Department for Education

Education technology for remote teaching

Research report

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Glossary of terms

Throughout this report we use a number of different terms to describe the teaching practices used by case-study schools and colleges. For clarity, these are defined below.

- **Asynchronous education:** is when the teacher prepares the material and the pupil accesses it at a later date. Asynchronous can involve both digital (e.g. pre-recorded videos) and non-digital (e.g. textbooks) materials.
- **Blended learning:** a mix of face-to-face and remote methods. An example would be the 'flipped classroom', where main input happens remotely (for example through video), while practice and tutoring happens in class.
- **EdTech:** Education Technology (EdTech) refers to the practice of using technology to support teaching and the effective day-to-day management of education institutions.
- **Flipped learning:** involves the use of digital technology, such as video, to provide direct instruction to pupils on new concepts outside of the classroom. Pupils come to lessons already having a preliminary understanding of the topic, freeing up class time for the teacher to focus on other beneficial learning activities.
- **Hybrid provision:** whereby schools and colleges are simultaneously teaching pupils both face-to-face in class and remotely at another location (such as at home).
- **Remote education:** any learning that happens outside of the classroom, with the teacher not present in the same location as the pupils. This includes both digital and non-digital remote solutions.
- **Remote teaching:** for the purposes of this study, 'remote teaching' is defined as 'a teacher teaching a live lesson from a different location to some or all of the pupils; for example, a teacher at home and children in class or a class split between multiple locations'.
- **Synchronous education:** this is live, typically a live lesson but also reflects other live practices such as chat groups, tutorials and one-to-one discussions that also happen in a live online setting.

Executive summary

The global outbreak of Covid-19 and the subsequent partial school closures significantly disrupted the delivery of education in England and across the world. It also created an unprecedented need for remote teaching and learning solutions.

During this period, research suggests that 64% of schools introduced, increased or upgraded their technology (CooperGibson Research, 2021), with 80% of schools using either new tools or a mix of new and old (Parkin and others, 2020). Tools ranged from the use of online learning platforms, digital curriculum content tools and services, and technology to deliver both live remote lessons and pre-recorded lessons online (CooperGibson Research, 2021; BESA, 2021).

More research is required to understand the many ways in which remote teaching can offer new opportunities through broadening pedagogic approaches, and to understand the implementation factors that support effective remote teaching.

Aims of the project

This research forms part of larger DfE-commissioned programme of evidence-based research into education technology (EdTech). The aim of this particular study was to take a detailed look at remote teaching, and, specifically, the tools that schools and colleges have used to facilitate remote teaching before, during and after the period of partial school closures (due to the Covid-19 pandemic in 2020 and 2021). For the purposes of this study, remote teaching is defined as ‘a teacher teaching a live lesson from a different location to some or all of the pupils; for example, a teacher at home and children in class, or a class split between multiple locations’.

The findings are designed to help policy-makers, researchers and practitioners to better understand how remote teaching was used before the pandemic, and how it has been used since. Drawing on selected schools’ and colleges’ recent experiences together with findings from the research literature, it also provides recommendations to inform the next phase of the DfE’s wider research programme.

Methodology

The study involved 3 main research activities:

1. A rapid review of UK evidence on remote teaching.
2. 16 in-depth school and college case studies, involving a total of 45 interviews with senior school/college leaders, staff members with responsibility for EdTech tool purchasing and implementation, staff members with lead responsibility for remote education, and class teachers with experience of undertaking remote teaching. The final sample of 16 comprised:

- 10 publicly-funded schools/trusts in England, including 5 secondary schools, 3 primary schools, one mixed-phase trust, and one special school.
- Three independent schools in England.
- Three post-16 providers in England, including a Further Education College and 2 Sixth Form Colleges.

3. Analysis of school and college monitoring and assessment data.

The project was undertaken between December 2021 and March 2022.

