information, as well as offering the option of returning a consent form then and there if they wished to do so. I then contacted participants via email to schedule a convenient date, time and place for their interview.

Data collection.

Interview protocol. Participants were given the option of taking part in interviews in person or via video call. All participants chose to speak with me in person, and all interviews took place at the participant's place of work either during or directly following the working day. The interviews were unstructured and based on a list of interview probes developed during an initial review of relevant literature. Some probes were included as a result of the study's epistemological position (for example, those designed to elicit participants' own constructions of key terms). Given that several studies pointed to the importance of school staff attitudes to an intervention for its

successful implementation, I sought participant views about technology and about the importance of fostering self-directed learning. Responding to a relative lack of studies explicitly comparing technological SDL interventions with analogue ones, I included probes asking the participants to contrast the two and discuss their related reflections. Some additional probes were also added over the course of the interviews in response to relevant areas of discussion being raised by previously interviewed participants. For the list of interview probes used as well as more detailed information around their origins and delivery, please see Appendix A.

I chose to conduct unstructured interviews in order to allow for diverse constructions of the topics at hand to lead the conversation in different directions with different participants. The standardisation of interview schedules is often carried out in an attempt to control variables between interviews, and it could be argued that to attempt to standardise and remove bias in the context of qualitative research is an example of positivism creep (Braun & Clarke, 2022) and therefore incompatible with a Big Q research paradigm. Reflexive thematic analysis embraces the idea that the interviewer is a co-producer of knowledge, rather than attempting to neutralise their or remove their input. The use of conversational, unstructured interviews is considered to be highly compatible with a constructionist epistemology, as it allows the interviewer to come closer to the interviewee's social reality on their own terms (Zhang & Wildemuth, 2016) and they have been described as particularly useful for research attempting to find patterns and/or inform system design and implementation.

While there exists a temptation to view topics that interviewees bring up unprovoked as especially salient or important, Braun & Clarke, giving an online lecture through Anglia Ruskin University (2024), cautioned that most participants are trying their best to be a 'good participant,' and will therefore be highly sensitive to cues from the interviewer as to what they are expected to discuss. I bore this in mind throughout the interviews and the subsequent analysis.

Procedure. During each interview, a recording was made using Microsoft Teams. The automatic transcription software within Teams was used as a starting point for transcription of the interviews, and these autogenerated transcripts were then edited by hand to promote speech-to-text accuracy and anonymity. Each participant was given the opportunity to review their transcript prior to analysis, a decision that was based on a desire from an ethical standpoint to provide

participants with agency over the ways in which they were represented in the transcripts, aiming to minimise discomfort or harm that could result from feeling misrepresented. The practice of member checking in qualitative, relativist research has been criticised, as the idea that transcripts must be checked against participants true views reifies those views in a way that conflicts with constructionist ideas about how knowledge is produced (Braun & Clarke, 2022). However, the process of inviting participants to review and reflect on their transcripts, inviting them to make additions or changes with the understanding that this is just another phase of the data collection and generation process, retains the participatory element without creating epistemological conflict. During the current study none of my participants chose to share any feedback on their transcripts; existing literature suggests that a low response rate to solicitation of member checking is common in qualitative research (Motulsky, 2021).

Data analysis. I chose to use reflexive thematic analysis (Braun & Clarke, 2022) in line with my epistemological and theoretical commitments to be explicit and reflective about the ways in which my subjectivity as the researcher would influence the process, and the impacts of this on the research I would produce. In this section, I will briefly discuss the particular forms of reflexive thematic analysis I chose to use, and then I will provide a personal account of my experience putting each phase of the analytic process into practice. While I will present the phases sequentially, as they are presented in Braun & Clarke's guide (2022), it must be noted that I moved between the phases frequently and fluidly, often returning to earlier phases or noting down ideas for later phases throughout the process. I conducted a single analysis, which I began by identifying and coding any points of data relevant to my primary research question. Then, during interpretation and writeup, I gave slightly more weight to data which answered both the primary question and the related subquestion - i.e. that which pertained to potential facilitators and barriers to implementation of tech to support SDL in schools.

***Characteristics of analysis*.** During the entire process, I leant towards interpretative modes of analysis, as opposed to those that are purely descriptive. While I also tried to ensure I used illustrative extracts to convey rich descriptions of my participants views, I also brought a strongly theoretically informed lens to the discussion in places, closely interrogating the potential effects - the 'stakes' (Braun & Clarke, 2022) of particular constructions of meaning as expressed by my participants.

As I progressed through the analysis I found myself leaning towards **critical** rather than experiential interpretation of the data. During the interviews I had on a few occasions probed further into my participant's initial answers to unpack what might be underlying them, and this curiosity about the social and cultural influences behind the data extended to the application of a critical, childist lens during analysis and writeup.

Phases of reflexive thematic analysis.

Familiarisation. Familiarising myself with the dataset began during the process of transcription, during which I listened to each interview several times, attending closely to fine-grained detail. Following this, I read and re-read each transcript, in order to build a more zoomed-out impression of the data. During this I made familiarisation notes, as advised by Braun & Clark (2022) in order to capture my initial impressions of the data. Towards the end of this process I found that a lot of my notes were beginning to look like codes, so I progressed to the next phase.

Coding. I worked through each data item at first sequentially and then in a random order, highlighting pieces of information that I judged to be relevant to the research question and tagging them with code labels. The coding process was facilitated by the qualitative analysis software program Nvivo, which allows the researcher to upload their data items and digitally tag each coded extract in such a way that allows for subsequent collation of all relevant extracts under each code. The software also allows for the large scale editing and manipulation of codes, for example collapsing closely related codes either under an umbrella 'parent code' or into a single code with a new label. I found this functionality invaluable and I feel I refined my code labels more than I would have if it had meant altering the label by hand on paper for each and every extract. See Appendix B for a worked example of the coding process, as well as a sample from the final codebook.

***Generating initial themes*.** This phase involves clustering codes into very tentative initial theme ideas. In order to facilitate this process I switched to pencil and paper methods. First, I wrote each code by hand on a flashcard and experimented with potential groupings. At this point I had exported my codebook from Nvivo, and while doing this I noted that the software automatically provides a frequency count that measures how often each code was tagged across

the entire dataset. While I initially found myself interested by this, Braun & Clarke (2022) caution against allowing one's perception of what is most meaningful or important in the dataset to be contaminated by quantitative measures, and therefore I removed the counts from my working document. The process of creating the flashcards took time and effort and I found that during this I became much more familiar with my codebook as a whole, and many initial ideas were generated while writing the codes out before I even began moving them around. Overall I produced ten potential initial themes.

***Developing and reviewing themes*.** During this phase, I moved away from flashcards towards a mind-map style representation of my clusters of codes. I created circles for each of my tentative initial theme ideas, and added the codes to them in order to visually represent the ways in which my codebook clustered together to form each theme (Appendix C). During this process I altered theme labels, experimented with possible wording of central organising concepts (Braun & Clarke, 2022) and sketched thematic maps that showed the links between some of the initial themes. Through this process, I settled on seven themes, ensuring I held them tentatively and remained open to further changes. I interrogated each theme using prompts from Braun & Clarke (2022) to ensure that there was enough meaningful data to evidence each theme and that each had something important to say about the dataset. Throughout both this and the previous stage I revisited my data items frequently, ensuring that while I worked from codes I did not become too distant from the raw data.

While developing and reviewing them, I noted that the themes that were emerging from the data were not explicitly related to the experiences of my participants, and instead involved exploring their views in a broader and more abstract way. Following discussion with my supervisor, I made the decision to alter my research question to reflect this shift. This decision was taken based on guidance from Braun & Clarke (2022; Anglia Ruskin University, 2024), who advise that it is good practice to revise the research question if necessary to ensure that the analysis provides a clear and satisfying answer.

***Refining, defining and naming themes*.** I created a name for each of my seven themes, shared these ideas with my supervisor, and created a short theme summary for each. These theme summaries or definitions are described by Braun & Clarke as like an abstract, delineating the

content and scope of each theme (2022). In line with Braun & Clarke's advice, I attempted to make my theme names engaging and interesting, as well as conveying the meaning and analytic direction of the theme they described. The themes remained very much subject to change, and over the course of the refinement process I removed three themes and created a new one.

Writing up. I began the process of writing up the analysis by creating subheadings for each theme, and selecting and transferring data extracts from Nvivo underneath each. I took care to ensure that where codes were tied to more than one theme that I avoided duplication of extracts, and I attempted to select pieces of data that were vivid, clear, concise and varied (Braun & Clarke, 2022). I chose some extracts for illustrative purposes, and chose others for their potential to be discussed more analytically. When I was happy with the selected extracts, I began to construct my analysis around them, moving around within the document as is my usual way of composing a written piece of work. Following this I worked on each theme individually, structuring the analysis that had been generated and adding depth to the discussion to produce a coherent analytic story. I then arranged the themes into the order that I felt supported the most logical thread through the entire analytic picture. I contained my findings and discussion into a single Analysis chapter, as suggested by Braun & Clarke as the best fit for the reporting of qualitative data (2022; Anglia Ruskin University, 2024). Once I was happy with this chapter, I composed the Conclusion section, drawing together the main points of my analysis and illustrating why they matter.

Research quality and researcher reflexivity. Although constructionist research has become more commonplace, positivist-empiricist ways of working are still the norm and at times it is necessary for Big Q qualitative researchers to evaluate conventional markers of quality in order to ascertain whether they are actually coherent with the underlying philosophy of their research (Braun and Clarke, via Anglia Ruskin University, 2024).

Within a social constructionist research paradigm, all knowledge is provisional and contestable, and there can be no claims as to the objective truth of the analysis. Instead, social constructionists often measure the quality of their work by its 'usefulness' and 'fruitfulness' (Burr, 2015); the potential for the analysis to generate new explanations, expand upon theory, and shed new light on preexisting findings. Additionally, 'soundness' of analysis can be evidenced by providing a logical account of how the analysis was constructed (Burr, 2015). Braun & Clarke advocate for

communicating a detailed and transparent account of the 'messiness' of qualitative research, and this I have attempted to do in the accompanying reflective chapter (Anglia Ruskin University, 2024).

Yardley (2015) suggests that the validity of qualitative, constructionist research should be measured by the presence of four key things: sensitivity to context; commitment and rigour; transparency and coherence; and impact and importance. I have conducted my research in a way which acknowledges contextual influences on me, my participants and the findings we constructed together, and I have demonstrated rigour through close adherence to best practice guidelines for my chosen research method (Braun & Clarke, 2022). I have also prioritised transparency by providing a detailed account of the research process and creating an accompanying reflective chapter. Finally, I have composed a literature review which aims to highlight the relevance and timeliness of my research, and presented the implications of my findings for further research and practice at the end of this empirical paper.

Ethical considerations. Ethical approval to undertake the research was sought from and granted by the University of East Anglia's School of Lifelong Learning. A detailed outline of the planned research was supplied to the school's ethics committee, and revised based on their feedback before I was granted permission to begin the project (see appendix D). A detailed information and consent form was generated using a template supplied by the university (appendix E).

Participants were assigned codenames in order to conceal their identities. It has been suggested that the use of codenames depersonalises the data, and it could be argued that this could affect the way the reader relates to the participants, or alternatively that it could be uncomfortable for participants during member checking (Heaton, 2022). However, it is also commonly acknowledged that most names are imbued with social and cultural significance, and can cue particular associations and identity characteristics in the mind of the reader (Clark, 2006). My research position emphasises the importance of context for my data, and I wanted to avoid muddying it by adding a layer of unconnected and arbitrary meaning over the top. I therefore chose to use simple numerical signifiers to differentiate between my participants in the Analysis chapter.

I took care to remove identifying information within the dataset, particularly that which could have been used to identify my participants or their place of employment. Due to the small number of participants recruited from each school, and the awareness of my school leader gatekeepers as to who had taken part in the research, additional care was taken to ensure that I removed any data that had the potential to be compromising or uncomfortable for my participants were it to become publicly available. The nature of the research meant I was asking my participants to reflect on and share views and attitudes intimately linked to their employment, and I wanted to acknowledge and honour the trust they had placed in me to represent them respectfully and with their interests in mind. While some qualitative researchers working with particularly sensitive interview data have used strategies such as creating a pseudonym smoke screen - wherein data extracts from the same participant are attributed to differing pseudonyms to prevent identification, or attributed to no pseudonym at all - it was decided that in this case, the sensitive data extracts were not of sufficient importance for answering the study's research question to be worth the compromise to integrity that this strategy requires (Saunders et al., 2014). While the removal of identifying information was undertaken in this study for reasons detailed above, and is considered by most researchers to be ethically mandated, it should also be noted that this practice a) removes contextual detail which could enhance the depth and fullness of data analysis (Clark, 2006), and b) could be detrimental to the reader's understanding of the transferability of the study's conclusions

Analysis

In this section, I will present the findings of the current study and discuss the ways in which they contribute to the existing literature around technology and self-directed learning. Using the six phases of reflexive thematic analysis (Braun & Clarke, 2022a) I constructed five themes that captured patterns of meaning across all nine interviews (see Fig. 1). Each theme provides an answer to my overall broad research question (RQ1), but throughout the analysis I gave greater weight to data points and codes that also answered the subquestion (RQ1a) so as to maximise the usefulness of the final analysis. The third and fourth theme in particular are focused on RQ1a in that they contain findings related to potential barriers to the successful implementation of technology-based approaches to support SDL. In order to demonstrate the context and significance of my findings, I will draw links to and comparisons with the literature that I reviewed in preparation for the current research, and I will tie my findings into our existing understandings around this topic.

Figure 1. *Thematic map displaying the themes generated during analysis.*

Swiss Army Tech

In many of the interviews, technology was described as a tool that could facilitate access (to expansive information, to increased independence, to remote and novel forms of learning), and that could also perform the functions of a myriad of analogue items, such as dictionaries, atlases, calculators and whiteboards. The presence of such tools in school environments paves the way for young people to access educational materials in more independent and self-directed ways, and enables educators to devise entirely new methods of teaching the skills required for successful self-directed learning. This theme encapsulates the view expressed by many of my participants that technology is a multitool which has the potential to support the acquisition of SDL skills in a variety of ways.

On several occasions, when I asked my participants to describe their understanding of the term 'self-directed learning,' the definition they provided included some reference to technology.

P1: self-directed learning is that obviously, probably like what we would do on an iPad

P2: I think of children taking learning into their own hands, having their own technology and sort of guiding their learning journey, what they want to find out, what they want to learn about, that's what I think

At surface level, this finding makes it seem as though my participants are making an inherent association between tech and SDL. However, it is important for me to report that at the start of

each interview, I reminded participants that my research was explicitly intended to explore the interplay between these things, and it is possible that my participants were therefore primed to make such an association, either subconsciously or due to a conscious effort to be a 'good participant.' The idea of a 'good participant,' i.e. one who divines and provides the answers that the researcher is looking for, has been explored in qualitative methodology literature (e.g. Whiting et al., 2018; Anglia Ruskin University, 2024) and I considered this during analysis. Any conclusions about my participants' perception of a link between educational technology and self-directed learning must be made tentatively; however, during other interviews other comments were made that suggested this link may be based authentically in participants' experiences rather than the result of priming. Participant 7 commented that in general, most of the opportunities their class currently have to learn in an autonomous way tend to be during lessons in which tech is used.

P7: across a term there's probably, I don't know, five or six different opportunities for self directed learning, yeah.
Int: and do they tend to be, kind of an even mix of tech and non tech, or do they tend to be more tech based?
P7: it would be more tech based, […] we do it, yeah, probably more in tech, with tech, rather than not.

While they also went on to mention some exploratory lessons in other subjects, typically at the beginning of a unit in order to allow students to familiarise themselves with new resources, they maintained that the opportunities for ongoing in-depth self-directed investigation of the term's topic are more likely to be carried out using technology.

Participant 8 also described technology as having a significant part to play in facilitating educational environments in which young people are able to explore in a way that feels more autonomous.

P8: I believe it can be done through inquiry-, sort of, led teaching and technology would be a great, you know, contributor to that, certainly when we got the VR headsets out for for that particular lesson and it was 'OK, you are an Anglo-Saxon, walk through this village, explore it' and it was an Anglo-Saxon village and that was immediately hands on and the children were actually able to

explore and discover, rather than me standing and talking about what a village typically would look like

Following this, P8 did also reflect on the ways in which the above experience might be considered more or less self-directed by different people. While it would not meet the threshold to be considered SDL by some authors (e.g. Fisher, 2023; Ponton et al., 2009), there exists a precedent within the literature for the term "self-directed learning" to be used to refer to the way learners move in a more autonomous way through a lesson that has been planned for them by a teacher (Glaubman et al., 2012). By some definitions, then, it can be argued that the above extract suggests that technology is being used in this case to support SDL.

From most of my participants, I got a strong sense that overall, they considered the impact of technology on their teaching and their working environment to be a positive one. When I asked Participant 5 if they were able to think of any disadvantages of working in a school with a relatively high amount of tech hardware, they said the following.

P5: I think it's all positive things honestly, I think it's all positive things.

Participant 8 also spoke with enthusiasm about the use of educational technology.

P8: I like technology I think it I think it's a really powerful tool, I think it's something as, I think it's something we need to keep up to date with

P8: I'm not a believer in if you just have a behaviour incident in a class, we don't use tech because that's your reward taken off, I think they have a right to use technology

These comments suggest that Participant 8 perhaps feels a sense of duty to ensure that their students are able to acquire competence and confidence with technology. Given that much of the relevant research literature suggests that these skills are likely to be of increasing importance for the academic and vocational success of today's young people, (Fischer & Sugimoto, 2006; Conradie, 2014; Brandt, 2020), these comments from Participant 8 suggest that they are aware of

this and consider it their responsibility to ensure that young people have opportunities to become acquainted with these tools and skills.

I asked Participant 9 how they felt about the amount that their school used technology, and whether they would like to see movement towards more tech or less.

P9: I think with technology, it's definitely helpful. Do I think it could be more helpful? yeah, absolutely

Participant 9 went on to suggest that they would like to see additional technology-based approaches being incorporated, and they feel additional training in the approaches the school is already using would be supportive for staff. This suggests that P9 is welcoming of novel approaches that involve tech, and sees the potential for them to be useful, which is important to note as research suggests that staff attitudes towards new approaches has a part to play in determining outcomes (Jong et al., 2010). In order to develop and successfully implement novel methods of fostering SDL skills in young people, the attitudes of school staff must be considered carefully.

Participant 6, when asked about the benefits of technology, identified the following.

P6: greater access to collaboration, a greater access to sharing resources, finding, finding information, children engagement, there's, you know, enormous amount of benefit as well

Many of these overlap with existing research literature regarding the benefits of educational technology that academics and school staff alike have identified and described. Karakas & Manisaligil (2012) highlighted both improved collaboration and global connectivity, the latter of which could be linked to P6's point about finding information given the fact that the Internet allows access to information generated and stored all over the world. Tour (2015) collected teachers' views about the utility of technology and their conclusions that connectedness and sharing are among the most important benefits of tech closely align with the views expressed by P6. Additionally, there is some existing evidence that the use of technology in primary school classrooms increases cognitive and emotional engagement in lessons (Marks et al., 2012).