Key findings

Schools' and colleges' use of live remote teaching

Use of remote teaching as part of an emergency response to the pandemic

- For most case-study schools and colleges, the use of live teaching was a novel approach introduced during the first or second period of partial school closures in England as part of an emergency response to the pandemic. This aligns with findings from national research (Montacute and Cullinane, 2021), which found that schools significantly increased their online learning provision during the second period of partial school closure, with over half of teachers (54%) delivering live online lessons in January 2021, compared with only 4% in March 2020.
- Some schools chose to replicate the normal school day, offering live-streamed lessons in place of face-to-face lessons. Others offered a more limited number of live lessons. This was a pragmatic approach for some, reflecting uncertainties regarding pupils' access to appropriate devices and robust Wi-Fi at home.
- During the periods of partial school closures, schools and colleges were using live remote teaching as part of a blended approach. This could involve pupils receiving a mixture of face-to-face and remote teaching. Some schools and colleges combined live teaching with asynchronous online teaching, and some used a combination of digital and paper resources. Some adopted a 'flipped learning' approach, where the main lesson content was delivered remotely (for example through the use of pre-recorded videos, PowerPoint presentations and quizzes), while live remote lessons were used to check and develop pupils' understanding.

More recent and ongoing uses of remote teaching

- Many schools and colleges reported they were continuing to use remote teaching to support individual or small groups of isolating pupils. One primary senior leader explained that this approach was designed 'for children who can't come into school but can still learn' and helped 'to reduce lost learning days'.
- While case-study schools and colleges appeared to be continuing with some form of remote education, this commonly focused on asynchronous learning, whereby the teacher prepares the material and the pupil accesses it at a later date, rather than live teaching. This typically involved one or more of the following activities:
    - Recordings and content that staff created during lockdown being used to support those children isolating and for revision.
    - Use of self-marked quizzes.
    - Diversifying the way in which pupils could complete homework, by, for example, allowing them to record themselves and/or upload videos.
    - Using technology to inform parents/carers of homework assignments that have been set for their children and notifying them when they have been completed.

Products and tools used to support remote teaching

Applications used to support remote teaching

- Case-study interviewees reported using one of 4 applications to deliver live video lessons: Microsoft Teams; Google Meet; Zoom; and Adobe Connect.

A range of supplementary applications were also used to deliver remote teaching. These included:

- **subject-specific applications**, such as Times Table Rockstars, which offers a sequenced programme of daily times-tables practice
- **recording and storage applications**, such as Microsoft OneNote, which allows teachers to organise and share lesson plans in searchable digital notebooks
- **Learning Management Platforms (LMPs) or Virtual Learning Environments (VLEs)**, such as Canvas, which provides rubrics, modules, calendars, quizzes and analytics.
- **online whiteboards**, such as Miro, which provides a web-based canvas with real-time and asynchronous collaboration tools
- **tools for engaging parents and carers**, such as Firefly, which uses a single central hub for schools to share information and parents to monitor and support their children's progress.

Devices used by teachers and learners

- Most teachers reported using a Chromebook, Windows- or Mac-supported laptop, with some using an iPad, surface tablet or desktop computer. Some reported using additional devices, including visualisers, graphics pads (with stylus), headphones, external webcams and microphones.
- Pupils used a wide range of equipment to engage with remote teaching. The equipment provided by case-study schools and colleges included laptops, tablets and desktop computers, as well as peripherals such as headsets. However, some schools and colleges did not provide devices, so their pupils connected to remote lessons using their own laptops/tablets, mobile phones or even smart TVs and games consoles.

What has worked well

Schools and colleges reported that EdTech worked well to support remote teaching when:

- **it was user-friendly, cloud-based and consistent across different devices.** User-friendly EdTech was important because this meant that teachers were confident to use the technology in different ways; pupils could easily access learning from home; and parents were confident in supporting their child.
- **there was consistency and integration between apps and platforms.** For example, EdTech leads commented on how all Microsoft and Google apps are integrated, which enabled teachers to embed a PowerPoint presentation within Teams or a Google Form within Google Classroom.
- **it provided pupils with a range of formative feedback.** Self-marking quizzes were used to engage pupils and provide them with rapid feedback, without adding to teachers' workload. They also enabled teachers to assess pupils' understanding live in the lesson and respond instantly to any general areas of weakness.