Indeed, several of my participants made comments that suggested that teaching that makes use of technology is inherently more engaging for young people than traditional educational resources.

P3: a bright shiny app is more exciting to learn times tables than writing them in your book

The characterisation of educational software and games as bright and shiny suggests something inherently attractive, and Participant 3 here directly compares it favourably against a traditional teaching method - namely, copying by hand the information that is to be learned. The idea that the apps are attractive and exciting suggests that young people might be more intrinsically motivated to engage with them, and there exists research evidence that intrinsic motivation is positively correlated with academic attainment (Taylor et al., 2014). Participant 5 echoed this assertion that tech-based learning approaches are more attractive to their students.

P5: they're really happy, they're looking forward to like have phonics, with the people very hard to read or sound it out. Open up new worlds.

P5: I think it's really helpful because when I go myself in the school, read from the good books that, books was really boring. Seriously, that, for myself it was boring.

The phrase "open up new worlds" ties into the idea of technology as access to an expansive space in which novel forms of learning can take place. In this way, it seems to have great potential as a vehicle for introducing new teaching practices that would support greater self-directedness; it has long been acknowledged that moving towards a more self-directed model of classroom learning has the potential to feel like a whole new world to staff and students alike (Bolhuis, 1996). Additionally, Participant 5 here reflects on their own educational experiences - the constructions that school staff have about teaching and learning may well have their origins in their own experiences of school, and this may affect their attitudes towards the approaches they are asked to use.

P6 explored in a little more detail why technology-based learning approaches might be more engaging for their young people.

P6: technology can engage a child in an exciting and interesting way for, on their on their level in and in their language so I think that could be very powerful

The idea that technology is "their language" is reminiscent of literature describing today's young people as "digital natives," (Prensky, 2001); people who were born into a world already rich with technological hardware and software and who have acquired the necessary skills to make use of it at a young age. However, the following comment by Participant 7 suggests that the normalisation of technology for today's young people has done nothing to dull the excitement and enthusiasm that is associated with its use in the classroom.

P7: they love it, yeah, anytime you say you're gonna get the laptops out or VR or whatever it is iPads, they, they are on it they love that ((laughs)) yeah, even though they're not really novelty, we use them quite a lot, at least twice a week, if not sometimes three times a week, but it's still like it's a novelty..

This finding suggests that there is long-term potential for technology-based approaches to remain engaging for young people even as they become better established within schools, across a variety of different potential uses.

Several of my participants spoke about the ways in which technology can perform the functions of analogue equipment commonly found in classrooms.

P3: I tend to use it as a substitute for a dictionary or a substitute for a whiteboard

P4: they have the ability to have ebooks now on on their iPad

P2: there's the calculator on the iPad, sometimes they think that they can use the calculator in maths to find the answer

P2: we had, like, an alien day where this alien, like, crashed into the school playground and they all took their cameras and they were filming and taking videos, they could look back the next day and remind themselves what had happened.

P6: using Google Maps would be amazing because the children can really benefit from that, but we could use the old atlases instead

P4: go and find a picture, you can choose a picture and then you can draw that, you know that that to just give you, you know, to inspire you to give you some ideas' and then they can go and find rather than you know, a mediaeval textbook, that's been used for the last 40 years

These extracts illustrate the potential for a relatively small amount of hardware and software to provide access to a multitude of diverse functions, all of which can be applied in creative ways to create learning experiences. The versatility and opportunity for experimentation that accompanies the adoption of technology has been emphasised in the research literature (Tour, 2015), and suggests fertile soil for creating opportunities for independence and self-directedness in classrooms. For example, the idea that students can easily and independently access the functions of a dictionary, thesaurus, atlas and encyclopaedia without getting up from their desks means that the barrier to entry for incorporating these resources into their work is significantly reduced, as compared to, for example, an environment in which a young person would need permission to visit the school's library. It has been suggested that merely providing improved access to information could have a significant effect on self-directed learning behaviour, independent of any explicit intervention to promote it (Maphalala et al., 2021).

I asked all of my participants about the ways in which they currently use technology in their practice. During these conversations it became clear that for many of them, access to this wide variety of functionality was already being taken advantage of to increase the versatility of their teaching practices and introduce novel forms of educational stimulation for their students.

P7: it gives us options, it gives us flexibility, […] it definitely opens up a lot more choices for us, yeah.

It could be argued that a classroom in which there are more ways to learn the same material is a classroom in which young people could be more easily provided with meaningful choices as to how they learn. By allowing young people to experiment with different educational activities,

teachers could support them to acquire insight and self-knowledge about the learning methods that they enjoy and that enable them to experience success; insight that is likely to be valuable throughout their lives. In this way, the variety and flexibility that technology provides may be crucial in providing access to self-directedness for whole classrooms of young people. Research suggests that some elementary school students are more than capable of reflecting upon their engagement with different learning activities (van Deur, 2011).

As well as generally increasing access to information and functionality for all users, some of my participants discussed particular cases in which technology enabled a greater level of accessibility to learning for students with special educational needs. Participant 6 provided the following detail.

P6: in the past we've used, for children that have hearing issues or children that have have had issues with their ears, have used a microphone to pick up the teachers voice so that that the speaker sits right behind the child or even in one case we had the voice going directly into the, into a speaker in that ear and so, stuff like that, pretty, pretty profound.

Participant 6 uses the word ‘profound,' to describe the impact of this technology for these students. The potential for technology to create equitable access for disabled students is highly significant in terms of enabling those students to feel autonomous, agentic and empowered in a classroom setting, important precursors to engaging in learning in a self-directed way (Deci & Ryan, 1981).

Participant 4 recalled their own experiences of the support they received at school for dyslexia, and contrasted it with the ways that technology is used now to support students with literacy difficulties to record their ideas independently.

P4: I think that gives him some freedom and independence rather than having to have his hand up all the time […] I remember experience when I was at school not, having those ideas but not knowing how to put it onto paper, but if I had that ability to be able to sort of transcribe it across, that would make me feel a lot more, I think he feels quite empowered by doing that, like, this is my work, I can do this […] I think wow like to be, for them to be able to have that now is amazing and I

do, I see him, his little face, when he can kind of formulate his his ideas and get them down and then it's his work, it's authentic, it's it's his rather than the teachers interpretation.

Int: Yes. Yeah. Because you know with with scribing there is that kind of additional element.

P4: Yeah of course, cause you're always going to be like 'ooh what about this word' and but then you are putting your, your own ideas in without it being completely theirs.

Here, the ability to record one's own ideas using technology is framed not only as something that makes composing schoolwork easier, but as a crucial form of access to independence and empowerment. In most traditional learning environments, the wishes of children are typically considered secondary to the learning goals set for them by adults (Wall, 2019), and children are most likely to be rewarded for producing work which closely mirrors the knowledge constructions of the educator rather than work that is creative or original (Morris, 2022). Reliance on an adult's support might therefore have a significant curtailing effect on a young person's ability to express themselves authentically in writing.

Several participants suggested that tech-based educational activities could feel more accessible for students who typically find academic activities difficult.

P5: the very low ones, they use an iPad, they feel more confident I think.

This could be because for some children technology feels like, as Participant 6 would say, 'their language,' or perhaps because they have formed positive associations with tech hardware through using them recreationally at home. Participant 6 also reported seeing a similar positive engagement in their struggling students.

P6: I think a lot of the time they don't, they don't always see using those programs as learning which is, which is actually really nice because for a lot of those children, for those programs, those programs in particular for those children who use those programs, learning is quite, is quite difficult at times. So the fact that sometimes those programs don't actually feel like learning, they feel like

something additional to and different from their experiences, I think is one of the most important parts of their success with the children

The fact that students who typically find academic activities difficult engage well with educational technology is a promising one in terms of the subsequent potential to foster enjoyment of and motivation for learning in these young people. However, the fact that a dividing line is being drawn here between 'learning' and activities that young people intrinsically enjoy could be considered a sign that educational approaches in general could be doing more to harness the inherent desire to learn that many researchers argue are innate in all young people (Ponton et al., 2009; Deci & Ryan, 1981).

The extracts discussed so far highlight the ways in which the access that technology provides to expansive information and varied functionality can be beneficial for learners. In addition, during many of the interviews I discussed with my participants the potential for access through technology to be beneficial to school staff as well.

While there is no denying that altering the way they work to incorporate more opportunities for self-directedness would be an effortful shift for teachers (Conradie, 2014; Mishra et al., 2013), comments made by some of my participants suggest that in other ways, technology could perhaps be used to reduce their workloads. Almost all participants made reference to the idea that technology can be utilised to reduce the pressure on teachers related to high workload, and Participant 2 spoke in detail about the extent to which they find that technology facilitates their lesson planning and preparation.

P2: if we didn't have iPads, I'd have to be running up and down to the printer and printing off all these worksheets, um, yeah, it does make it a lot easier, and then I can put all the worksheets on Monday for the whole week so I don't have to be, like, worrying about 'ooh what are we doing today, ooh is my stuff ready,' um, yeah, it does make it a lot easier

Participant 3 recalled teaching practices that they used before they had access to technology, and contrasts the amount of time and effort that these practices required.

P3: the Internet and the research element I think makes your workload a lot less because ten years ago I would be, you know, photocopying, it seems alien to me now, and to think that was literally only ten years ago, I'd be photocopying books in the non fiction library and hiding them around the classroom and doing, whereas now I'm like, scan this QR code here's five different pages of information […] so in that way, it saves time, preparation, it saves time massively.

Given that arduous amounts of lesson preparation were cited in a recent study as one of the key factors affecting teacher stress and professional attrition (Jerrim et al., 2021), the finding that technology can be used to ameliorate this is an important one. As discussed earlier in the section, the ability to present children with a single piece of hardware rather than a dictionary, a calculator, an atlas and a stack of printed worksheets or images means that school staff have fewer logistical demands placed upon them to prepare and facilitate lessons. Additionally, both the extracts above mention a reduction in production of printed learning materials; the idea that using technological hardware saves materials and could ultimately save the school money were recurring patterns across the dataset.

Participant 4 speculated about ways in which technology could be used even more effectively to conserve the school's analogue resources.

P4: if there was some kind of, you know, online library that [parents] could access the same kind of books that [children are] reading at school at home, that would, that would be amazing, I mean […] that also would reduce the amount of books that go missing

By providing access to educational materials - in this case, books - online, as well as preventing books from being lost, Participant 4 also envisions facilitating greater parental involvement in education, and greater opportunities for young people to extend their learning outside of school hours. Yang & Li (2013) suggest that one of the major benefits of teaching self-directed learning skills is that it provides learners who need to spend additional time on their work with the ability to do so independently. Using technology to facilitate home-school resource sharing could facilitate this significantly.

Drawing from this collection of data, my analysis suggests that school staff view technology as providing access to a wide variety of resources, functions and teaching strategies. This, combined with the data suggesting that tech hardware is useful in enabling students to access learning materials more independently, highlights the potential for tech to act as an avenue for the creation and implementation of novel approaches that foster and nurture the development of self-directed learning skills in children and young people. Further research exploring specific approaches will enable the practical implementation of this still nascent idea.

It's A Nice Idea, But…

This theme emerged from the experience that many of my participants expressed that they would like to provide their students with more opportunities for self-directed learning, but that there are logistical constraints which make this difficult. Across many of the interviews, during discussions about student autonomy and self-directedness, my participants suggested that providing students with opportunities to learn in an independent way was something that schools and school staff should try to aim for, and student freedom was spoken about very positively. Some of my participants identified it as something they were actively focused on increasing in their classrooms. However, most participants also identified significant barriers present in their current working environment that make incorporating activities which foster self-directed learning very difficult for them. This led to an overall impression of the idea of facilitating SDL as an aspirational goal, but one that was often stifled by constraints beyond the participants' control.

Participants who spoke positively about student autonomy gave a variety of reasons as to why they might wish to promote it within their classrooms. One of the most strongly advocated-for reasons that participants gave for wanting to increase the frequency of opportunity for self-directed learning was a perception that their students really enjoy and engage in lessons in which there is an element of freedom and independence.

P4: they love telling me little facts that they've found or you know, 'oh, did you know, miss, that so and so?' and that does, you feel a difference in the classroom, you feel like a real enthusiasm like, 'look what I found,' you know, rather than being told 'this is, this is, this is really interesting' and them going 'ugh, all right.'

Several studies related to self-directed learning report the finding that the participants found the experience of learning in a self-directed way to be fun (van Wyck, 2017; Ceylaner & Karakuş, 2018; Brennan, 2021), and indeed, some definitions of self-directed learning stipulate that SDL should be enjoyable for the learner (Fischer & Sugimoto, 2006). This participant's statement that children are *enthusiastic* about and *love* conducting independent research suggests that the learning experience they are having would align with this definition of self-directedness. This extract also aligns with existing literature regarding the factors that contribute to positive student engagement with learning, for example Stephen et al. (2008)'s finding that freedom, active involvement and choice are fundamental in fostering engagement and enthusiasm in learners. The idea of a classroom-wide shift in mood and energy adds weight to the argument that providing young people with agency can have a seismic positive effect on the way the learning environment operates. The use of "ugh" to illustrate a young person's response to teacher-directed learning also suggests some awareness on the part of school staff that some of what they are being asked to teach is not that which the students would be intrinsically motivated to engage with. Being asked to teach a curriculum that is prescribed and lacks student input can lead to their hard work being received negatively - with the exasperation or annoyance conveyed by "ugh," - and it may be worth considering the potential emotional effects of this on school staff.

Other participants suggested that offering young people more opportunities for self-directedness was worthwhile because it had the potential to produce better learning outcomes.

P9: it is quite nice, like for example in their literacy, especially when they're story writing, to be able to give them freedom, because you find that actually what they're writing tends to be more interesting and what they're writing about tends to be better if they're interested in it

There exists research evidence to suggest that attainment is positively correlated with students' intrinsic motivation (Taylor et al., 2014), and therefore the idea that children produce better writing related to topics they are interested in and have chosen for themselves aligns with this finding. In addition, given that some authors have expressed concern that traditional, teacher-directed formal learning environments are inherently discouraging of creativity and original ideas

(Morriss, 2022), the extract above has important implications in terms of highlighting the value of incorporating elements of student freedom and self-direction into creative tasks in particular.

The idea of young people being given a choice of topic to write about within a strongly teacher-directed environment in which teacher-directed success criteria are still applied would not fall within every definition of 'self-directed learning.' However, historically the construct of 'self-directedness' has been described by some scholars as a continuous variable or a spectrum (Grow, 1991; Kerka, 1994), and if used in this way it can be used to draw comparisons between lessons with more or less student freedom - just as this participant has done. By conceptualising self-directedness in this way, implications for practice can be drawn that can be practicably implemented even within teacher-directed, formal education environments in order to produce incremental changes towards a greater degree of student self-directedness.

During a discussion about how technology is used in their classroom, Participant 7 suggested that fostering the ability for self-directed learning in students reduces the pressure on teachers to acquire completely comprehensive understanding of the technology-based learning material that their class is using.

P7: they are creating brilliant things, lots of our Kodu units like we provide like I said before an umbrella target like, create a racing game or this game, and they come up with something better than I could do or better than I could teach them cause I don't know how to do it so, under the self-directed sort of label of that, they are quite, most of them are successful

By encouraging students to draw on their existing tech competence in order to learn to use new software, the responsibility of teachers shifts to facilitating the educational experience rather than completely directing it. This idea that as technology and self-directed learning become more embedded, teachers will become more like guides than directors of the learning experience has been proposed across relevant research literature (Grow, 1991; Conradie, 2014; Karakas & Manisaligil, 2012), and it is possible that such a shift in the teacher's role could lead to a reduction in pressure placed upon them. Moving to a model in which responsibility for the learner's experience is more shared rather than resting solely on the teacher's shoulders could ameliorate the effects of accountability stress that many teachers currently experience (Jerrim et al., 2021).

As well as providing interesting insights into the role of the teacher, Participant 7 suggests in this extract that lessons that enable students to be more self-directed could lead to improved outcomes, particularly in lessons involving technology in which students tend to have a higher level of preexisting knowledge. Given that classrooms are increasingly populated by technologically skilled digital natives, (Prensky, 2001), the idea that increased student self-directedness could support improved learning outcomes in these lessons in particular is important to consider.

Participant 8 also spoke about the potential for bidirectional learning between young people and their teachers that self-directed research using technology can provide.

P8: what the children find can surprise you and and therefore they're teaching you something that you didn't know […] that's really fascinating for me to hear, and my research that I'd have put out in the room might not have given the children that

It must be noted that existing research literature suggests that the ease with which debate, role-swapping and bidirectional learning can take place within the learning environment is highly dependent on the culture of the school (Fischer & Sugimoto, 2006). However, this extract suggests that incorporating both technology and a greater level of self-directedness into exploratory lessons could broaden the scope of the learning experience, allowing a wider range of potential topics to be covered and facilitating the introduction of new knowledge to the class without creating additional work for the teacher. As discussed above, teacher workloads and wellbeing are a significant cause for concern in the UK (Jerrim et al., 2021) and therefore insights that provide support for adjustments to teaching practices that reduce demands on teachers are significant and timely.

The idea that technology-based self directed learning had the potential to create breathing space for teachers recurred across the dataset. When I asked Participant 1 to provide their impression of what is meant by the term "self-directed learning," their answer incorporated the idea of SDL as being less effortful for teachers.

P1: we would give a child say an app to do with literacy or maths or whatever, um and it would sort of self direct them on how, how to learn rather than putting so much pressure on the teachers it can, that can be used to just give that bit of extra help

Participant 1's construction of self-directed learning appears to suggest that direction from a piece of educational software might be deployed in order to allow students to be guided without placing additional demands on school staff to monitor and differentiate their progress. This seems to be a situation in which the technology provides a bit of extra help to both the learner and the teacher at the same time.

As well as being valuable for school staff in a practical, logistical sense, several of my participants expressed affective positive responses to facilitating self-directed learning for their students.

Int: What are those lessons like as a teacher, those exploratory lessons?

P7: I love them because it's those moments of like, 'oh my gosh, look what I found out, look what I've discovered,' and it's, yeah, I really like those moments of 'ohh I've, I've found something for myself or done something for myself rather than just being told it' […] which, is lovely to see when they're like that, yeah.

Given that teacher wellbeing and retention is a concern in the UK and beyond (Jerrim et al., 2021), I would argue that it is more important than ever to assign some weight to school staff's affective responses to the practices they are being asked to implement. By giving some consideration to staff's preferences, it could be that overall, teacher wellbeing might improve and a larger proportion of teachers could be recruited and retained.

As well as finding it enjoyable and satisfying to witness their students learn in a self-directed way, other participants appeared to feel a sense that facilitating agency and choice was the *right* way to teach. Participant 8 spoke about their efforts to implement an inquiry-based approach to humanities education that emphasised the opportunity for students to make choices within a broader topic around the particular areas that they wanted to study. P8 spoke with enthusiasm about this and made it clear that they felt it should be a priority for their school.

P8: that's where we're at as a school developing and I'm gonna then do a hand over to the next lead to try and really push that particular point because I think it's, I think it's the right one

Participant 9 also suggested that providing their students with more freedom was something they would consider spending time incorporating into their teaching in the future.