What has worked less well

Schools and colleges reported that EdTech worked less well to support remote teaching when:

- **users faced resource constraints or technical problems**. This included problems finding a suitable space in which to learn, devices and internet connectivity issues in pupils' homes.
- **pupils were reluctant to engage in learning.** This appeared to be a greater issue in secondary compared to primary schools, where some pupils were self-conscious about appearing on camera.
- **teachers lacked the skills or confidence to engage in remote teaching.** This was particularly challenging at the start of the pandemic, but there continued to be some reluctance to its use.

Mitigation strategies included using: the government's 'Get help with technology programme (GHwT)'; low stakes quizzes to increase pupil engagement; and the phased roll-out of training for teachers by specialist in-school staff, including 'early adopters' and 'EdTech enthusiasts'.

Gaps in functionality

Some interviewees had suggestions for new or additional functions they would like to see added to the software they were using. In general teachers wanted:

- full-control over live remote lessons, including the ability to mute pupils and to simultaneously view every pupil's camera while presenting
- to better support the submission of hand-written work, including the ability to take high-quality scans of pupils' work
- support with file management, so that online documents could be more easily indexed and retrieved.

It should be noted that other interviewees had already found solutions to these gaps, reflecting both the pace with which software was being developed and updated, but also the variability in teachers' knowledge of the different ways in which different packages could be used.

Topics to explore in further research

Our recommendations for topics to explore in further research focus on key areas identified in the case studies and research literature. They are designed to support the Department's next steps, which entail scoping further research into EdTech tools and products.

1. The Government is committed to remote education 'allowing children to keep pace with their education when in-person attendance in school is impossible' (HM Government, 2022, page 59). We recommend further investigation into solutions for schools to provide remote live teaching for these pupils. In particular, there is a need to identify the best (most efficient and effective) hardware and software solutions to allow for simultaneous delivery and broadcasting of live in-person lessons. This could include consideration of the use and positioning of microphones and webcams as well as the use of different applications to create a more cohesive, integrated and managed learning experience.
2. Given the importance of interaction during live remote lessons for pupil engagement and learning, we recommend an investigation of which EdTech tools are most effective in enabling interactivity and how these can best be deployed. This needs to take account of the pedagogical and practical/workload challenges for teachers: they need to be simple and easy for teachers to use and address safeguarding concerns.

3. Some interviewees commented on the challenges of delivering remote education to younger children, particularly those in Reception and Year 1. For example, interviewees' expressed concerns about young children's ability to concentrate for extended periods of remote teaching, and for the potential negative consequences for children's social and fine motor skills (such as being able to write, or hold a pencil or a paintbrush). We recommend an investigation of remote teaching for younger children (i.e. children aged 3 to 6). This should include which products are most suitable for which age-groups, and any recommended limits on the length and frequency of live remote teaching, or the need to balance live remote teaching with other activities, such as play and other forms of learning, to enable the development of the whole child.
4. Some case-study schools and colleges were concerned that live remote teaching had widened rather than narrowed attainment gaps between pupils with different characteristics. This was attributed to some pupils not being able to reliably access remote learning, while others were reluctant or unable to engage. While the use of the government's 'Get help with technology programme (GHwT)' had helped with device access, and the introduction of low stakes, smart retrieval quizzes had helped to increase pupil engagement, these approaches had not fully overcome these issues. In addition, while accessibility tools embedded within EdTech could be helpful for SEND pupils, the support needs of these pupils were sometimes regarded as 'too nuanced' to be wholly met by remote teaching. We therefore recommend that the DfE commission research into tools and products designed to support learners with a range of different special educational needs and disabilities. We also recommend that all future impact research and trials require consideration of the needs of learners with SEND and those from disadvantaged backgrounds.

1 Introduction

The UK has been a global leader in the development of technology to support the education sector (EdTech), with the industry expected to reach a market value of £3.4 billion in 2021 (Ash-Brown, 2021). Much of the growth of the EdTech market has been organic, with the 2020 partial school closures[1] and lockdown measures in response to the Covid-19 pandemic acting as a 'hyper-accelerator'. The value of UK's EdTech sector grew by 72% in 2020, far exceeding the 18% growth of EdTech companies globally (Cotton, 2021). Yet, when it comes to making decisions about EdTech procurement, the glut of options has made it difficult for schools, multi-academy trusts and local authorities to navigate the market and select products and services that meet their specific needs.

The Department for Education (DfE) launched its EdTech Strategy in 2019 to more closely link the developing EdTech business sector with teachers, lecturers, and education experts by fostering market engagement and research. In particular, the EdTech strategy seeks to support the development of solutions that can cut teacher (non-teaching) workload, drive efficiencies, remove barriers to education and ultimately improve outcomes.

The global outbreak of Covid-19 and the subsequent partial school closures significantly disrupted the delivery of education. The national lockdown periods created an unprecedented need for remote teaching and learning solutions, while the introduction of a legal requirement for schools to provide remote education for children unable to attend due to Covid-19, ensured this was universally met during the second period of partial school closures in 2021.

The DfE's EdTech Survey 2020-21 found that 64% of surveyed headteachers had introduced, increased or upgraded technology in the previous 12 months, particularly in response to Covid-19 (CooperGibson Research, 2021). Other research (Parkin and others, 2020) found that 80% of schools used either new tools or a mix of new and old. Tools ranged from the use of online learning platforms, digital curriculum content tools and services, and technology to deliver both live remote lessons and pre-recorded lessons online (CooperGibson Research, 2021; BESA, 2021). The implementation of remote teaching and learning has varied in practice. The selection of technology has differed across primary and secondary schools, where primary schools were more likely to use asynchronous learning and pre-made online materials, and less likely to use live, online teaching than colleagues from secondary schools (Müller and Goldenberg, 2021; Eivers and others, 2020).

[1] Note that most schools remained partially open throughout the lockdown periods, to accommodate vulnerable children and children of keyworkers.

However, the DfE's EdTech survey (CooperGibson Research, 2021) found that 24% of teachers felt that the increased use of technology to support remote teaching and learning increased their workload. While 66% of teachers rated their ability to offer remote teaching and learning as 'good' or 'very good' (Lucas *et al*., 2020), the level of training in the use of technology is comparatively low. For example, in England, prior to 2020, 18% of pupils had teachers who had participated in professional development for the use of technology in mathematics instruction at primary level, as compared to a global average of 34.6%[2] (Galvis and McLean, 2020).

The flexibility offered through EdTech continues to be of importance, especially as Covid-19 continues to affect teacher and pupil attendance. It is therefore not surprising that wider use of EdTech for teaching appears to be here to stay. For example, many schools, particularly at secondary level, are now more likely to invest in supporting remote teaching and learning and offer blended learning and lesson delivery (CooperGibson Research, 2020).

The hybrid provision, whereby schools and colleges are teaching pupils both in class and at home, poses additional pedagogic challenges, such as teachers needing to ensure they are seen and heard by their online pupils and simultaneously attending to the needs of their pupils who are in the classroom. It also creates opportunities, including to mitigate against lost learning time. Therefore, more research is required to understand the many ways in which remote teaching can offer new opportunities through broadening pedagogic approaches, and to understand the implementation factors that support effective remote teaching.

1.1 Aims of the project

This research forms part of larger DfE-commissioned programme of evidence-based research into education technology. The aim of this particular study was to take a detailed look at remote teaching, and, specifically, the tools that schools and colleges have used to facilitate remote teaching before, during and after the period of partial school closures (due to the Covid-19 pandemic in 2020 and 2021). For the purposes of this study, remote teaching is defined as 'a teacher teaching a live lesson from a different location to some or all of the pupils; for example, a teacher at home and children in class, or a class split between multiple locations'. This was the specific area of interest for the DfE, but the focus on live remote teaching should not be interpreted as indicating a policy preference for this approach, as distinct from other approaches to remote teaching.

[2] England was compared against other countries participating in the Trends in International Mathematics and Science Study (TIMSS) 2019, which includes Hong Kong, Singapore, Russia, Latvia, Taiwan, Northern Ireland, Ireland, South Korea and Japan.

The findings are designed to help policy-makers, researchers and practitioners to better understand how remote teaching was used before the pandemic, and how it has been used since. Drawing on selected schools' and colleges' recent experiences together with findings from the research literature, it also provides evidence-based recommendations for how remote teaching can be most effectively deployed in the future.