P9: it might be something that I introduce more as I go through my practice

These responses, as well as the other extracts collated above, illustrate that there was a pattern across the dataset whereby participants expressed that facilitating self-directed learning is valuable, purposeful and worthwhile. However, most participants also mentioned significant logistical and practical challenges that were associated with attempting to provide their students with greater opportunities for self-direction.

As previously discussed, some participants suggested that self-directed learning could reduce the pressure placed on teachers; however, other participants stated that creating lessons with opportunities for choice and freedom were likely to be more effortful for teachers, compared to traditional, wholly teacher-directed, linear lesson structures. When asked whether the use of educational technology ever contributed to an increase in teacher workload, Participant 1 said the following.

P1: it's probably easier if you could sometimes sit there and think, 'oh, I'll just put the, put the slide on the board and they're just to write it on their paper, done,' but no, you've got to be like, 'OK, right, well, you can Google it if you want, or-'

This response contrasts traditional, teacher-directed methods of providing students with information with a more self-directed approach, facilitated by technology. The characterisation of teacher-directed lessons as "easier" suggests that for some school staff, facilitating research-based lessons is still more effortful than one in which they have collated all the educational materials themselves. Participant 9's comment above about incorporating more freedom into their lessons as they progress through their career, spoken as someone who described themselves as a fairly

new to their current role, also suggests that introducing more learner autonomy into lessons is perhaps something that only an experienced member of school staff could pull off.

In the majority of the interviews, participants made allusions to the fact that the school day is tightly timetabled in order to ensure that National Curriculum objectives are met, without much time to spend learning about other topics or for exploration. When I asked Participant 8 about what affects the design of their lessons, they shared the following reflections.

P8: time is a big thing, if we've got one lesson and I need the children to have some information to support an argument at the end of that one lesson, I might steer that a little more
Int: I wonder whether that's really a time constraint or whether that's a curriculum constraint?
P8: quite possibly, […] the curriculum definitely does play a part of this and and our curriculum is huge, and we have a responsibility to teach that to the children and they get one shot to learn that, but is that detrimental to their self study, self directed study? quite possibly.

The idea that opportunities for self-directed learning must be sidelined in order to ensure that the learning objectives of the curriculum are met could be considered examples of adultism (Wall, 2019), as it is suggesting that adults are more capable of determining what a child should learn than the young person themselves, simply because of their age. Proponent of critical unschooling Noah Romero suggests that mainstream curricula serve to reinforce and replicate hegemonic power structures (2018), and by limiting the opportunities young people have for independent exploration of other perspectives, it could be argued that the constraints of the curriculum are stifling criticality and creativity. Van Deur's interviews with elementary school students found that the children were clear that they felt much more able to learn in a self-directed way at home than at school (2011).

Similarly concerned about meeting the demands of the curriculum, Participant 9 spoke about the pressure to produce a tangible end product at the end of every lesson, in order to evidence progress towards the required learning obectives.

P9: especially in say foundation subjects where there are, you know, Maths you need to teach through teaching, so there's there's there's no real room there, you need to cover the national

curriculum and that's it. But with foundation subjects there are, there is a lot more flexibility, but it is then at the end right well, how can I produce something that shows how well they've done over the course of this term? […] and also making sure that you, you're covering everything that you need because it's almost like you've, you've got to get some sort of really heavy teaching in almost every lesson to be able to achieve what you need to achieve.

From the above response, it can be inferred that P9 feels that they have little control over the material they teach to their students, and even when there is an increased element of choice they feel a strong obligation to be able to evidence the effectiveness of the choices they have made. Their use of the words "heavy teaching" suggests an amount of course material that is burdensome for teaching staff, and perhaps also for students. Additionally, the phrase "no real room" conveys the image of a crowded environment in which no space can be made for self-directed learning, to give young people more agency and autonomy, even when the teacher wants to. Their comments also evoked feelings of crowdedness in the extract below.

P9: imagine if you, I mean giving a child, especially in a classroom where you've got twenty eight children total freedom and giving each twenty eight, you know, all twenty eight of them… it would be absolute carnage.

This response suggests that the number of students each teacher is required to teach creates a constraint on the degree of freedom that those teachers can provide for each student. Indeed, schools such as Summerhill which afford as much freedom as possible to their students tend to have a fraction of the number of students on roll relative to their mainstream counterparts (Vertel, 2023). Class size was referenced by several participants as a factor that made it challenging to provide a nurturing, tailored learning experience for each of their students.

P6: as a teacher, how, how do you accommodate for everybody's journey? Do you have to script some of that or direct a little bit of that within the situation of having thirty children?

This extract aligns with statements made by other participants suggesting that facilitating self-directedness will create more work for teachers. Here, Participant 6 appears concerned that the effort required to be prepared for a full class of students to all have different learning journeys

might be a prohibitively large amount, and they refer to *having to* script or direct the learning trajectory of their students more closely as a way to manage the fact that they are expected to educate such a sizeable group of people at the same time. Similarly, P7 described the diversity of learning needs in their classroom and how challenging pitching their lessons appropriately could be.

P7: what I always found interesting there was seeing the range of approaches, you'd have some children that would jump straight in and try and make a game, 'I'm gonna try and create this thing,' other children would spend a lot of time working on the Avatar, the character, making a, playing around with those settings, and other times, other children sorry, would say 'I don't know how to do that, how do I do it' and so they want a lot more instruction […] I think that level of freedom can worry some and it can be quite exciting to others, so you find in a class of 30 you will get lots of different groups and it's trying to pitch things in the right way.

Here, Participant 7 shows awareness of the fact that within their class, there are likely to be students who are at vastly different levels of readiness to engage in self-directed learning. Much of the self-directed learning literature refers to the processes of acquisition of the skills that are required for successful SDL, from Grow's staged model (1991) to empirical studies in which these skills are explicitly taught (e.g. Sellars, 2006), and the development of quantitative instruments to measure the SDL readiness of learners (e.g. Teo et al., 2010). Participant 7 here echoes the idea that the level to which these skills have been developed will differ between learners, and that these learners may request different levels of teacher-directedness in order to be successful. Grow suggested that it is the match between the self-directedness of the student and the directiveness of the teacher that is most important for success (1991). P7 expresses the difficulty inherent in attempting to meet the needs of all 30 of their students in the *right* way, a feat that seems very challenging if not impossible.

Throughout the interviews, my participants often expressed a desire to facilitate self-directed learning in their classrooms. Many of them stated that they and their students enjoyed lessons that involved learner freedom as well as appreciating the subsequent boost to engagement and intrinsic motivation, and they remarked that often learning is more successful on these occasions. However, the interviews highlighted several logistical and practical constraints that limit the

opportunities that school staff have to fulfil this desire, most significantly: workload, curriculum constraints and class size. The fact that most of my participants experience these constraints as prohibitive to their ability to foster SDL skills may reflect wider issues in mainstream formal education environments, and if so, it is likely that students will continue to leave school unprepared to engage in successful independent study (Asfar & Zainuddin, 2015) unless these practical concerns are addressed. Researchers have long suggested that shifting towards teaching paradigms that support SDL would be a complex process for teachers, schools and society at large (Bolhuis, 1996), and indeed these findings suggest that any policymakers wishing to encourage the facilitation of self-directed learning skills in young people must take into account the features of our current system that are currently making this difficult.

User Guide Not Provided

This theme was generated from the statements my participants made around the idea of technological competence - the ease with which people are able to employ digital software and hardware to achieve their objectives. Both learner tech competence and school staff tech competence were discussed in detail, and through both conversations there was a thread related to the persistent absence of a functional, systematic and effective route by which competence and confidence with new technology can be reliably acquired. The ability of both staff and students to confidently acquire competence with technological tools is a significant factor in the potential for these tools to be used to foster and facilitate self-directed learning.

Many of my participants, selected because of their employment in schools that use a relatively large amount of educational technology, suggested that teaching with access to a wide range of digital software and hardware is fundamentally different to teaching in more traditional school environments, using traditional educational materials.

P2: I think it would be weird going to a different school
P3: you know what, I would actually be a little bit lost without the iPads now
P4: I don't know how I'd feel if I came from a school that had no technology, I think it would be strange

These comments suggest that my participants have likely made adjustments, learned new skills, and acclimatised to ways of working that involve technology. When asked about how teaching with technology was different from teaching without, several of my participants emphasised that the effective operation of educational technology requires that teachers acquire new knowledge and skills.

P6: you've gotta have a wider range of skill sets, you've gotta know how technology works and how programs work

Given that my participants expressed feeling that teaching using technology is a very different experience, and that it requires a new set of skills, I was prompted to ask about what specific training is available to them in order to support them to meet the tech-related demands associated with their roles. Two of my participants reflected on the gap between the technology they were trained to use during their initial teacher training, and the technology they feel they are expected to utilise now.

P2: yeah cause like my teacher training, they didn't really speak much about iPads and technology

P7: when I was doing my PGCE even three years ago AI was just not even mentioned, umm but it seems to be cropping up a lot more on sort of the social media teacher pages that I'm on

Research has begun to highlight the need for an increased focus on technology within initial teacher training (Meisner & McKenzie, 2023), and this finding suggests that ensuring the input is up to date should be prioritised.

I also spoke with most of my participants about the training they receive as part of their continuing professional development, particularly when new technology is introduced to their school. Almost all participants could find examples of areas in which they felt they were expected to incorporate technology-based approaches into their practice without having first been provided with appropriate, comprehensive training. Many of my participants spoke quite starkly about their experiences.

P2: it felt like I came here, I got given an iPad and they were like, OK, off you go

P9: It's interesting actually, because I don't, I wouldn't necessarily say that there's been any sort of explicit training given?

Several of my participants felt that a lack of training meant that their practice was less likely to be effective, and they were less able to confer the potential benefits of using the educational technology in question to their students.

P1: I don't have, as much training, and as much knowledge in some of the apps that the children use, so I'm not, teaching them how to use them apps correctly

P2: I feel like we've got loads of apps on the iPads, but I don't think I'm using them to the best of my ability, I feel like I don't really know, I know they're on there, but I don't know how to get the best out of them and how to use them in the best way

It is very possible that a lack of focus on competence with technology in staff professional development is indeed compromising practice in some schools, and it is possible that this is subsequently having an effect on learning outcomes, though that is well beyond the scope of the current study to measure. However, what can be outlined is that my participants expressed low confidence in their own ability to use technology effectively, and psychological theory suggests that lower self-efficacy can be corrosive to a person's engagement with their work. For example, the self-determination theory of motivation (Deci & Ryan, 2012) suggests that a person's intrinsic motivation to engage with a task is formed in part from their sense of competence. Therefore, any circumstance in which school staff are being required to make use of teaching practices that they do not feel confident administering could be damaging to motivation and morale. The fact that a lack of training was a recurring theme across the interviews suggests that this is something school leaders must consider particularly in cases relating to the introduction of new technology. When I asked what working a school with technology was like for them, Participant 1 demonstrated this quite clearly.

P1: that's probably my worst part that I don't have, as much training, and as much knowledge in some of the apps that the children use

In situations in which school staff are being asked to put into practice approaches without receiving formal training from their leadership team, their knowledge of the software and hardware provided to them must nonetheless come from somewhere. Participant 2 mentioned that the task of providing new support staff with training sometimes falls to teachers.

P2: the teachers were kind of expected to tell TAs how to use the iPads, which is a lot of pressure on us.

Given that teachers already generally experience very high workloads (Jerrim et al., 2021) and have sometimes not had comprehensive training on the technology themselves, it would likely be beneficial for schools to make alternative arrangements in order to ensure that new support staff are adequately supported without increasing the demands placed on teachers. Participant 2 describing the request as 'a lot of pressure' suggests that the additional responsibility may have been difficult to manage, and in order to combat rising attrition in the teacher workforce it will be important for schools to attend to the factors that are creating unnecessary pressure on their employees (Jerrim et al., 2021).

Some of my participants reflected on the expectations placed on them to pursue training independently.

P8: I think the training can be as much as you allow, but it's often self directed which is interesting, so there might be an initial push, but again historically with the introduction of new technology, I do feel like some staff feel quite unsupported with it, because it's knowing how to access the training, I think with the hardware you mentioned, the VR headsets, the training comes within the website that you've been signed up to, so that's where you create the bank of lessons for the children but that's where the CPD [continuing professional development] is also held so you don't get somebody coming in to train you as you would have had the traditional CPD in the past, it's very much you learn by watching these videos, interacting with the resources that are there, that's what the payments go towards, but do people have the time to access that training? Yes, if it's

taken out, like you've got an afternoon go and do that training, absolutely, you've got the time, but, but if you're not given that time, you've got to find it somehow, and therefore is it CPD, or is it just your own self study?

P8 here describes an experience in which the traditional teaching method - 'somebody coming in to train you,' - has been replaced with a novel, technology-based approach - 'you learn by watching these videos, interacting with the resources that are there.' Conradie's 2014 paper exploring the use of online learning environments predicted a reduction in the role of the educator over time in favour of online and self-regulated learning practices, and this is reflected fairly directly in this description of the educational experience that was offered to P8 and their colleagues (Conradie, 2014). The use of this approach by school leaders to educate their staff could be seen as an endorsement of technology-based, self-directed learning in which the role of the instructor is very minimal. This raises interesting questions around the differing experiences which are made available to adults as compared with children - it may be that if this approach is being used for workplace professional development, it would be sensible to allow young people the opportunity to practice learning in this way rather than expecting them to switch abruptly from directedness to self-directedness (Maphalala et al., 2021). Further research comparing the experiences of staff trained in this way as compared with traditional CPD could shed light on the advantages and disadvantages of this approach.

Participants 9 and 2 recounted similar experiences around the expectation that teachers be responsible for their own competence with educational technology.

P9: I think it would be nice to sort of have, more training on, sort of what it is, especially we're teaching within sort of computing like Scratch like Flow or like the radio station program, because we were given a sort of unit and then 'right, you teach it,' but actually do we all know how to use it? and I think a lot of the ownership has been on, I think every year group across the board uses Scratch, but we've never had any training on Scratch, so it's a case of, you teachers teach yourself, but hang on, when am I going to find the time to teach myself Scratch? because it's such a new program.

P2: we also had to plan all this technology on top of the normal lesson so it was like planning a lesson plus all this technology like, thrown at you, then you had to, like, teach yourself how to use it almost

Research into how best to preserve the mental health and wellbeing of teachers has listed support for professional development as a key recommendation (Jerrim et al., 2021), and it is likely that providing adequate time and resources for staff to feel competent with the programs they use would be beneficial for their self-efficacy and motivation, as described above. Spiteri et al. (2020) write that teacher skills, attitudes and knowledge are of paramount importance in the successful implementation of new interventions, therefore any novel approaches developed with the aim of facilitating SDL must be accompanied by consideration of the school staff who will be implementing it.

In the absence of formal training, many participants spoke about a more on-the-job style of learning, whereby new knowledge and skills were acquired by observing and interacting with others with more knowledge, or simply via interacting experimentally with the technology itself.

P1: you just, I think you just you just sort of kind of get on with it and everything I learn, I learn from the children or when the teacher's displaying it on the board or, you know, so you always, you're always learning aren't you with technology, so

P6: so many new programs and things like that to understand how they worked and a lot of it was, you know, sort of, trial and error really sometimes

P9: again with the headsets it's a case of having a go, [colleague] and I stuck them on one afternoon,, set up a program and just, and it's sort of learn as you go really, yeah, no actual explicit training

A high proportion of my participants made comments like these, suggesting that there may be a widespread expectation that school staff acquire new skills by trial and error. Further research into whether this is the case, and perhaps into the outcomes of this practice as well as the views of teachers around it, would shed light on whether this may be a useful site for change in terms of

improving the CPD school staff receive around technology. In order for school staff to be in a position to use technology to develop self-directed learning in their students, they must first be competent with the technology themselves.

A few of my participants did report experiences of receiving formal training in the use of new educational technology. Participant 6, who in general spoke positively about technology and expressed confidence in their use of it, said the following.

P6: something that [Head's name] might bring in, the headmaster, you know, he might give us plenty of information on it and access to professional development before we use it

However, I also spoke to Participant 1 about the effectiveness of the formal training they had received. As illustrated below and in the extracts presented throughout this theme, Participant 1 describes themselves as not very confident with technology in general.

P1: in the past we've had like bits of training on sort of Sumdog and things like that, TT Rockstars, I'm not the most technical person, I admit that.

Int: Do you feel that it kind of prepares you enough?

P1: Um, probably not, no, cause I'm always getting children come up to me and go 'oh, miss, can you just show me how to do this?' And I'm like, 'hmm, hang on, let me see, I'll, I'll just ask, I'll just ask the other teacher,'

The contrast between P6's 'plenty' of input and P1's 'probably not' enough preparation could be because they have received different amounts of formal training. However, it might also be that staff with differing levels of preexisting knowledge and tech competence require different levels of input from school leaders in order to practice confidently and effectively using the educational technology that is made available to them. There exists research evidence for the idea that teachers who were more confident in using technology are more likely to see it as useful (Blackwell, 2014), and therefore time spent tailoring training and professional development

opportunities to ensure that they are sensitive to the current skill level of staff could be an important investment in school-wide best practice.

Several of my participants spoke about feeling intimidated by newer technology, to the point of rarely using it.

P2: I think sometimes we don't use it because we have don't know how to use it, and don't really wanna stand in front of the children and look like an idiot, like 'oh, I don't know how to do this, don't know how to do that'

P3: we've got a 3D printer, we've got, and I do, that overwhelms me a bit, I don't use that very much.

From reading these extracts, it appears that for these participants, in these particular situations, their use (or not) of technological hardware is strongly impacted by their feelings. Participant 2 expresses concern about 'looking like an idiot,' suggesting that being put in a situation where they were asked to use technology without sufficient training is something that has the potential to be embarrassing for them. Prior research has found that some teachers report that knowing less than their students about a particular technology might disincline them to make use of it (Morsink et al., 2011). If this is the case, not investing sufficiently in professional development could contribute to wasted resources in the form of superfluous, rarely-used hardware, and also has the potential to compromise the wellbeing and motivation of school staff, contributing to workplace stress (Jerrim et al., 2021).

Several participants made comments suggesting a link between confidence with technology and age among school staff.

P9: somebody like myself who's taught for a couple of years, still relatively young so, you know, I've got, I like to think that I've got a good grasp of technology
P1: that's my age, I blame it on my - '[P1]'s really old now, so I might have to get somebody younger to help me.'

P1: I suppose it's your personal opinion what, what you think of technology some people swear by it and they say, oh, there's, you know, there's nothing better, that's what they're going to be using when they're older, like the way forward is technology, um, obviously for a few of the older generation then that's, you know, a bit like oh no I still like to see a pen and paper I like to see a book

P7: some of the older, they won't mind me calling them older, members of the team really do struggle a bit more because they find it very frustrating and they don't know how to troubleshoot as well, so I end up doing it with them a bit more […] like I find it hard to keep up with so like, I can't imagine how it is for people in their 60s, like, to be keeping up with it

This finding also highlights a need for school leaders to plan and provide training that will meet the needs of staff groups who may have differing levels of familiarity with technology. Research suggests that accounting for prior experience and comfort with technology results in more effective CPD (Tour, 2015). Research into teacher attitudes towards tech found that teachers with more experience tended to have less favourable attitudes towards technology; it may be that this is linked to the current findings around age (Blackwell et al., 2014).

Many of my participants had expressed some discomfort around their own lack of confidence with technology, and in many cases they expressed feeling as though the students were more confident with technology than they were. Most of my participants perceived this not as a threat but as something to be celebrated. During my conversation on the topic with Participant 6, they reflected on this, and suggested that this might be due to an evolution in classroom culture.

P6: when I first started teaching teachers had a fear of that because that felt like they were they losing control, or they didn't have control of something , but actually nowadays, I think conceding kind of knowledge, knowledge or conceding sort of to children who know more about something than you is actually fine.

The potential for technology to create not only self-directed learning for students but also bidirectional learning between teachers and students could be a positive step towards a more collaborative culture within schools, as opposed to the teacher-student hierarchies that are currently widespread and which some critical scholars describe as oppressive (Wall, 2019; Romero,

2018). Indeed, many of my participants made reference to instances in which they had learned something about how to operate their educational technology from their students.

P2: sometimes I have to be like 'oh, how do you do this? how do you do that?' and then they're telling me how to do it

P5: 'Kids, do you know how I need to do that, […] how I can connect or share class code on Showbie?' 'Oh, I know, miss.' Straight away. 'Okay, oh, thanks'

P1: everything I learn, I learn from the children

When considering how best to implement improved training for school staff, utilising the knowledge of students to support this could be a powerful way to increases students' sense of being agentic participants in the classroom.

In a similar vein, other participants reported encouraging collaborative learning between their students, and that this could be used to supplement gaps in their own knowledge of the technology the class were using.

P6: I don't have to be the expert at coding because I might have, you know so and so in the room, who actually he's been spending all his summer holidays coding, you know, his own game and like, 'ohh so what would you.. let's, let's everyone listen, what would you do in this situation?' 'well, I would use a' 'ohh brilliant OK, let's try that now, that works perfectly, OK, class, there you go,'

P7: when you've got five or six kids that know how to do it, you can then send them out to be like, 'can you show the other people around you how to do it?'

This links to findings discussed in the first theme, whereby the potential for technology to ease pressure on teachers was highlighted by several of my participants. This finding also links to earlier data points regarding the usefulness of technology for collaborative work, and to research such as Karakas & Manisaligil (2012) which emphasised the potential for collaboration as a key application of educational tech.

However, while most of my participants described young people as overall more competent with technology relative to previous generations, this finding was not universal across all forms of technological hardware. Several participants specified that typically, their students are much more confident using tablet computers than laptops or desktops.

P8: we've found the children are brilliant with iPads, their touch screens they're so used to, you put a laptop in front of somebody and all of a sudden using the mouse pad, is an hour long lesson
P9: when they first got their laptops, it was quite difficult for them to use, they weren't used to keyboards, it was all touch screen

Participant 7 speculated that this might be due to the sorts of hardware their students have access to at home.

P7: not many of them have laptops, most of them have tablets. A lot, some of them do have laptops, but most of them have tablets so they know how to use tablets and iPads and stuff, but they're less confident on the laptops.

This was presented as cause for concern by several of my participants, and they spoke in detail about the challenges of attempting to teach using technology that their students were not confident or competent using.

P7: it's like, 'ahh, I don't know how to do this, I don't know how to do this, I don't know how to do this' and you're constantly trying to fight fires for them because they can't seem to problem solve themselves with 'oh this has come up what do I press?' and I think they're really scared of pressing the wrong thing […] some ICT lessons and lessons for laptops can be really intense and really like 'guys, I can't have a queue of fifteen of you waiting for me to press a button, can you just figure it out?'

P8: The children don't know of the existence of the undo button, they don't know some of the keyboard shortcuts that can get them out of a sticky situation, they don't know about minimising windows and and or having split screens so that they don't need to keep swapping between

windows and forgetting what they've just read, they don't know sometimes how to find the @ symbol in order to log on to their profiles, they don't know when a a message comes up about accept these cookies to to click OK or you know, and these are things when you're teaching a programming unit that you don't want to go over, you don't, you don't want to spend the first half an hour of already a tight one hour programming lesson going through how to log on, how to find the program itself, how to navigate through any error message that pops up

It is clear from these extracts that this is an exasperating experience for these members of teaching staff. While their students have high levels of competence with novel software and touch screen technology, they are less familiar with personal computers and this creates barriers to engagement in laptop-based lessons. When I asked my participants about the origins of this problem and how it should be addressed, several of them explained that they perceived gaps in the National Curriculum for computing.

P7: I suppose just like sort of the basic skills of like typing and stuff like I think ((sighs)) our IT curriculum sort of jumps a bit because it has this assumption that children can do some things when actually they don't necessarily know how to do those things so sort of the skills like, typing and all that

P8: I just worry that we're trying to get these children to learn how to program but if they don't know how to type, they don't know how to compose, er, for example, if you're programming something, if you create a video game, you're gonna want to type the brief of it, you're going to want to be able to write down the instructions. And children might have made this game, but they can't communicate how to actually play it, or what the purpose is, what is the aim? how do you win the game? And so I I think workshops or at least an element of the curriculum early on that helps the children do that, but then time to time to do it, time for the children to actually learn it.

Here, two of my participants suggest that there are important omissions in the curriculum related to prerequisite knowledge of hardware that is being incorrectly attributed to their students. During my interview with Participant 8, we discussed the fact that, anecdotally, when we were middle school students the families we knew tended to have a central family computer, and little to no touch screen technology, whereas now their students tend to have smartphones and tablets at

home rather than laptops and desktops. The curriculum still appears to assume that young people will be exposed to personal computers at home, however increasingly this is no longer the case. This links to earlier findings by Morris and Rohs (2023) that in several prior studies exploring technology and SDL, researchers found that young people lacked the necessary technological competence to engage with tech-based learning approaches. It will be important for schools who wish to incorporate educational technology to ensure that students are provided with adequate time to become familiar with necessary hardware at school, as trends in home and recreational technology use are likely to continue to shift. Additionally, to rely on students being able to access this hardware at home could serve to perpetuate socioeconomic inequality.

In addition to the lack of focus on mastery of basic computer operation skills, Participant 7 raised another topic that they felt was missing from the current curriculum.

Int: Do you feel that the IT curriculum kind of meets the needs always, or?
P7: No, I don't think there is enough time for safety and I know it's on there, but I know there's lots of other things on there as well and I just think Internet safety needs to be up there in flashing lights and every single thing needs to be, 'are you safe?' because that is going to be the predominant thing for them

Researchers exploring the potential for young people's digital security to be compromised through interacting with educational technology have stressed the importance of ensuring that students are aware of how to stay safe online (Tlili et al., 2022). It has also been suggested that data privacy should be considered when school leaders are selecting technology based interventions to adopt into their schools (West, 2022).

Throughout all nine interviews, my participants identified ways in which both staff and students could benefit from additional instruction to enable them to make the most of the educational technology that is available to them. Lack of opportunity for formal CPD training has led to school staff teaching each other or learning through trial and error, diminishing their confidence and making them feel as though they could be doing more with the technology they have. The gaps in student understandings of how to operate computer hardware are causing long delays and staff frustration during computing lessons. As technology becomes more embedded in schools, it will be

crucial to develop systems that enable staff and students alike to acquire the tech competence they need for successful teaching and learning, and interventions that use technology to facilitate self-directed learning are unlikely to be successful without this. Ensuring that students can operate hardware independently will be a pivotal step towards supporting them to learn in an independent and self-directed way.

Technology Tsunami

This theme encapsulates instances in which my participants expressed concern or disapproval around the increasing use of technology for educational purposes. While all of my participants had positive connotations around technology, there were also lots of instances of them talking about the development of new technology as something intimidating, to be resisted or tempered, and also at the same time as something that was inevitable. The presence of these characterisations brought to mind the image of an unstoppable tide. School staff attitudes and affective responses are likely to significantly impact the ways in which tech-based approaches are implemented in schools, including those which involve self-directed learning (Forman et al., 2013).

Several participants made comments suggesting that introducing novel technology and tech-based approaches to the classroom has the potential to be stressful or anxiety-inducing for school staff. I heard from Participant 9 about some teaching approaches they had learned about online that make use of artificial intelligence, and they concluded with this remark.

P9: I think I'm still a little bit frightened to use it, I think it's the idea of using AI in your classroom, […] I think it's still still very much, not frowned upon, that's not the right word, but.. bit nervous about it, potentially.

The idea that some staff might feel apprehensive about the introduction of new technology is closely linked to the previous theme wherein I discussed reluctance or discomfort that staff might experience as a result of being asked to use technology-based teaching practices without thorough training. This theme however concerns itself with affective responses from staff not related to their felt competence. In this extract, Participant 9 expresses their own reservations and emotional

responses when considering making use of new technology, and also some concern about how using new technology might be perceived by others.

Several of my participants made reference to the idea that developments in technology happen rapidly, and that educational technologies (and therefore the training and competence that relates to them) tend to become obsolete over time. Participant 2 mentioned this explicitly during a discussion about the training that is provided to them at school.

P2: [Teacher X] does do a few meetings, staff meetings on technology but that was last year so obviously there's more things that have come out and I would like to be more updated

This comment suggests that school staff are conscious of the fact that the use of technology in their school will require a greater amount of time and effort to remain up to date with than most analogue teaching approaches. Given that workloads are already cause for concern, it makes sense that staff might feel apprehensive about having to keep up with something new in addition to their baseline administrative load.

Despite the challenges, Participant 8 shared their commitment towards maintaining an up-to-date understanding of technology.

P8: if you are worried by it and you bury your head in the sand, you are going to miss a lot of the developments in technology. I'm aware of how quickly things can be outdated as well, as soon as they arrive in a primary school possibly that technology is already out of date, so you just do the best you can to keep on, that is just the way technology is advancing,

P8 cautions against deliberate ignorance of new developments, and elsewhere during their interview spoke about feeling a sense of obligation to ensure their students were able to access the benefits associated with good quality educational technology. While this extract is clear that staying up to date while working in a school environment is likely to be challenging, it is positive that they also express an attitude of 'just doing your best.' It may be that Participant 8's realistic and non-perfectionist standards are what enable them to consider technology through a positive and optimistic lens. Research literature exploring technology and education suggests that, due to

this rapid pace of development, computing education should focus on teaching students *how to learn to use new tech*, rather than simply educating them on the technology that exists now, in order to prepare learners for the future (Karakas & Manisaligil, 2012). While this idea is important to consider as a strong argument for incorporating self-directed learning into the education of school-age children, these findings demonstrate that this conclusion may also have practical applicability with regards to the training and continuing development of school staff.

During a conversation around the impact of technology on teachers and on the learning environment in general, Participant 6 made the following observation.

P6: certain safeguarding elements as well, it could be, it can be upsetting to see certain children involved in certain situations, you know, with, with, with um, involving technology

The fact that safeguarding came to mind as an issue specifically related to technology for this participant suggests that perhaps some school staff feel that technology creates additional risk for young people in the school environment. Indeed, there are documented examples of situations in which the use of an educational program led to a significant breach of young peoples' personal data (Zaghoul et al., 2022), and researchers in this area caution school leaders to select their software with care and prioritise data privacy within the decision-making process (West, 2022).

As part of a broader conversation around the challenges involved in monitoring children's use of technology, Participant 2 spoke about the ways in which technology facilitates communication between children, some of which has the potential to be inappropriate or lead to safeguarding concerns.

P2: there's Airdrop as well, on the iPads they can send each other pictures and stuff, and sometimes they send each other like really weird messages and they'll send it to like another child in another class, and it's hard to monitor, who they're sending it to and what they're sending.

Participant 6 also spoke in more detail about their concerns around technology-facilitated communication between children.

P6: when I went home, if there has been someone that was giving me a hard time at school that day, that was the end of it when I got in. Nowadays that could continue for children once school time has ended cause they can still contact each other on the phone and that kind of behaviour can still continue

Cyberbullying is considered a global public health issue, with victimisation prevalence estimates ranging from 13.99 to 57.5% of children and adolescents worldwide (Zhu et al., 2021). Cyberbullying can have devastating impacts on mental health, and several participants expressed concern around the possibility of inappropriate or even harmful communication between young people taking place as a result of increased access to technology.

Participant 2 spoke about safety concerns specifically related to providing young people opportunities for self-directedness using technology. During a discussion of how it can be challenging to strike a balance between giving students freedom to pursue their own interests online and monitoring their internet use closely enough to ensure their safety, Participant 2 made the following comment.

P2: there's loads of dodgy things on Google

They followed this by providing a concrete example of an occasion in which one of their students had found an inappropriate image online that had not been picked up by the school's protective firewalls. Participant 8 also echoed the desire to closely monitor and direct students' online research activities from the rationale of ensuring their online safety.

P8: I would probably steer towards a few websites, I would certainly steer towards search terms, just to ensure that safety element

The concern for students' online safety should be paramount in the development of any technology-based learning approaches, but will perhaps be particularly important when those approaches are designed to provide students with greater freedom and independence online; i.e. approaches that would enable them to practice and develop skills for self-direction. The idea of foregrounding safety more in the curriculum was raised as part of the previous theme, and several

of my participants expressed the view that education around safe independent use of the internet is something that schools should prioritise.

P8: I think I think wherever you teach this stuff, safety has to be, you know, a real a real point of focus for us, the same as when we use the Internet in, in the classroom, you know, reestablishing those rules and and and and and how to keep ourselves safe and what to do if we don't, it's all important to do each time.

These extracts suggest that my participants feel strongly about their obligations to safeguard their students and that they harbour some concerns about their safety when using technology. It may be important that the developers of technology-based interventions to support self-directed learning are able to reassure the school staff using and delivering it that safeguarding has been adequately considered and addressed. While keeping children safe online clearly has the potential to be challenging for teachers, it could also be argued that by gradually increasing opportunities for students to access the internet independently, they will be better prepared for the eventuality that they will at some point have completely unfettered access to the internet.

Many of my participants spoke about logistical challenges involved in the use of educational technology. While the ability to operate technology using your voice was discussed by some participants as a really important feature to enable independence in students who struggle with literacy, Participant 1 mentioned that in practical terms, given class sizes and the close layouts of most classrooms, this can be challenging.

P1: and then you've got some kids saying, 'oh, can we, can we use our iPads for, like, finding words?' So they'll they'll speak into Siri and they'll go 'Siri spell this' and then you've got 25 kids saying 'Siri spell this' and then it gets a bit like, 'oh God, really?'

This is a downside to the use of voice-operated technology in the classroom that had not occurred to me personally prior to conducting these interviews, and I feel this serves to illustrate the utility of bidirectional communication between those who are designing and planning novel educational technologies, and those who are trialling and implementing them. The feeling of "oh God, really?"

that P1 describes suggests that some technological approaches can be overwhelming and exasperating for the school staff trying to use them.

Participant 7 also mentioned some unique logistical challenges that accompany the use of technological hardware in classrooms.

P7: yeah, it's a ((sighs)) just sometimes it's little things like the laptops are all in a big trolley, which is great and it's fine that's where all the chargers are it keeps them really neat, keeps them all in the same place, but the chargers are all in there, so if their, if their battery's dying, we have no way of like charging it whilst we're using them so if it dies, it's like, oh,
Int: It has to live back in the trolley till it's?
P7: Till it's recharged again, so that's that's a little bit of a pain

As well as considering and taking steps to prevent staff frustration associated with these logistical problems, school leaders wishing to incorporate technology-based learning approaches will benefit from careful thought around the practicalities of accommodating both the necessary hardware and the activities that young people will be engaging in. Consideration of how the school environment will contain, for example, students using virtual reality headsets, will ensure that school staff are able to get the best from the school's resources and prevent the accumulation of superfluous and rarely-used technology. Similarly, those designing novel teaching approaches that use technology, particularly those that use types or quantities of hardware beyond that which might typically be available in a classroom environment, must consider the logistics of implementation carefully in order to ensure that they are creating programmes of learning that are actually practicable.

Another concern my participants raised when discussing the disadvantages of using technology in the classroom was the idea that their students find it difficult to transition away from it.

P1: when they're told to put them down, they they won't
P1: they won't put them down, they won't listen because they're more occupied on what they're doing on their iPad

While the fact that students find technology-based learning activities highly engaging was raised as a positive thing as part of the first theme, there are also challenges associated with the extent to which tech software and hardware caputures learners' attention. Researchers measuring the impact of technology use on attainment have suggested that access to tech may increase engagement in recreational activities in a way that detracts from progress towards learning goals (Rashid & Asghar, 2016).

Participants also suggested that these high levels of engagement could impact communication and rapport-building in the classroom.

P2: Yeah and just like communicate with [the students] rather than them being on the iPads all the time. Like, 'how was your weekend?' Like, 'what did you do at the weekend?' rather than 'go on Sumdog,' and them just being, like, typing on their iPads
Int: You're kind of less likely to have those chats if the iPads are available.
P2: Yeah, that's what I mean, yeah, cause as soon as they come in, iPad.

Research suggests that positive teacher-student relationships are a significant factor in ensuring that learners have positive emotional experiences of school (Goetz et al., 2021), and therefore ensuring that new approaches do not interfere with these relationships is important to consider.

Many of my participants spoke about the high levels of engagement of their students with educational technology as problematic and creating disruption in their classrooms.

P2: I must say it about 10 times day like, 'lock your iPad screens, put your cover on' and there'll always be one child who's, like, sneakily like going on it

Participant 2's description of having to ask repeatedly for student cooperation and then not receiving it is clearly an experience that has the potential to be frustrating and demoralising for school staff.

Multiple participants drew comparisons between the ways in which young people engage with technology and addiction, or the idea of being unable to control their behaviour.

P5: sometimes they don't pay attention if they enjoy doing TT Rockstars or any Sumdog, so they will be out of control and using under the table
P2: they are really annoying, the iPads, because they're just, the children are just obsessed with them, like addicted to them, like too much
P1: it's a bit like an addiction really
P4: I noticed it both becoming not an addiction, but kind of like a oh, we can't just sit still or read a book, particularly, because it was instantly going on to those apps

Addiction is defined by the NHS as a lack of control over engaging in a harmful behaviour, and information about 'internet addiction' appears on their website (NHS, n.d.) despite the fact that the usefulness of the word to describe behavioural compulsions is disputed (Sinclair et al., 2016). Indeed, some authors suggest that referring to excessive or mindless use of technology as addiction is unnecessarily pathologising, and that by instead understanding an unhelpful amount of technology use as a habitual problem, we open the door to exploring how more helpful habits can be built and reinforced instead (Aagaard, 2021).

At another point in their interview, Participant 2 also drew a comparison between the behaviour of their students with technology and the behaviour of a folkloric monster.

P2: it's hard though because they do get glued to the iPads and they become sort of like zombies

While there exist varying cultural connotations associated with the word 'zombie,' it has been argued that the defining and most salient trait of a zombie is that it is mindless, non-sentient and therefore devoid of free will. Invoking monstrous imagery conjures a strong impression of how some school staff feel when observing their students engaging with technology, in a similar way to the metaphor of addiction.