1.2 Research questions

The project explored the following key research questions.

1. **What products and tools are schools and colleges using for remote teaching?**
2. **How did they select the tools they used?**
   - 2.1. Were they piloted or reviewed?
   - 2.2. How did they hear about them?
3. **How have the tools been implemented in schools or colleges?**
   - 3.1. How have schools/colleges implemented the tools?
   - 3.2. If they were implemented at speed as a response to the pandemic, what would schools or colleges have done differently in a different scenario with more time to assess what best met their needs?
4. **Have they measured the success of the tools in any way?**
   - 4.1. What approaches have they used to do this?
5. **What has worked well and less well, and why, in the use of different products and tools?**
   - 5.1. What tools would they recommend for what purpose(s)?
   - 5.2. What additional features/functions would teachers like to see adding to their recommended tools and why?
6. **What have they learnt as a result of remote teaching during the pandemic?**
   - 6.1. What are the benefits and drawbacks of this mode of teaching?
7. **What are their future plans for remote teaching?**
   - 7.1. What are the potential opportunities and benefits?
   - 7.2. What are the potential barriers and disadvantages?
8. **What are the range of purposes for which remote teaching has been used/considered? For example, has remote teaching been used/considered:**
   - 8.1. To allow a greater breadth of subjects to be taught?
   - 8.2. To support catch up on missed learning caused by coronavirus?
   - 8.3. To enable access to specialist teachers in harder-to-recruit subjects?
   - 8.4. To support teacher wellbeing and reduce workload?

8.5. To support specific groups of learners, including learners with special education needs and disability (SEND), the most able, other small groups, or pupils who have long-term illnesses?

1.3 Methodology

The study involved 3 main research activities:

1. A rapid review of UK evidence on remote teaching.
2. In-depth interviews with staff as part of school and college case studies.
3. Analysis of school and college monitoring and assessment data.

Further details are provided in the sections below.

Rapid review of UK evidence

To inform the research team's choices about the selection of case-study schools and colleges, the design and content of the research instruments, and to provide context for the findings presented in the report, NFER undertook a bespoke, focused evidence synthesis. This involved drawing together the findings from recent research conducted in England between March 2020 and December 2021, which shed light on schools' and colleges' experiences of using EdTech to support remote teaching. A total of 13 sources were identified, including the DfE-commissioned EdTech Survey: 2020 to 2021 (CooperGibson Research, 2021) and the inaugural report from the All-Party Parliamentary Group for Education Technology (APPG) 'Lessons from Lockdown: What we Learned about Education Technology in 2020'. The review sought to identify:

- examples of the types of products and tools that schools and colleges are using, or have been using, for remote teaching
- examples of how they have been deployed
- the main benefits and drawbacks of different modes of remote teaching, including more innovative approaches.

Relevant findings from the review have been incorporated within the report.

In-depth case studies

Overview

The main body of the project involved undertaking 16 virtual school/college case studies, each comprising semi-structured interviews with staff who had experience of using remote teaching. The research team sought to speak to staff in up to 4 roles in each case-study school/college, comprising:

- a senior school/college leader
- the staff member with responsibility for EdTech tool purchasing and implementation (if different from above)
- the staff member with a lead responsibility for remote education
- a class teacher with experience of undertaking remote teaching.

In practice, some interviewees had more than one of these responsibilities; for example, several senior leaders also held responsibility for EdTech tool purchasing and implementation within their organisations. The interviews lasted for between 30 to 45 minutes on average and were undertaken by video call. Where the interviewees gave their permission, the interviews were recorded, and summarised notes written up. A total of 45 interviews were undertaken with school and college staff between January and March 2022. We also spoke to 2 representatives of Oak National Academy, which was created in April 2020 in response to the coronavirus outbreak. The Academy provides schools and colleges with access to some 40,000 free, curriculum-aligned teaching resources. We included them in the study because, while their resources are not designed exclusively for use as part of live remote lessons, several of the case-study schools/colleges reported making use of these resources (see Chapter 2).