P6: I think it actually would probably benefit, you know probably benefit, a lot of people, you know a bit more simplistic lifestyle away from technology.

This statement, made without further explanation, seems to indicate an underlying idea about technology being harmful that contradicts other statements Participant 6 made about the usefulness of technology in an educational environment. It is possible that this remark, along with the others listed above, reflects contemporary cultural talking points around the possible harms of over-reliance on technology.

Some participants expressed feeling as though school staff have the potential to contribute to an excessive amount of technology use by their students. Many of my participants spoke about using educational apps or programs as 'gap fillers,' an activity to occupy their class for a few minutes in order to buy teachers some time.

P2: so if I've got a spare 10 minutes where I'm like, trying to print things off or, like, sort out the books, I can say like, oh, just go on Sumdog for 10 minutes

From this remark from Participant 2, it is easy to see why a teacher might be tempted to make use of technology in this way. A recent research synthesis exploring teacher workload and wellbeing suggested that teachers are increasingly experiencing 'time poverty,' in which the quantity and intensity of their work are creating a sense of being out of time (Creagh et al., 2023). Under such conditions, making use of any teaching approach that affords teachers a little more time in the day seems sensible, and indeed could be argued to be a proactive method of safeguarding wellbeing and reducing burnout and teacher attrition (Creagh et al., 2023; Jerrim et al., 2021). However, several of my participants were critical of the practice. Participant 4 raised it when asked a general question about any overall disadvantages of using technology in the classroom.

P4: Um, not necessarily, only as I said before, only the the overuse maybe, we did get to a point where it was perhaps being a little bit more used once again as a, as a, ((pauses)) a bit of a filler maybe?

The fact that gap-filler technology use was foregrounded as one of the only disadvantages of employing educational technology suggests that for this participant, it is a significant problem. Indeed, elsewhere in their interview Participant 4 expressed concern that frequent technology use

throughout the day reduced the number of opportunities for students to practice mindful stillness, and they also posited that it could lead to chronic overstimulation.

Participant 1 also spoke about gap filler use in a negative light.

P1: I think everyone's probably been guilty of it in the past you know if they've gotta, just quickly get on with something and they've said oh just have ten minutes on there or whatever

While elsewhere in the interview Participant 1 showed solidarity with overworked colleagues and did not explicitly place any blame on school staff for overuse of technology, the above characterisation of gap-filler use as something that people are 'guilty of' casts an implicitly negative judgement on this particular usage of technology.

Participant 8 reported that they had used educational technology as a gap filler in the past, and that they knew of other teachers who had done so as well.

P8: I know some people use it, not here necessarily, but I know of teachers that are happy to be open and honest about it, they've said the same, and I think that's great for reflection and growth

Again, the conceptualisation of this strategy as something that teachers need to be honest about in order to support growth indicates that it is seen as something that school staff should be working to eradicate. The fact that my participants as a group both spoke about the advantages of or even the need for gap-filler style use, and also expressed disapproval or guilt about it, could suggest that issues with teacher workload are creating situations in which teachers feel unable to always act in line with their values in order to manage the pressure. It could be argued that there is potential to move classroom practices towards more self-directed learning for students in a way that is explicitly designed to reduce the pressure experienced by teachers, and this finding provides some weight towards the argument for doing so.

Many of my participants spoke about the need to hold back the tide of overuse of technology. When asked what might make them decide whether to incorporate technology or not into a particular lesson, Participant 7 gave the following response.

P7: we try to balance it out so it's not always using them, or never using them and it's just it would be more of a balance, so it's, when we plan out like a topic unit, we have about six or seven topic lessons in that unit, so we'd probably want to use it a couple of times within that particular unit

Participant 1 also expressed a similar view.

P1: as long as you're not going to use it all the time, um, because you can't expect a child to sit there 24 hours a day, all day at school, just being on an iPad

The idea of balance or using technology in moderation suggests that there is something about technology that would be harmful if used 'too much.' Further research drawing comparisons between classrooms that use different amounts of technology could be useful to establish how technology impacts staff experience, student experience and learning outcomes, and to clearly delineate the nature of any particular potential harms. Additionally, exploring the reasons why teachers feel they need to reduce or balance the amount of time their students spend engaging with technology will be an important preface to the development of new SDL-focused teaching approaches that involve increasing screen time.

The interpretations of data within this theme suggest that the introduction of new technology-based approaches may be met with apprehension, concern or other negative affective responses by school staff. This will be important to bear in mind when considering the implementation of teaching approaches intended to foster self-directed learning skills that involve the use of technology. Implementation science research suggests that when developing a new intervention, the attitudes and beliefs of the implementer can significantly impact the success and faithfulness of implementation (Forman et al., 2013), and therefore the creators of new SDL-focused approaches must consider and account for the emotional responses of school staff when designing them.

They Couldn't Cope

In stark contrast to the instances in which teachers spoke about self-directed learning as something valuable yet difficult to incorporate into practice, there were also times in which participants made comments which seemed to suggest that they did not believe their students to be capable of autonomously generating valuable learning experiences without extensive input from an external teacher. This theme, whose title is derived from a statement by Participant 9, draws together instances in which my participants expressed doubt that their students would be able to successfully engage in self-directed learning.

When asked about the extent to which they believe that students should have control over their own learning, Participant 2 gave the following response.

P2: obviously it's important that the teacher's there telling them what to learn about otherwise the children would just search any old random things like, they would just search cats, dogs, bike, you know, so they do need instructions as such

This statement suggests that Participant 2 has witnessed the diversity of topics that their students are interested in, and, as discussed above, experienced that often their desire for self-directedness comes into conflict with the learning that is prescribed by the curriculum. Implicit in the idea that they *need* instructions is a clear idea of what the optimal learning goal is, and this is typically determined by policymakers, beyond the control of either the students or their teachers. The idea that the importance of keeping students on track towards this goal is *obvious* leaves very little space for consideration of the value of any learning experience that is entirely driven by the student's interests or intrinsic motivations. Statements asserting that students require instruction in order to pursue valuable learning experiences appeared in several interviews, and my participants rarely qualified these statements; this makes sense, as the idea that adults should exert influence over what children do is highly normalised and forms the dominant ideology in most schools (Wall, 2019).

Participant 9 expressed the belief that self-directed lessons should still involve a high level of planning by a teacher.

P9: with these more self-guided lessons, typically there's more preparation then because you need to make allowances for their choices.

The idea that creating more possible directions for a young person's learning to take will necessarily require that each direction be prepared ahead of time by an adult is one that makes sense within a highly teacher-directed, formal learning environment in which a curriculum must be followed and set learning objectives must be met every day. However, there is evidence to suggest that young people are able to generate meaningful learning experiences and forge their own paths independently of a teacher or facilitator (Brennan, 2021), and indeed some scholars would argue that this is a condition for learning to be considered truly self-directed (Ponton et al., 2009; Fisher, 2023).

Other participants raised concerns that while some of their students might be capable of directing their own learning, others might not.

P9: my first class were an incredibly challenging class where you couldn't give them freedom, because they couldn't cope, whereas this lot I've been able to give them a lot more freedom because they can cope with it and so it's, it's providing them what they need, whereas I would say self-directed the first year would have been an absolute car crash, it would have just been awful.

When asked to elaborate about the difference between coping and not coping, Participant 9 characterised coping well with freedom as listening to instructions, staying on task and asking good questions; in short, it seemed that P9 was measuring the young people's ability to independently remain focused on an adult-directed task. This construction of self-directed learning is one that is sometimes used in the SDL literature (e.g. Glaubman et al., 2012; Tan & Koh, 2014), but it is also one that can never rank more than half way up Roger Hart's Ladder of Children's Participation (Hart, 2008).

While Participant 9 differentiated between the ease with which they could allow for self-directed learning experiences between classes, others drew comparison between different categories of student within their class.

P7: my issue with it is, the ones are successful are the ones that already know how to do it, I'm not sure how much the ones that don't know how to do it already are gaining from that.

Here, Participant 7 expresses some concern that only some of their class group are able to engage meaningfully and purposefully with self-directed learning. Their characterisation of "the ones that already know how to do it" might suggest that students who are generally higher attainers are more able to engage with SDL, but they could also be referring to students who have already been exposed to adequate teacher-directed instruction, or who had had more time to practice a specific skill. In either case, this response suggests that they feel some young people are less capable than others of benefiting from opportunities for self-direction. Participant 9 expressed similar concerns that students with differing levels of academic ability would respond to greater freedom in ways that were challenging for teachers to manage.

P9: [by] giving them freedom, are you then losing your lowers, sort-of-catching your middles and then your highers are on something completely different?

This aligns with Grow's writings that students with differing levels of SDL-readiness may require different teaching approaches, and that those with low readiness may actually be disadvantaged by the use of a less directive teaching style (1991). He advanced the idea that teachers must be aware of and responsive to the level of directiveness their students require, and in line with this, Participant 6 provided a definition of self-directed learning in which the sensitive input of a teacher is central.

P6: self directed learning for me that is, um, me as a teacher facilitating a theme, a question, an overarching sort of lesson objective, umm, discussing the success criteria which, or framework in which to succeed as a learner, and then them carrying out that research or using technology to help them achieve that discussed learning objective and success criteria

Participant 6 here describes thoughtfully scaffolding the learning process they are guiding their students through in order to meet predetermined objectives and criteria. It is presumed that they are referring again here to criteria which are handed down by educational policymakers, and this is presented without challenge or problematisation. However, researchers who conceive of self-

directed learning as child-initiated and intrinsically motivated (e.g. Partridge et al., 2015; Fischer & Sugimoto, 2006) would argue that in order for self-directed learning skills to truly be learned, students must be afforded the opportunity to practice working towards their own goals. When probed regarding their reasoning behind characterising SDL as something that requires teacher preparation and guidance in order to be effective and meaningful, Participant 6 gave the following response.

P6: I think some people might think it's well, 'here you go, here's, you've got an hour on the iPads to research blah blah blah,' well, I don't know if that's gonna be successful self directed learning, I think you have to, to give them the toolbox in which to select their tools first, so if it is a research project or something like that where, where technology might assist, actually you need to still give them a framework in, with which to succeed

This further detail seems to allude to the idea that people require strong self-regulatory and metacognitive skills in order to be able to engage in productive and successful learning processes. In contrast to writings which propose that human beings are born with the capacity for exploratory behaviour that itself qualifies as self-directed learning (e.g. Ponton et al., 2009; Deci & Ryan, 1981), the idea that SDL can only take place once a young person has received instruction related to how to learn is perhaps indicative of a particular view of what 'learning' is, despite growing interest in the potential for young people to learn through child-initiated play (Parker et al., 2022).

Indeed, many participants contrasted 'learning' with activities that are inherently or intrinsically enjoyable for their students. Participant 6, when asked about tech-based academic interventions which are engaging and interactive for their students, said the following.

P6: it's nice to see that kind of, a lot of time they see it as having fun, playing, and then OK back to the serious work

The idea that an academic intervention would not count as "serious work" just because it is enjoyable for the students suggests that formal learning is not perceived as intended to be inherently desirable, satisfying or fun for young people. There were comments from several participants that suggested that intrinsic enjoyment of an activity by young people is not a good

enough reason for that activity to be provided at school, and that young people's inherent preferences for which activities they take part in should largely be ignored in favour of learning goals determined for them by adults.

P4: just because you finished your work early doesn't mean necessarily you're going to be able to go on something cause you think it's fun

P8: don't just get the VR headsets out because it's fun, get the VR headsets out because it's purposeful. what do you actually want the kids to get from it?

Every single one of my participants expressed fondness for and deep investment in the best interests of their students, and they all celebrated instances in which their students *were* able to experience fun and enjoyment as part of their school experience. However, the idea that this should always be secondary to curriculum-based learning objectives was highly prevalent, and does align with literature suggesting that typically, school environments are designed around adults' goals for young people rather than providing an environment in which they can explore their own (Wall, 2019). It is highly likely that an increased focus on academic outcomes and the subsequent rise of 'accountability culture' for teachers (Jerrim et al., 2021) is contributing significantly to the way teaching staff prioritise within their classrooms.

This pressure to focus on attainment above all other considerations is illustrated in this response from Participant 9, who when asked why they found teacher-directed lessons easier, referred to the need to be able to justify their decisions around their own practice to school leaders.

P9: you then know that your choices are going to be questioned so you know, if you've chosen to teach this this way, why? if you've chosen to do it this way, why? if you've chosen to give the children more freedom on that, why? did it? and so you've got to be able to back it up with whatever you choose

The pressure to ensure that learning outcomes and attainment targets are met may be discouraging teachers from even considering teaching practices that enhance agency and autonomy for their students, in favour of tried-and-true methods that support academic

attainment but at the expense of providing opportunities for students to learn in a self-directed, intrinsically motivated and interest-based way.

Almost all of the interviews, when discussing the extent to which young people should be provided with opportunities to exercise choice, freedom and self-direction, touched at least briefly on the idea that self-directed learning should be undertaken in pursuit of a learning objective that is determined by their teacher.

Several participants referred to the idea of providing the young people in their classes with the *illusion* of choice, rather than affording them real opportunities to shape their learning experiences.

P9: I would say it's probably, you know, still very heavily structured but sort of allowing them at least to feel that they've got a choice, is more than, you know, 'right, you guys choose' and they, they very much enjoy having that option of choice, even though it's, you know, you have a choice but within my, within my ten choices that I'm gonna give you

Research by Tan & Koh (2014) suggests that by allowing students to *feel* as if they are able to exert control, even within fairly tightly maintained adult-directed boundaries, school staff can engender some of the benefits associated with self-directed learning (creating higher levels of engagement, enjoyment and pride in their students) without actually ceding any real control over the learning process or outcomes. While the demands placed on teachers to adhere to rigid learning objectives may mean that this is the most self-determination they are able to offer their students under the current system, advocates for children's participation would likely view this as tokenistic (Hart, 2008) and an argument could be made from a childist perspective that children should be empowered to engage in authentic participation in the classroom instead.

Participant 4 recalled a lesson in which students were given the opportunity to use technology to conduct some independent research around a specific topic.

P4: I did a history lesson yesterday about Alexander the Great and they were getting some facts up and and one of them, it wasn't Alexander the Great, it, they were on a different, a different one and

so it was just having to sometimes, like, just like steer them in the right direction, sort of like 'ooh, ooh, we're we've just gone slightly off' or we've been talking about a Roman diet and then suddenly there on, like BBC like Foods, getting up recipes that, you know, so it's just kind of homing it in and just once again, installing those boundaries for what, what we want to achieve in this lesson and is that within our scope

In this example, it appears as though P4 conceptualises their role as requiring them to actively prevent students from following their own threads of intrinsic interest, in favour of a set learning objective. Self-directed learning research has highlighted the idea that making alterations to classroom environments and cultures to enable more self-direction will require considered reflection on what the role of the teacher should be (Mishra et al., 2013), and this extract illustrates one of the ways in which school staff may not currently be encouraged to think of themselves as facilitators of children's exploratory learning behaviour.

Several of these extracts suggest incompatibilities between the ability for students to learn in a self-directed, intrinsically motivated way and the requirements of the classroom. When asked to provide a definition of SDL, Participant 4 painted a picture of a type of learning that is inherently separate from that which takes place at school.

P4: self-directed learning so, as far as I'm, my interpretation of that would be for example, if they've got homework and they're at home and they want to explore a little bit more, say it's on I don't know farming yeah then that would be, self-directed learning would be, 'well, actually, I'm really interested in that, I'm gonna go and have a little bit more research about what, what it means to be a farmer,' so it would be, you know, going on, reading articles, looking at different facts and just sort of gaining your own self knowledge.

Int: so what, what makes it self-directed?

P4: that you're doing it yourself, you're taking your own initiative to do it, you're not, it's not something that you've been told to do, it's just from your own interest, your own, your own wanting to know more, without somebody else saying, 'right you need to go away and learn that now' it's just something that you choose to do yourself.

This definition of self-directed learning is one that aligns with literature exploring the potential for SDL that exists in a homeschooling or unschooling environment as opposed to a traditional classroom (Fisher, 2023), and it fits well with van Deur's finding that young people often feel more able to direct their own learning at home than they do at school. The sort of learning that P4 describes is largely not compatible with mainstream teaching practices, and would be very unlikely to be acceptable to school leadership in a typical formal education setting. P4 explicitly describes SDL as something that takes place at home, and without any kind of involvement from a teacher, either in determining the learning outcomes or scaffolding progress towards them.

If education stakeholders wish to bring some of the potential for enthusiasm, engagement, autonomy and independence that self-directed learning engenders into the classroom environment, a shift will need to take place in the typical culture of formal education settings. At present, adult directiveness is highly normalised to the point where its ideological nature is so naturalised as to be invisible (Wall, 2019), and if this continues to be the case it is likely that students will continue to leave formal education without the necessary skills to be effective self-directed learners during their further and higher education, during their careers, and throughout their lives (Fischer & Sugimoto, 2006). Further research into the benefits of self-directed learning for children and young people could prompt more serious consideration of the need to incorporate it into classroom environments.

Conclusions

The current study has explored and discussed the views of school staff regarding the use of technology to support self-directed learning in school aged children, with a particular focus on what might be facilitating or hindering the more widespread adoption of this practice. I found that the members of school staff I spoke to have mixed emotions about the use of technology; on one hand acknowledging its powerful multifunctionality and the many ways in which this could be applied to create opportunities for students to have more autonomy in the classroom, but on the other, experiencing apprehension and concern about the ways in which technology can impact their practice and their students, particularly when used in excess. My participants reported a

desire for more - and more comprehensive and formal - professional development, and I learned that for many of them, at present competence with new technology is acquired via a myriad of informal paths. I also found that my participants are ambivalent about the idea of promoting self-directed learning in their classrooms; while they were able to identify many benefits and many of them expressed a desire to incorporate more learner autonomy, logistical constraints often interfered with this, and normative attitudes around the idea that children should learn what they are told to learn were very prevalent across the sample. Taken together, these findings suggest that there is much to consider before a greater focus on self-directed learning can be integrated into traditional classrooms and children can be provided with opportunities to develop independent learning skills before they leave school.

Limitations. There exist several limitations to the current study, which were created by certain decision points along the research design and execution process. Firstly, my philosophical and theoretical positionality confer limitations on the study by situating it within a relativist and constructivist framework in which all knowledge is highly contextual and claims about generalisability cannot be made. My ontological and epistemological positions determined the kinds of research questions I was able to ask, and the kinds of findings I was able to generate. I will discuss the implications of this decision in greater detail in the following reflective chapter.

My decision making process around the inclusion criteria for participant recruitment has placed a limitation on the transferability of my research. My participants were selected in part due to their employment in schools that own and use a relatively large amount of digital software and hardware as part of their typical educational provision. Therefore, their perspectives around the ubiquity and frequency of use of technology, particularly as pertains to overuse, are unlikely to be transferable to school environments that currently use primarily traditional, analogue teaching approaches. However, in wider society technology is becoming more ubiquitous over time and it is possible that the majority of school environments will follow suit. By interviewing staff at schools that are early adopters of educational technology, valuable contributions can be made to our understanding of what working in these conditions will be like, and these conclusions may be useful for school leaders who are making decisions around how and when to introduce technology-based approaches into their schools in general. Additionally, I conducted my research in the East of England, in a county that is relatively demographically homogenous with almost 95%

of the population identifying as white, and it is possible that this may also impact the transferability of my findings to more culturally diverse school environments.

My participants were recruited from two schools, and I made the decision to treat the entire dataset as a single entity. This allowed me to analyse for patterns of meaning across all nine interviews, and be sensitive to similarities between teams of staff in similar working environments. However, I could have analysed the interviews from each school separately, treating them as two separate case studies, and this would have enabled me to draw more specific conclusions about the views each staff team had in response to their school's particular practices. Similarly, I obscured information about the specific role of each participant within the schools in order to foreground commonalities in the ways support staff, teachers and school leaders construct meaning around the topic, but separating them would have allowed for a fine-grained analysis that could potentially have revealed interactions between the participants' roles and their views.

Implications for further research. This project was partially in response to an identified gap in the research literature relating to the ways in which technology can be used to facilitate self-directed learning for children and young people (Morris & Rohs, 2023). While the present study has made a contribution it is far from sufficient to address this gap entirely, and therefore additional research into this area must yet be conducted in order to further develop our understanding. My research was intended to be exploratory and identify useful directions for future research, and my findings have suggested several topics around which our current knowledge would benefit from further examination.

The current study identified that staff are able to identify many ways in which technology can be harnessed for educational purposes, many of which could be used to support students to engage with learning materials in a more self-directed way. Trials of educational approaches specifically formulated to support SDL skills could be conducted in order to evaluate the advantages and disadvantages of this approach, and determine the best ways to support young people to develop the ability to learn in independent ways. These approaches could be developed while taking into account the findings of this study; making full use of multifunctionality, addressing staff reservations about technology and ensuring that adequate accompanying training is provided for staff. While some research into potential approaches already exists (Morris & Rohs, 2023), there is

a dearth of SDL literature relating to children compared with that which pertains to adults, and this could be said to be skewing the overall picture of our understanding of SDL.

The current study found that across the nine participants, very different definitions of self-directed learning were expressed, which parallels the variation in definition that is present in the research literature (Kerka, 1994; Loeng, 2020). In order to enable discussion through which different constructions around SDL can be understood and compared, it could be useful to create a tool with which to describe the specific features of any learning experience that is being referred to as self-directed. By exploring the constructions of SDL held by a much wider variety of stakeholders, including both educators and learners, the key potential features of self-directedness could be delineated, and a tool could be created in order to visualise which the degree to which a learning experience was aligned with those features, perhaps in a form similar to Figure 2. In order to uphold emancipatory and childist principles, I think it should only be completed by the learner themselves and not by the educator in charge of the learning experience.

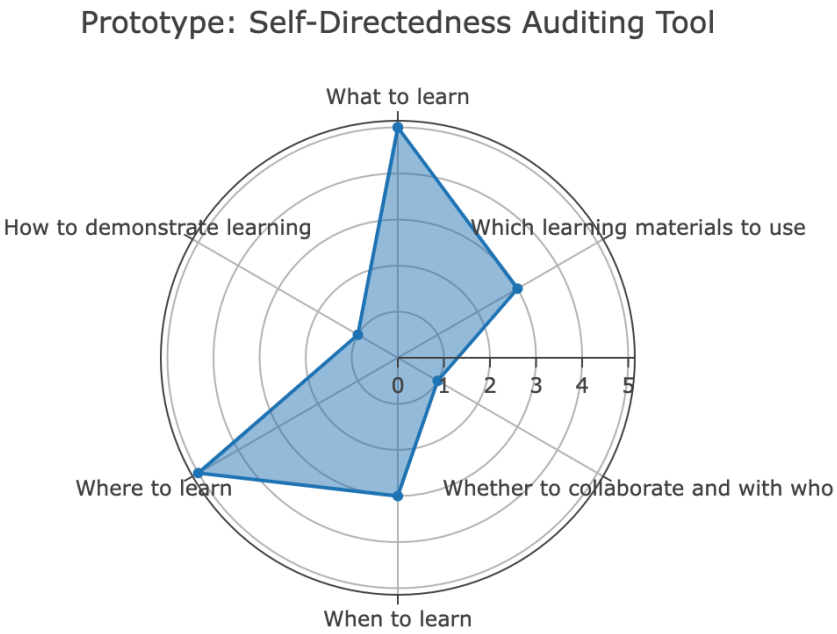

Figure 2. *Prototype for a possible instrument to measure self-directedness, with arbitrary example ratings.*

The findings of the current study identified several significant barriers to the effective deployment of technology to facilitate SDL in formal classroom environments. While the situation in traditional education settings is important to understand, there is likely also value in conducting research exploring the ways in which educators encourage the development of independent learning in other educational settings. Research that explores elective home education, unschooling and high autonomy schools such as Summerhill could be immensely valuable in generating ideas that could be translated into more mainstream teaching practices. Morris and Rohs' 2023 scoping review found no studies related to self-directed learning concerning non-formal learning contexts, so there is potential to address a significant gap in the literature.

One finding that has the potential to be highly significant was the suggestion that many of my participants felt that the current computing curriculum is not providing adequate time for young people to acquire basic prerequisite hardware operation skills (i.e. how to turn on and log on to computers and laptops) before expecting them to engage in laptop-based lessons. Further research to establish whether this is a phenomenon that is being observed widely across the UK would be useful in order to determine whether curriculum changes may be necessary to better prepare students and remove frustration for teachers.

Several logistical barriers to implementation of technology-based approaches that foster self-directed learning skills were discussed within this study, from issues with equipment to safety concerns. However, of more salience than practical barriers is the idea that the size of the existing curriculum creates pressure on school staff to the point where many of them expressed not feeling able to deliver it to their students AND provide opportunities for other more flexible learning experiences. Further research to establish whether these experiences are more widespread could provide rationale for an adjustment to create space for students to learn crucial self-directedness skills to support their future academic and vocational success.

Implications for educational psychology practice. The design of the current study was based in part on the idea that educational psychologists may provide a service indirectly to young people via working with the staff at their schools (Gutkin & Conoley, 1990). Through dedicating time and space to hear the views of school staff I believe some valuable findings were generated

that have the potential to be of use generally to educational psychologists in their work with frontline educators. One way in which I hope that the findings can be useful is during consultation with school leaders around related topics. For example, EPs workign with school leaders might be able to highlight the importance of taking time to engender confidence and security in teaching staff when introducing new technology-based teaching approaches. EPs working more directly with school staff might prioritise creating a space in which they can express concerns or worries around using technology. Additionally, EPs who wish to support the fostering of self-directed learning skills in the schools they work with might use the findings of the current study to inform the way in which they raise these topics with school leaders. In addition to their use during consultation, it is my intention that EPs will be able to share a concise summary of the findings of this study with school leaders they feel might benefit, in order to support those leaders to make decisions about how they might go about implementing technology-based approaches to facilitating SDL in their school.

Perhaps the most pertinent finding to the role of the EP is the idea that my participants felt in need of additional training. While training related to the everyday computing curriculum might be outside of the remit of most EPs, the need to consider staff of differing levels of existing tech competence when delivering training on new technology-based approaches is highly relevant. Additionally, EPs are well placed to address issues with confidence and self-efficacy through providing teaching staff with access to professional supervision; schools using a lot of new technology could source EP input to support their staff to manage change and communicate their needs.

The findings of the current study might also be used by educational psychologists to inform the design and delivery of individual, tailored interventions for young people who are struggling. For example, an educational psychologist may be called upon to work with young people who are experiencing a low level of motivation to engage in any learning at all. Self-determination theory (Deci & Ryan, 1985) suggests that feelings of competence and autonomy are conducive to motivation, and by combining this theoretical knowledge with the findings of this study, EPs might feel inclined to recommend intervention in which a young person who is confident with technology is able to make use of school equipment to support greater self-directedness in their learning, thereby promoting autonomous engagement with their academic work.

In addition to the practical implications of my findings, I also hope that this piece of research can serve to add weight to the idea that it is useful to consider educational psychology research through an implementation science lens. Forman et al. (2013) state that in order to enhance our ability to confer the benefits of research knowledge to school staff, all intervention research should incorporate elements of implementation science, improving our understanding of intervention fidelity, contextual influences and the approach's effectiveness with diverse populations. They stipulate that those who develop and introduce novel educational approaches should be in continuous conversation with practitioners about the feasibility and contexts of their approaches, and state that this will require enhanced communication between researchers and practitioners (Forman et al., 2013). By carrying out research that sought the perspectives of practitioners around the implementation of tech-based approaches to support SDL, I hope that I have both added to the body of knowledge around this approach in particular, and lent my voice to those calling for a greater focus on implementation science in education psychology research as a whole.

Final comments. In this empirical paper, I have recounted the rationale, the methods, and the findings of a piece of qualitative research intended to amplify the views of school staff around the use of technology to support self-directed learning. The results of the study suggest that there are likely many issues to address before such approaches can be effectively and widely embedded into mainstream classrooms, and a great deal of further research will be required in order to determine the best methods of doing so.

Reflective Chapter

In this chapter, I will discuss my reflections on each stage of the research process, including further discussion of my ontological, epistemological and theoretical positionality and my plans for dissemination of the research findings.

Reflexivity can be defined as the process of examining one's own beliefs, judgements and assumptions, and critically considering the ways in which these factors can influence the decisions we make as scientist-practitioners. In a research context, it has been suggested that prioritising reflexivity promotes deliberate and contemplative engagement with the research process, and is an important part of ensuring research quality across all epistemologies and methodological approaches (Jamieson et al., 2023). The British Psychological Society's Code of Human Research Ethics (BPS, 2021) includes value statements concerning both scientific integrity and social responsibility, the latter specifically calling on psychology researchers to be self-reflective, and it could be argued that the practice of reflexivity is important to meet both of these requirements. In addition, the codes of conduct of the BPS and the Health and Care Professions Council (BPS, 2018; HCPC 2016), both of which apply to the professional conduct of educational psychologists, both require a practitioner who is able to critically assess their own positions, feelings and state of being. For example, the HCPC stipulates that practitioners work within the limits of their own knowledge and skill, which requires accurate self-assessment; in addition, the (at time of writing) upcoming revisions to the code place new emphasis on the practitioner's obligation to monitor their own mental and physical health, and the potential impact of this on their practice. The importance of reflexivity to both educational psychology research and practice is clear.

Identifying a research interest. Through my practice as a trainee educational psychologist, I worked with a primary school that was using technology very deliberately and consistently to develop the self-directedness of their students. With each young person provided with their own laptop, their students were able to independently access and move through learning materials in a way quite distinct from traditional classroom learning, in which a single pace of learning is determined by the teacher. As someone with a preexisting interest in promoting autonomy and agency for children and young people, I was intrigued by this and felt excited by the idea of using technology to facilitate more independent and agentic participation in learning even for primary-

aged children. I became curious about whether this practice was widespread, and if so, what was known about the best ways to make use of technology for this particular purpose. Having found technology invaluable to my own independent study from undergraduate level onwards, it made sense to me that there could be huge potential for this to be extended to children and young people of school age. Access to expansive sources of information via the Internet and the functionality of modern computer software to enable self-expression, collaboration and communication all seemed that they had a lot to offer in a mainstream classroom setting.

My aforementioned interest in promoting young people's autonomy can be in part attributed to my own experiences of education. I have been told by everyone who knew me when I was little that I was a precocious and extremely inquisitive child, with a strong early interest in books, writing and all things academic. I steamed through educational workbooks in my free time, and my preschool records contain the quote "Not now, I'm doing my sums," uttered before I turned three. Yet over the course of my mainstream education I found myself less and less free to independently follow my strong desire to learn, and by the time I was in middle school I remember my parents being called in to discuss my listlessness and my refusal to do anything more than the bare minimum. Their strategies were not successful, and my dominant memories of school are of feeling passive, disconnected and frustrated with the futility of most of the work that was required of me. I was concerned only with how little I could get away with doing. Reflecting on this now, it strikes me as nothing less than a tragedy. Upon transitioning for sixth form to a school that had done a different Maths GCSE to mine, I felt totally lost as to how to acquire the skills I was missing on my own; all I knew about how to learn was how to sit silently and listen. When I moved to university, into lecture halls of 200 people with very little external structure, my attendance and grades slipped and slipped until a year abroad, complete with small classes and well-chunked work, saved me. I feel that I was woefully ill-prepared to engage in self-directed learning at the further and higher education levels. Looking back on this contrast with my preschool self, I feel grief about the way that I believe the lack of autonomy in a mainstream classroom environment changed me, and this has spurred me on to spend my professional life advocating for the rights of young people to have agency and autonomy over their learning and their lives.

Reviewing literature and generating initial RQ. I conducted a brief review of relevant literature in order to determine whether this was an area suitable for further research, and noted

that there was very little research relating to self-directed learning in children and young people. Upon finding Morris and Rohs' highly relevant scoping review of how self-directed learning is facilitated in the digital age (2023), which described a dearth of literature related to SDL, young people and technology, and called explicitly for further exploratory studies, I decided that a project within this broad area would be worthwhile and interesting.

In order to establish a specific research question under the broader umbrella of using technology to facilitate self-directed learning in young people, I considered the specific role of education psychologists in the advancement of this practice. I had recently attended a lecture in which we discussed an indirect route through which EPs can provide a service to young people: by supporting, training and uplifting the staff that work with them every day. As someone who has worked as a member of school staff for many years, I know first hand how knowledgeable and insightful staff at all levels can be, from senior leadership to teaching assistants and midday supervisors. I feel strongly that the voices of those who work with young people every day deserve to be elevated alongside those with theoretical knowledge, and I believe that there is huge value in doing so. Additionally, the lecture in question discussed the application of implementation science to educational psychology practice; the study of the methods by which the uptake of evidence-based practice into regular use can be facilitated and supported. As scientist-practitioners, educational psychologists have a crucial role to play in the translation of research insights into the day-to-day provision that young people receive in schools, and a significant factor in the effectiveness of this process is the ability of EPs to communicate effectively and bidirectionally with school staff. Combining these insights about the importance of school staff views and attitudes with my broader area of research interest led to the development of my particular research question, and resulted in what I believe to be a valuable contribution to our existing knowledge in these areas. I decided early on to focus on school-aged children, for a number of reasons; primarily, that self-directed and play-based learning tend to already be more present in Early Years contexts (Gray & Crittenden, n.d.) and therefore there was potentially more to be gained by exploring its potential incorporation with older children.

Ontology, epistemology and researcher positionality. Studying at doctoral level has meant engaging in learning and reflection that has greatly enhanced my understanding of my own personal and professional positions with regards to ontology and epistemology. I have always

found philosophy interesting; studying it at A level and through an optional module at undergraduate level cemented this interest and prepared me somewhat to advance to doctoral level thought. The book *Science As Social Knowledge* (Longino, 1990), introduced to me by a philosophy professor during my undergraduate year abroad, has formed the background for my thinking about the process of research and the necessary impacts of the researcher's values and beliefs on every stage of the research process. For this reason, the orientation towards embracing the researcher's subjectivity that is inherent to Braun & Clarke's reflexive thematic analysis (Braun & Clarke, 2022) appealed to me immediately. Throughout my study of psychology I have found the use of quantitative methods to measure something as impalpable as a human personality difficult to reconcile with my personal beliefs, and the positions of relativism and constructionism come much more easily to me than the realist and positivist alternatives.

I was very aware that the particular constructs relevant to my research are highly situated; for example, the values of my participants around what children are and how they should be treated are very much historically and culturally specific. Similarly, technology is a concept which is rapidly shifting and highly situated within a particular time, both in terms of the pace with which the nature of technology changes but also evolving cultural attitudes towards its use, and particularly its use by children. Constructionism was the best fit for this project because in exploring the views of my participants around the research area, I wanted to learn about the particular realities which had been made by them in relation to these topics, and the implications of these realities (Braun & Clarke, 2022). By conducting relativist research, I am stepping away from trying to present a singular truth, or even the truth as reported by my participants, and instead offering my personal reading of collaboratively generated data, aiming to tell a meaningful and useful story about the sorts of meanings that have been produced and constructed (Braun & Clarke, 2022).

In line with my constructionist positionality, I opted not to provide my own definition of 'self-directed learning,' either during the literature review or the empirical paper. In the literature review, as I address briefly in the introduction, I wanted to be sure to include a breadth of relevant research, and adhering to a single definition of SDL at this point would have constrained my ability to do this. For the empirical paper, I wanted to be sure that I was eliciting and amplifying the constructs of SDL that were held by my participants; in a piece of research focused on their views, it made sense to foreground their understandings of the term over my own. Now that the research

is complete, I have reflected on the meaning of the term “self-directed learning,” and while I believe ‘self-directedness’ as a concept could be usefully measured on a spectrum (as described on p114), I feel that I am aligned with authors such as Ponton et al. (2009) and Partridge et al.. (2015) in believing that true self-directed learning is that which is chosen by the learner, and carried out without intensive direction or supervision.

Similarly, I felt it was beyond the scope of the current research to explore in detail the philosophical and historical connotations of the term “technology.” While the definition of digital technology provided on p43 could be considered overly simplistic, I felt that again my participants’ understandings of what constituted technology were more important in answering my empirical research questions, as when they were discussing their views and experiences of working with ‘tech,’ they were doing so from a place of everyday engagement with digital devices rather than an academic understanding of the term. When reviewing literature related to technology and education, I noted that often no explicit definition of the term is given (e.g. Clark-Wilson et al., 2020; Haleem et al., 2022).

While I believe that my researcher positions are valuable and are the most compatible with my preferred ways of working, I acknowledge that in divesting from the common scientific ideas of realism and positivism, the ability to make any claims about the true way of the world is lost. Research insights generated under a Big Q paradigm, using qualitative methods and embedded in qualitative sensibility, can only ever be more or less transferable, never generalisable. During my undergraduate study of psychology, there was little prompting to engage thoughtfully with ontology and positivism was very much the dominant paradigm; my undergraduate research was conducted within a realist paradigm using quantitative methods and I quite enjoyed it at the time. However, now I have more deeply considered the philosophy underlying such research design decisions I think I would struggle to conduct a similar project in the future; nonetheless, there is a sense of loss that accompanies letting go of the idea of striving objectively for the truth. Braun & Clarke caution that in order to truly engage in reflexive research one must become comfortable with uncertainty, and while this has been challenging - as I think it is probably a counterintuitive notion for most people who have received a traditional Western education - it has also been incredibly eye-opening, and I would not trade it for all the certainty in the world.

My professional interest in advancing awareness of childism was ignited during the first year of my educational psychology doctorate, though it is something that in principle has always been important to me. Readings from Sorin (2005), Young-Bruehl (2012) and Wall (2019) broadened my thinking about the ways in which ideas about childhood have been constructed throughout history, and the enormous effects of these shifting constructions on the lived experiences of young people. Personally speaking, I have clear memories of the acute discomfort of feeling utterly voiceless as a child, and anecdotally my time working in schools suggests that my experiences were far from unique. I often found the tendency towards adultism - belief in the inherent superiority of adults over children - that is present in a lot of schools (Wall, 2019) difficult to operate within, and I have very much enjoyed the opportunity to step outside of this that my current role as a trainee EP has afforded me. I often use consultations and reports to gently challenge practices or decisions that appear to be based in adultist prejudice, often purely through making empowering, child-centred recommendations that I hope might be generalised into wider practice. I enjoyed this opportunity to bring a childist lens into the research space, and I hope that through sharing my research I might embolden other scholars to do the same.