Sampling

Schools and colleges were purposively selected to include a range of innovative practice examples whereby a teacher in a school/college/trust had taught ‘a live lesson from a different location to some or all of the pupils’. In particular, selection criteria included organisations in which remote teaching:

- had been delivered in an innovative way (primary focus)
- had been attempted, but was unsuccessful
- had helped to address issues of social deprivation or reflected more mainstream examples of use.

A small sample of schools and colleges known to be doing some interesting work in remote teaching were contacted by the DfE, with the contact details for those who agreed to take part in the study being passed on to the research team. At the same time, the research team used social media and contacted a number of schools, colleges and multi-academy trusts (MATs), as well school umbrella organisations, such as the College of Teaching, to seek expressions of interest to take part in the study.

Types of education settings that were in scope for the study

A broad range of settings were in scope for the study. We focused on those in England, but also included one setting that was part of an international network. The final sample of 16 comprised:

- 10 publicly-funded schools/trusts in England, including 5 secondary schools, 3 primary schools, one mixed-phase trust, and one special school.
- Three independent schools in England.
- Three post-16 providers in England, including a Further Education College and 2 Sixth Form Colleges.

Five of the case-study schools and colleges were part of the DfE's EdTech Demonstrator Programme, which was developed to ensure schools and colleges across England could access free expert advice from education technology specialists across the country.

Other considerations

The research team did not impose quotas on the different types of schools/colleges that were included within the case-study sample, but we did aim to include schools/colleges with a) different characteristics and b) those which were using different products and tools for remote teaching.

School/college characteristics	Deployment choices
• are in different phases (e.g. primary, secondary, post-16) • are located in different geographic areas (North, Midlands, South) • have different socio-economic contexts	• different tools and platforms (e.g. Teams, One Note, Google Classroom, Loom, Zoom, Seesaw) • deployed for different purposes (e.g. to support Covid recovery, for different groups of learners, to support access to different subjects, to promote efficiency and reduced workload).

Observations

In addition to the interviews, we were able to observe a live or pre-recorded remote lesson in 3 different settings. This helped to deepen the team's understanding of the implementation models adopted by different settings and provided an opportunity to explore the immediate response from pupils.

Piloting

Given the project commenced in December 2021, and fieldwork started in January 2022, there was not time to conduct a cognitive pilot of the research instruments. Instead, the first 2 case-studies served as 'live pilots' and allowed the research team to test how the research instruments performed. The team found that the instruments performed as expected, and only minor wording changes were made to the instruments as a result of feedback from pilot participants.

Analysis of monitoring and evaluation data

As well as exploring the key research questions outlined above, the research team sought to gather monitoring and evaluation data from schools/colleges on their use of EdTech and its effectiveness and outcomes (see Chapter 4).

1.4 A note on reporting and interpretation

While remote teaching can take different forms, all of the case-study schools and colleges interviewed as part of this study were purposively selected because of their experience of delivering live remote teaching, whereby a teacher taught a live lesson from a different location to some or all of their pupils.

Many of the school and college staff interviewed as part of this project could be regarded as EdTech innovators. As such, their views and experiences are unlikely to be typical of most schools or colleges. Similarly, differences in the types of institutions included within the research, as well as differences in the way they approached remote teaching, and in the characteristics of the communities they serve, means the group should not be regarded as uniform or homogenous.

The report includes a number of boxed 'vignettes' to illustrate how case-study schools and colleges have delivered remote teaching. These were written so as not to identify the case-study school or college in question, and so are heavily summarised. A more detailed description of how specific schools and colleges have approached remote teaching can be found in Chapter 6. While every effort has been made to accurately reflect the practices and experiences described by case-study interviewees, only the named case-study write-ups were checked with the schools and colleges.

Finally, while throughout the report we have made reference to programs and tools used by case-study schools and colleges, the naming of specific products in no way represents or implies endorsement of these tools by the DfE or the research team.