Research design. It is worth noting that this research project represents a second attempt at completing the research strand of my professional doctorate. Initially, I planned a study that aimed to capture the views of school staff working with students at risk of exclusion, that used an online diary for data collection in order to capture ideas and impressions over a period of time. Ultimately, after a year of attempting to recruit via several different methods, an insufficient number of participants were found and with the support of the course team, the project was abandoned in favour of a new idea. While this was personally and professionally very challenging, I also feel that the design of the current piece of research benefited from the experience that my first attempt afforded me. During supervision I was able to reflect on the factors that influenced my first design - namely, that I feel I personally express myself much better in writing than in person - and subsequently realised the importance of instead considering first and foremost the needs of my participant group. School staff are a notoriously hardworking group of people, often with little downtime during the working day and a high mental load, and it is likely that this proposed data collection method was pretty unappealing to most potential participants. I also attempted to recruit primarily via cold emailing, with very little success. For my second project, I chose a recruitment method that was more personally challenging for me, and am very pleased

with the results, both in terms of the number of participants I was able to recruit and the opportunity for professional reflection and growth. I also chose a more challenging data collection method.

Ethical considerations. Throughout this research, it was of the utmost importance to me to try to represent my participants faithfully. I wanted to convey honestly the sentiments they had expressed, and also be sure to represent them in ways that were highly respectful and safeguarded their wellbeing. At times, conducting my analysis through the lens of childism meant that for the purposes of the analysis, it was necessary to highlight the ways in which dominant discourses of adultism permeated some of the assertions made by my participants. At times this required careful thought to ensure that it was clear that I was critiquing the discourses rather than my participants personally, and this was something that I discussed with my supervisor on several occasions. While I feel a very strong moral responsibility to my participants, as well as being bound by the BPS Code of Human Research Ethics to prioritise their fair and respectful treatment (BPS, 2021), I also felt a social responsibility to bring awareness to the existence of adultism within the dataset. I sought guidance on this from Braun & Clarke (2022), whose thematic analysis guide provides specific advice around the presence of problematic discourses within qualitative data. They stress the importance of reflectiveness on the part of the researcher, highlighting that while the idea that all views are equally valid appears a noble one, in our societal contexts, different stories can have different consequences. I attempted to strike a balance between these two ethical obligations, and I hope that I have managed to do so.

Recruitment and data collection. The experience of conducting interviews for qualitative research was new to me, and I found it fairly challenging. I had attended a lecture by Simon Watts that was provided by my university in order to support postgraduate researchers, and I drew on the lecture content heavily to inform my preparation. I made use of supervision throughout the data collection period to reflect upon and discuss the interviews, which generated many valuable insights that have improved my understanding of and competence with the interviewing process. For example, on one occasion I scheduled several interviews in one day, and during reflection with my supervisor on the advantages and disadvantages of this I decided that from then on, scheduling them individually would allow me more time to prepare and to reflect afterwards. In addition, one of my participants spoke English as an additional language, and upon concluding the interview I

wondered whether I could have done more to accommodate them. Conducting a post hoc search for relevant methodological literature yielded a book chapter by Caroline Fryer (2019) outlining her approach to cross-language qualitative research. Within the chapter, Fryer objects to the common practice of including only participants who share a preferred language with the researcher, highlighting the importance of affording minoritised people the opportunity to share their experiences and have their voices heard, in a way that promotes research findings that more accurately reflect the diversity of the communities they are making conclusions about (Fryer, 2019). As part of the information and consent form for any future research I were to undertake, I would consider including a place for each person to specify the language in which they would prefer to contribute, so that I can put in place the necessary accommodations to ensure their comfort and their full participation.

Transcribing and familiarising myself with the interviews also provided me with ample time to reflect on the way I had conducted them. At times, I noted that my interview style borrowed heavily from the consultation skills that I have developed as a trainee educational psychologist, for example on occasions when I had affirmed or restated the participants' views in order to ensure that they felt heard, or times I had made a joke to encourage them to feel at ease. While this may have afforded some benefit in terms of building interviewer-participant rapport, hopefully encouraging my participants to feel comfortable and speak freely, reading it back I initially worried that my conversational style meant I was inserting too much of myself into the interviews rather than sitting back and acting as a neutral information probe. However, Braun & Clarke position 'being yourself,' and establishing trust and rapport as important skills to facilitate qualitative interviews, and my ontological and epistemological positioning mean that the research does not need to shy away from the idea that I have brought myself into every step of the process (Braun & Clarke, 2022), as I am not trying to produce unbiased truth, only a particular interpretation of the data that is inseparably tied to me.

Data analysis. Reflecting on the use of Microsoft Teams for transcription purposes, I feel that in the future I might transcribe by hand rather than using automated software. I found correcting the errors in generated transcripts frustrating at times, and I feel that perhaps transcribing from scratch might engender more in-depth familiarisation with the data. Additionally, during future research I would make an effort to transcribe the data as I go instead of all at once at

the end; on a few occasions during transcription I reflected on interesting areas of discussion which could have become probes during future interviews, iteratively improving the richness of the data over the data collection period. While I did incorporate some probes from previous discussions into later interviews, this could have been done much more systematically.

When I first designed the research project, I had intended to carry out an experiential, empathic analysis that aimed to remain as close as possible to the data. I felt (and do still feel) strongly about giving voice to my participants, and I felt that experiential analysis would be the best way to do this. However, as I coded the data, I found myself drawn towards critical, latent coding, and spent some time reflecting on this both during supervision and through further reading of methodological literature. Despite Braun & Clarke's assurances that critical analysis is not "cleverer," (Braun & Clarke, 2022) I found it difficult to shake the feeling that my analysis would be more interesting and potentially more valuable if I brought both the theory I had learned while completing my literature review and also my existing psychological knowledge to the forefront during interpretation. I completed the literature review in advance, in line with typical course requirements (although due to my unique circumstances I could have opted for a different order), and my memory for things I have read tends to be strong, so I was likely to generate insights that were closely linked to theory as I read through the data anyway. Additionally, I drew on Braun & Clarke's statement that qualitative analysis should concern itself with the consequences and implications of the meanings within the dataset, and felt in this case I would be more able to do this using a more critical style of analysis (Braun & Clarke, 2022).

Dissemination. A one-page summary of the research findings will be generated following successful submission of the thesis, to be shared with the participants who indicated via their information and consent form that they wished to be informed of the results of the study. I believe the themes generated during analysis have the potential to be useful in contributing to the decision-making of school leaders who are considering how best to implement technology-based interventions to support self-directed learning; I will therefore aim to produce a document that presents the themes clearly with this potential purpose in mind. I will share this summary with my educational psychology and specialist teacher colleagues so that they are able to in turn share it with any schools they encounter that they feel might benefit from it.

As well as the summary, I will likely share a more detailed account of my findings with my educational psychology service through either a verbal presentation or a comparable alternative. I will also consider sharing either the literature review and/or the empirical paper more widely, perhaps through journal publication; if so, I would be proud to submit to a journal such as the Open Journal of Educational Psychology which is completely open access, thereby promoting equality of access to high quality psychological research regardless of one's organisational affiliations or ability to pay. Their ethos of 'giving psychology away,' with the aim of sharing the benefits of psychological knowledge freely in order to improve people's lives, is one that is closely aligned with my personal and professional values.

Personal and professional development. My research journey was far from straightforward, and has been personally and professionally very challenging. Starting my entire research project again from scratch just a few months before my submission date required applying for an extension of one calendar year, leaving me 15 months to complete the thesis instead of the usual 21. In addition, it was emotionally difficult to discard and duplicate a significant amount of work. While recruitment was again challenging, this time due to the attrition of a key gatekeeper, progress was good until some extremely challenging home circumstances in December/January 2024. The effect of these circumstances on my health and wellbeing required an application for a further extension of 16 weeks. For some of this time, for the first time I was able to focus on just one strand of the EdPsyD doctorate. I have had lifelong difficulties with executive function, and during the first year of the doctorate I sought an ADHD diagnosis in order to be able to access support. The requirement to balance the academic, placement and research strands of the doctorate has been extraordinarily challenging for me, but these last few months, despite all their challenges, have taught me how important it is to my wellbeing and productivity to simplify my workstreams wherever possible. This is an important insight that I am already acting on in terms of my professional practice, and that I will continue to reflect on throughout my career.

Conclusion. Over the course of this professional doctorate I have greatly developed my self-understanding and my ability to identify the ways in which my subjectivity inform my decision-making. Learning psychological theory such as ecological systems theory (Bronfenbrenner, 1979) and using practice tools such as the Interactive Factors Framework (Frederickson & Cline, 2002) has made explicit the ways in which a person's surrounding context can profoundly affect them,

and discovering ontologies, epistemologies and research methods that not only acknowledge but incorporate and celebrate the influence of a person's social and cultural surroundings felt satisfying and stimulating to me. I feel that completing this research has made me a more contemplative practitioner, and that this experience will enhance my ability to interpret the research of others in the future in order to support the translation of research insights into practice effectively and faithfully.

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Appendices

Appendix A - Interview probes

Interview probes

Overarching research question: *what are the views of school staff in the use of digital technology to facilitate self-directed learning in children and young people?*

- Participant **understanding** of teaching approaches that use "digital technology" and what constitutes "self-directed learning"

(Included due to social constructionist epistemology)

- **Personal views** around : technology in general
  - technology-based teaching approaches
  - the importance of self-directed learning

(Included due to research from Gutkin & Conoley (1990), Morsink et al. (2011), Spiteri et al. (2020) and Blackwell et al. (2014) suggesting the importance of staff views and attitudes for successful implementation of tech-based approaches)

- Perceived **effectiveness** of the technology-based approaches they have used to facilitate self-directed learning
  - Factors affecting the effectiveness and their importance
  - Examples of particular success? Examples of particular difficulty? In which situations did the approach work best?
- **Comparison** of technology-based approaches to other teaching methods wrt self-directedness
  - Other ways in which school facilitates SDL?
  - Relative advantages of tech?
  - Relative disadvantages?

(Included based on research aims around enhancing knowledge of how these approaches could be implemented in the future; constructed using techniques from solution oriented psychology)

- Factors affecting **implementation** of technology-based approaches for this purpose
  - Training?
  - Equipment?
  - Remote learning?
  - Pupil engagement?

(Included based on previous research suggesting these factors are important in determining success of implementation, including Fischer & Sugimoto (2006), Morsink et al. (2011), Morris & Rohs (2023) and Jong et al. (2010))

- Effects on school staff **workload**
- Effects on school staff **wellbeing**

(Included in line with secondary aim to generate knowledge about novel approaches that might improve teacher workloads, wellbeing and retention (Jerim et al., 2021))

EXAMPLE INTERVIEW PROBE DELIVERY

In order to provide transparency around how the interview probes were used in practice, I have included two partial transcripts from interviews I conducted. These partial transcripts both start at the beginning of the respective interviews, and are a record of the first few questions I asked in order to probe further into the data. Dialogue where I was merely reflecting, affirming or encouraging the participant to continue speaking have been removed. This is intended to illustrate the uniqueness and unstructured nature of each interview, while demonstrating how key prompts were returned to and incorporated across them all to ensure I captured relevant data.

Example 1

Int: So as I'm sure you remember, the study is about tech and also about self directed learning, so how tech can be used to support young people to have a bit more kind of, ownership over the pace of their learning and things like that. So do you wanna start by telling me a little bit about how tech is used at [School]?

Int: Yeah, definitely, yeah, it's really interesting to hear that kind of summary and lots of, lots of bits to come back to so that's really useful to have to start us off. One thing that I wanted to ask early on is what your understanding is of the term self directed learning and this isn't me looking for a correct answer it's more kind of across interviews and across schools, wanting to know whether people are using the same definition or not.

Int: Yeah, I think so too. So, um, I think different schools and you know different different teachers will have different levels of emphasis on self-directedness, what do you think about kind of the the culture at [School]? Is it something that's that's talked about, something that isn't?

Int: Yeah. Yeah, that's really great to hear because yeah, it is very different across schools. Um, tell me a bit more about how tech could be used in those kinds of tasks?

Int: Yeah, for sure. Yeah. So among the approaches that you talked to me about, so kind of the specific software, the kind of more creative use of tech, are there approaches that you as a teacher find preferable?

Example 2

Int: So I thought if you start by telling me a bit about how you use tech in your role?

Int: Mm. OK, so kind of the things that, you, you mentioned kind of being a bit frightened of it, it being a bit frowned upon, is there anything else that kind of is holding you back from..?

Int: Why do you think that is?

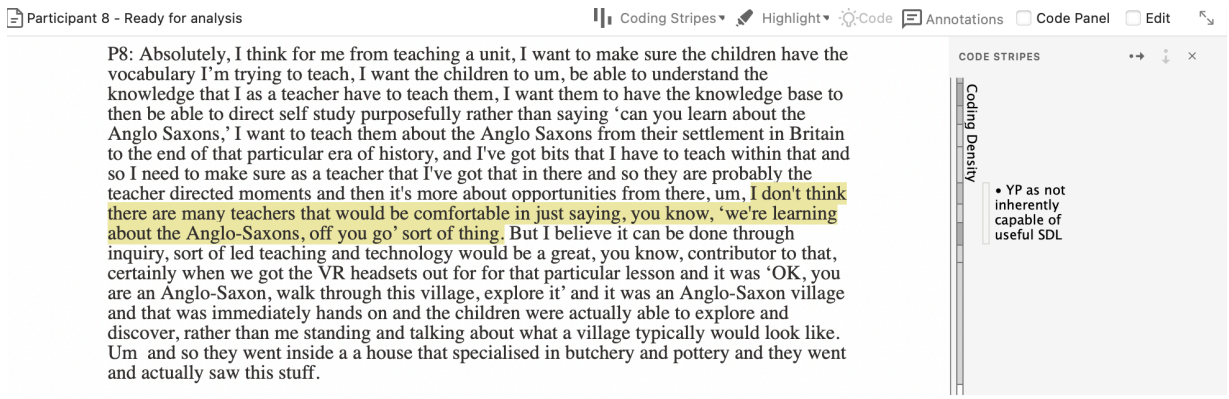
Int: Do you notice the kind of a difference in fluency between the laptops and the iPads?

Int: So they kind of had their own experiences to bring to the lesson, even though..?

Int: Yeah, sounds very good. All right, so we've we've covered loads there about tech, I wanted to ask you, what you understand by the term self directed learning? and this isn't like a a test, I don't have an idea in my head really of what of what the answer is, it's more I want to kind of compare what different people say and see whether you know school staff are operating kind of with the same understanding of self directed learning or whether everyone's kind of got a different idea.

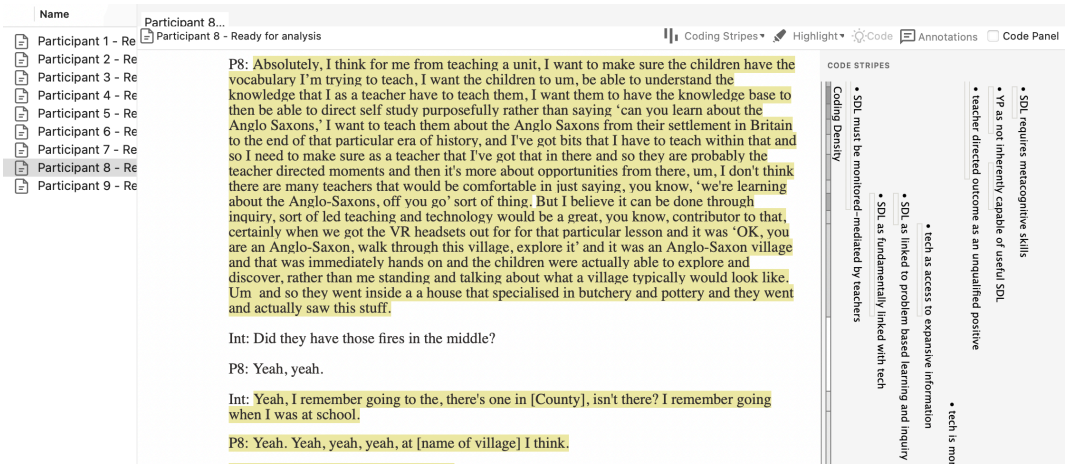
Appendix B - Worked example of coding process

1. Extracts of data relevant to research questions were highlighted using Nvivo and tagged with a descriptive code label.



2. Coded extracts could then be aggregated and viewed within the Nvivo software, grouped together by their code label.

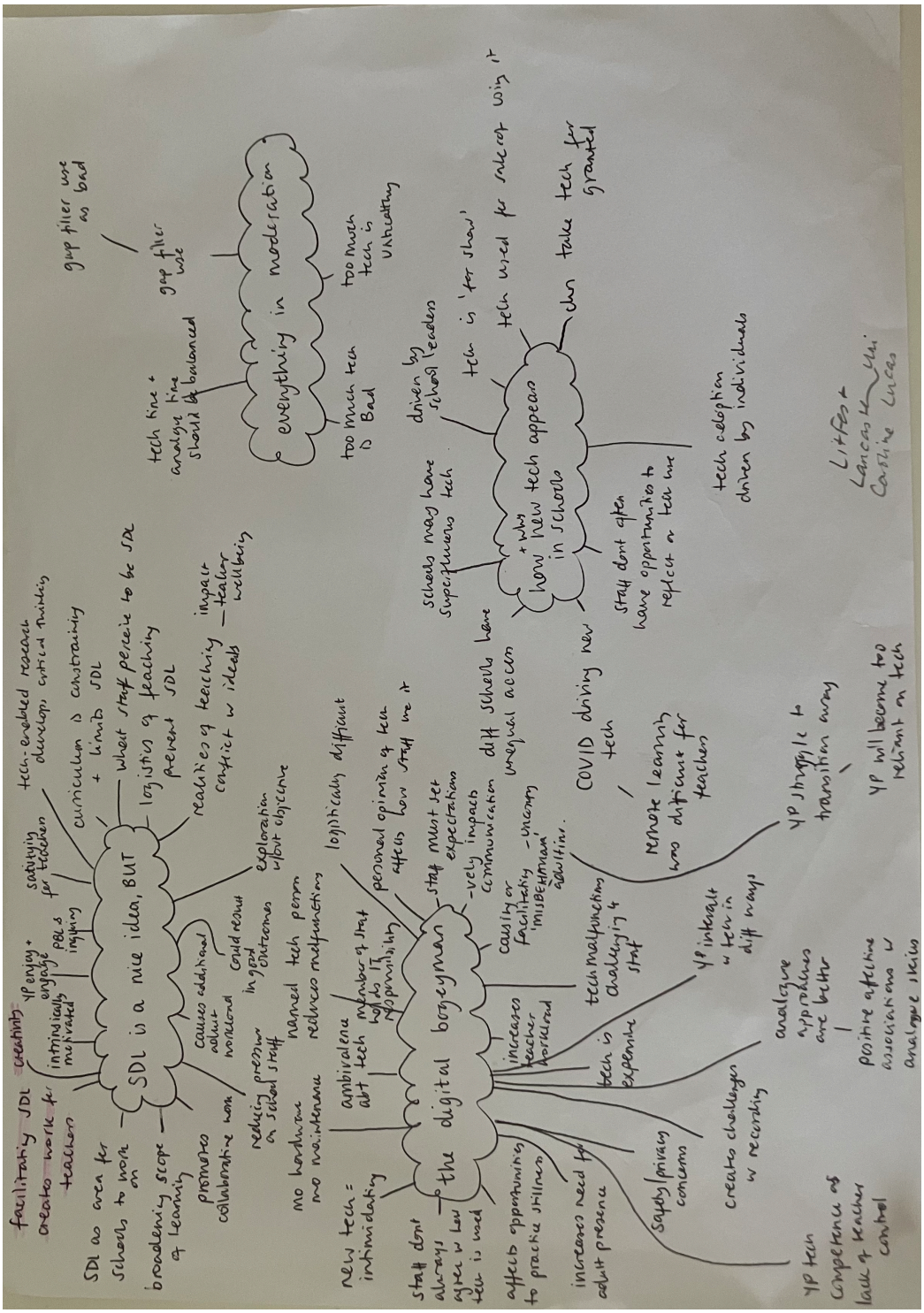
3. Once all the relevant data from a paragraph had been coded, it could be viewed as below, with the labels for each code visible in the coding stripes on the right.

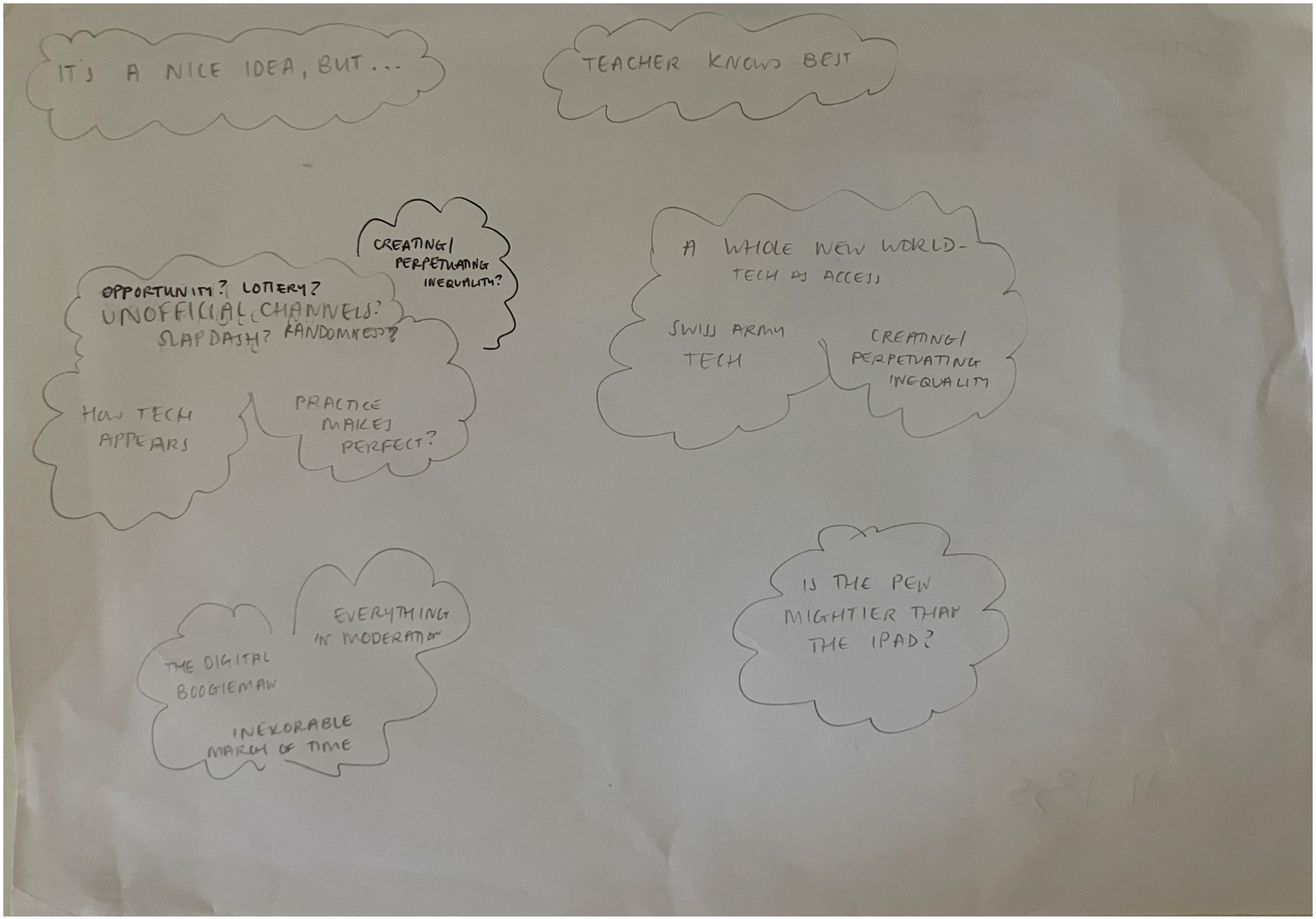


Illustrative extract taken from final codebook. This list of codes was generated by the Nvivo software once the coding phase was complete, and the list was subsequently used to begin the generation of themes.

Name	Description
IT curriculum is not fit for purpose	
knowing less than children can be uncomfortable	
lack of training for school staff	
experimentation, trial and error vs formal training	
lack of training reduces effectiveness	
lack of training,competence as uncomfortable for staff	
not enough time to learn to use new tech	
some staff do not feel secure in their tech competence	
staff do not feel adequately trained to use tech	
logistics of teaching prevent SDL	
member of teaching staff holds IT responsibility	
mo hardware, mo maintenance	
need to differentiate creates pressure	
new tech can be intimidating	
not all members of school have equal access to tech	
not all YP have equal tech access at home	
old or unreliable tech is worse than analogue tools	
overall tech is positive	
parental tech competence affects access to remote learning	
personal opinion of tech affects how school staff use it	
realities of teaching conflict with ideals	
realities of teaching impact teacher wellbeing	
remote learning was difficult for teachers	
rewards are good	
school staff receive some training	
schools may have superfluous tech	
SDL as an area for schools to work on	
SDL as broadening scope of learning	
SDL as enjoyable and satisfying for teachers	
SDL as focused on the individual	
SDL as fundamentally linked with tech	

Appendix C - Examples of mind maps created to help generate and organise initial themes.




IT'S A NICE IDEA, BUT...
TEACHER KNOWS BEST
CREATING/ PERPETUATING INEQUALITY?
OPPORTUNITY? LOTTERY?
UNOFFICIAL CHANNELS?
SLAPDASH? RANDOMNESS?
HOW TECH APPEARS
PRACTICE MAKES PERFECT?
A WHOLE NEW WORLD-
TECH AS ACCESS
SWISS ARMY TECH
CREATING/ PERPETUATING INEQUALITY
IS THE PEN MIGHTIER THAN THE IPAD?
EVERYTHING IN MODERATION
THE DIGITAL BOOGIEMAN
INEXORABLE MARCH OF TIME

Appendix D - Certification of ethical approval

University of East Anglia

Study title: School staff perspectives on the use of digital technology to facilitate self-directed learning

Application ID: ETH2223-1881

Dear Max,

Your application was considered on 6th June 2023 by the EDU S-REC (School of Education and Lifelong Learning Research Ethics Subcommittee).

The decision is: **approved**.

You are therefore able to start your project subject to any other necessary approvals being given.

This approval will expire on **1st September 2024**.

Please note that your project is granted ethics approval only for the length of time identified above. Any extension to a project must obtain ethics approval by the EDU S-REC (School of Education and Lifelong Learning Research Ethics Subcommittee) before continuing.

It is a requirement of this ethics approval that you should report any adverse events which occur during your project to the EDU S-REC (School of Education and Lifelong Learning Research Ethics Subcommittee) as soon as possible. An adverse event is one which was not anticipated in the research design, and which could potentially cause risk or harm to the participants or the researcher, or which reveals potential risks in the treatment under evaluation. For research involving animals, it may be the unintended death of an animal after trapping or carrying out a procedure.

Any amendments to your submitted project in terms of design, sample, data collection, focus etc. should be notified to the EDU S-REC (School of Education and Lifelong Learning Research Ethics Subcommittee) in advance to ensure ethical compliance. If the amendments are substantial a new application may be required.

Approval by the EDU S-REC (School of Education and Lifelong Learning Research Ethics Subcommittee) should not be taken as evidence that your study is compliant with the UK General Data Protection Regulation (UK GDPR) and the Data Protection Act 2018. If you need guidance on how to make your study UK GDPR compliant, please contact the UEA Data Protection Officer (dataprotection@uea.ac.uk).

I would like to wish you every success with your project.

On behalf of the EDU S-REC (School of Education and Lifelong Learning Research Ethics Subcommittee)

Yours sincerely,

Victoria Warburton

Ethics ETH2223-1881 : Miss Max Vannucci

Appendix E - Information and consent form. Evidence of signed consent forms from all participants available upon request.

Max Vannucci
Trainee Educational Psychologist

Faculty of Social Sciences
School of Education and Lifelong Learning

University of East Anglia
Norwich Research Park
Norwich NR4 7TJ
United Kingdom

Email: m.vannucci@uea.ac.uk
Tel: 01603 217600
Web: www.uea.ac.uk

School staff perspectives on digital technology and self-directed learning

PARTICIPANT INFORMATION SHEET

(1) What is this study about?

You are invited to take part in a research study about the use of technology to help young people learn in a self-directed way. I am particularly interested to learn what school staff think about this, so that those who design and implement similar interventions in the future are encouraged to take into account the views and experiences of the people who will actually be using them in class. You have been invited to participate in this study because you are a member of school staff who has used any kind of electronic device or software that allows students greater control over how they learn. This Participant Information Sheet tells you about the research study. Knowing what is involved will help you decide if you want to take part in the study. Please read this sheet carefully and ask questions about anything that you don't understand or want to know more about.

Participation in this research study is voluntary. By giving consent to take part in this study you are telling me that you:

✓ Understand what you have read.
✓ Agree to take part in the research study as outlined below.
✓ Agree to the use of your personal information as described.
✓ Have received a copy of this Participant Information Sheet to keep.

(2) Who is running the study?

The study is being carried out by Max Vannucci, Trainee Educational Psychologist and postgraduate student at UEA. (m.vannucci@uea.ac.uk).
This will take place under the supervision of Ryan Cullen, Tutor in Educational Psychology. (ryan.cullen@uea.ac.uk).

(3) What will the study involve for me?

If you decide to participate, we will schedule a time to discuss your views around the use of technology to support self-directed learning. You will have the choice of whether you would rather speak to me face to face or via video call on Microsoft Teams, and I will either travel to you or send you an email invitation. We will discuss your views, I will record the conversation, and then I will create a written record of what we talked about. You will have the opportunity to read this before I begin analysing it to ensure that you feel it is an accurate record of our conversation.

The conversation will be unstructured, which means I won't be asking you a set list of interview questions. I want to hear from you about the things that you think it's most important for people to know. However, I will also have some prompts in mind around the topics I think it might be useful to talk about, if that's helpful at any point.

You will have the opportunity to review information generated about you prior to publication.

(4) How much of my time will the study take?

The study will involve one recorded conversation with me, and the length will depend on how much you would like to say. It is expected that the conversation will last between thirty minutes and an hour. You will also be given the opportunity to read through the written record of our conversation once I have transcribed it; you are free to spend as much or as little time doing this as you would like.

(5) Do I have to be in the study? Can I withdraw from the study once I have started?

Being in this study is completely voluntary and you do not have to take part.
Your decision whether to participate will not affect your current or future relationship with the researchers or anyone else at the University of East Anglia now or in the future.

If you decide to take part in the study, you can withdraw your consent at any point. You can do this by emailing me at m.vannucci@uea.ac.uk.

(6) What are the consequences if I withdraw from the study?

You are free to stop the interview at any time. Unless you say that you want me to keep them, any recordings will be erased and the information you have provided will not be included in the study results. You may also refuse to answer any questions that you do not wish to answer during the interview. If you decide at a later time to withdraw from the study your information will be removed from my records and will not be included in any results, up to the point at which I have analysed and published the results.

(7) Are there any risks or costs associated with being in the study?

Aside from giving up your time, I do not expect that there will be any risks or costs associated with taking part in this study.

(8) Are there any benefits associated with being in the study?

By participating in the study, you will be contributing to research that encourages the developers of new educational approaches to consider in more depth the views and experiences of school staff who work with young people directly. In addition, I hope that you find the experience of spending time discussing your work, reflecting on your practice and sharing your views with me to be of some personal and professional benefit.

It is hoped that insights generated from this study will be used by school leaders when deciding whether and how to implement similar approaches in their schools. By recording the factors that are most impactful for school staff, it is hoped that school leaders will have a better idea of what to consider when implementing changes in their schools.

(9) What will happen to information provided by me and data collected during the study?

Your name and email address will be stored for the duration of the study in order to enable me to contact you, but will be deleted once the study is completed.

The recording and transcript of your interview will be stored securely on OneDrive and only downloaded onto password protected devices. They will be freely accessible only to me. I may share excerpts of data with my supervisors so that they can support me with the research process, but I will take care to do so anonymously. All storage and processing of information will be carried out using software approved by UEA Research Ethics protocols.

Your personal data and information will only be used as outlined in this Participant Information Sheet, unless you consent otherwise. Data management will follow the Data Protection Act 2018

(DPA 2018) and UK General Data Protection Regulation (UK GDPR), and the University of East Anglia's Research Data Management Policy.

The information you provide will be stored securely and your identity will be kept strictly confidential, except as required by law. Study findings may be published, but you will not be identified in these publications if you decide to participate in this study.

(10) What if I would like further information about the study?

When you have read this information, Max Vannucci (m.vannucci@uea.ac.uk, 01603 217600) will be available to discuss it with you further and answer any questions you may have.

(11) Will I be told the results of the study?

You have a right to receive feedback about the overall results of this study. You can tell me that you wish to receive feedback by providing your contact details at the end of this form.
This feedback will be in the form of a concise and clear one-page summary of the study's findings. The feedback will be composed and made available following successful submission of my doctoral thesis in summer 2024.

(12) What if I have a complaint or any concerns about the study?

If there is a problem please let me know. You can contact me via the University of East Anglia at the following address:

Miss Max Vannucci
School of Education and Lifelong Learning
University of East Anglia
Norwich NR4 7TJ
m.vannucci@uea.ac.uk
01603 217600

You can also contact my supervisor Ryan Cullen at ryan.cullen@uea.ac.uk.

If you are concerned about the way this study is being conducted or you wish to make a complaint to someone independent from the study, please contact the Head of School of Education and Lifelong Learning: Professor Yann Lebeau (Y.Lebeau@uea.ac.uk).

(13) How do I know that this study has been approved to take place?

To protect your safety, rights, wellbeing and dignity, all research in the University of East Anglia is reviewed by a Research Ethics Body. This research was approved by the EDU S-REC (School of Education and Lifelong Learning Research Ethics Subcommittee).

(14) What is the general data protection information I need to be informed about?

According to data protection legislation, I am required to inform you that the legal basis for processing your data as listed in Article 6(1) of the UK GDPR is because this allows us to process personal data when it is necessary to perform our public tasks as a University.

In addition to the specific information provided above about why your personal data is required and how it will be used, there is also some general information which needs to be provided for you:

- The data controller is the University of East Anglia.
- For further information, you can contact the University's Data Protection Officer at dataprotection@uea.ac.uk
- You can also find out more about your data protection rights at the Information Commissioner's Office (ICO).
- If you are unhappy with how your personal data has been used, please contact the University's Data Protection Officer at dataprotection@uea.ac.uk in the first instance.

(15) OK, I want to take part – what do I do next?

You need to fill in one copy of the consent form and return it to me at m.vannucci@uea.ac.uk. Please keep the letter, information sheet and the second copy of the consent form for your information.

(16) Further information

This information was last updated on Friday 2nd June 2023.
If there are changes to the information provided, you will be notified by email.

This information sheet is for you to keep

PARTICIPANT CONSENT FORM (First Copy to Researcher)

I, ... [PRINT NAME], **am** willing to participate in this research study.

In giving my consent I state that:

- I understand the purpose of the study, what I will be asked to do, and any risks/ benefits involved.
- I have read the Participant Information Sheet, which I may keep, for my records, and have been able to discuss my involvement in the study with the researchers if I wished to do so.
- The researchers have answered any questions that I had about the study and I am happy with the answers.
- I understand that being in this study is completely voluntary and I do not have to take part. My decision whether to be in the study will not affect my relationship with the researchers or anyone else at the University of East Anglia now or in the future.
- I understand that I may stop the interview at any time if I do not wish to continue, and that unless I indicate otherwise any recordings will then be erased and the information provided will not be included in the study results. I also understand that I may refuse to answer any questions I don't wish to answer.
- I understand that the results of this study may be published but that any publications will not contain my name or any identifiable information about me.
- I understand that personal information about me that is collected over the course of this project will be stored securely and will only be used for purposes that I have agreed to. I understand that information about me will only be told to others with my permission, except as required by law.

I consent to:

Audio-recording	YES □	NO □
Video-recording	YES □	NO □
Reviewing transcripts	YES □	NO □

Would you like to receive feedback about the overall results of this study?

YES □ NO □

If you answered **YES**, please indicate your preferred form of feedback and address:

□ Postal: _____

_____

□ Email: _____

.....
Signature

.....
PRINT name

.....
Date

PARTICIPANT CONSENT FORM (Second Copy to Participant)

I, ... [PRINT NAME], **am** willing to participate in this research study.

In giving my consent I state that:

- I understand the purpose of the study, what I will be asked to do, and any risks/ benefits involved.
- I have read the Participant Information Sheet, which I may keep, for my records, and have been able to discuss my involvement in the study with the researchers if I wished to do so.
- The researchers have answered any questions that I had about the study and I am happy with the answers.
- I understand that being in this study is completely voluntary and I do not have to take part. My decision whether to be in the study will not affect my relationship with the researchers or anyone else at the University of East Anglia now or in the future.
- I understand that I may stop the interview at any time if I do not wish to continue, and that unless I indicate otherwise any recordings will then be erased and the information provided will not be included in the study results. I also understand that I may refuse to answer any questions I don't wish to answer.
- I understand that the results of this study may be published but that any publications will not contain my name or any identifiable information about me.
- I understand that personal information about me that is collected over the course of this project will be stored securely and will only be used for purposes that I have agreed to. I understand that information about me will only be told to others with my permission, except as required by law.

I consent to:

Audio-recording	YES	□	NO	□
Video-recording	YES	□	NO	□
Reviewing transcripts	YES	□	NO	□

Would you like to receive feedback about the overall results of this study?

YES □ NO □

If you answered **YES**, please indicate your preferred form of feedback and address:

□ Postal: _____

_____

□ Email: _____

.....
Signature

.....
PRINT name

.....
Date