1.4 About this report

Chapter 2 explores case-study schools' and colleges' use of remote teaching, both before and since the start of the pandemic. Chapter 3 looks in more detail at the range of

products and tools used to support remote teaching. Chapter 4 considers the monitoring and evaluation evidence, collected by schools and colleges, on their use of remote teaching, and Chapter 5 explores schools' and colleges' future plans for remote teaching. Chapter 6 describes in more detail the approaches to remote teaching adopted by five of the case-study schools and colleges. The final chapter draws together the main findings and includes recommendations to inform the next phase of the DfE's wider research programme.

2 Schools' and colleges' use of live remote teaching

2.1 Introduction and overview

This chapter explores the range of purposes for which case-study schools and colleges used live remote teaching, both before and during the pandemic. It also draws out the key learning points identified by schools and colleges, from their experience of delivering remote teaching.

Previous research has found that during the first period of partial school closures, most schools used a blended approach, combining live teaching with asynchronous online teaching (implemented by around 90% and 86% of respondents respectively) (Eivers and others 2020). However, most pupils accessed fewer lessons online than offline. Another study (Müller and Goldenberg, 2020) found that schools typically used a range of different approaches within live online teaching, including whole-class teaching and one-to-one sessions to support individual learning needs.

A number of studies find that disadvantaged pupils were less likely to receive high-quality remote learning support from schools than their more advantaged peers, due to access issues at home and/or their schools' capacity to offer such support (Cullinane and Montacute, 2020; Horrocks, 2020; Sutton Trust, 2020; Teach First, 2020). In particular, some pupils from disadvantaged backgrounds were unable to access EdTech at home (CooperGibson, 2021) due to their lack of devices, internet connectivity or a quiet study space, which limited their engagement with learning (Lucas and others, 2020). Research into the home learning environment (Andrews and others, 2020) found that while children in the highest-income families spent 5.8 hours per on day home learning during the first period of partial school closures, those in the poorest fifth of households spent only 4.5 hours per day.

2.2 Use before the pandemic

Case-study schools and colleges reported that, prior to the pandemic, they made widespread use of EdTech to support teaching and learning, including to deliver remote education. However, delivering live remote lessons was less common before the first period of partial school closures in March 2020.

For most settings, the use of live teaching was a novel approach introduced during the first or second period of partial school closures in England as part of an emergency response to the pandemic. This aligns with findings from national research (Montacute and Cullinane, 2021), which found that schools significantly increased their online learning provision during the second period of partial school closures, with over half of teachers (54%) delivering live online lessons in January 2021, compared with only 4% in March 2020.

One case-study had more extensive experience of delivering live lessons prior to the pandemic through its campuses based in the UK and internationally (see Box 1 below).

Box 1: Experience of delivering remote lessons prior to the pandemic

This network of independent schools caters for pupils aged 7-18 (Years 3 to 13). Prior to the pandemic, the schools taught some A level classes, such as economics, philosophy and politics, remotely. This was introduced to broaden the curriculum and increase access to subject specialists. Pupils in the same school as the subject specialist received face-to-face teaching, while their peers from other schools in the network accessed the lesson remotely.

> 'The only way we could offer a wide range of A levels was through [live] online learning, using video conferencing.' *Senior leader.*

Schools in the network tend to be small in size, which helped facilitate successful live remote teaching by enabling teachers to establish good working relationships with their pupils. Member schools had some experience of delivering live lessons before the pandemic but expanded their use of this technique during the first lockdown. They also extended their use of live remote lessons to include primary-aged pupils. For all pupils, the remote learning day replicated a normal school day as closely as possible as they continued to follow the same timetable. The only exception to this was the introduction of screen-free Wednesday for primary pupils. Staff reported that both teachers and pupils became more confident about delivering teaching and accessing learning remotely.

While most case-study schools and colleges had no experience of delivering live remote teaching prior to the pandemic, some had limited experience. Examples included: a post-16 provider with experience of using blended teaching, combining in-person and online teaching; a publicly-funded primary school with experience of using Skype to connect classes with other schools; and an independent school which had used Zoom to share lessons with a school in India as part of a student exchange programme. There was limited time during the interviews to explore these experiences in more detail, but they appeared confined to small numbers of pupils and teachers and were only used occasionally and/or for short periods of time.

Case-study schools and colleges commonly reported that they had some experience of delivering asynchronous remote education prior to the pandemic. This encompassed a range of teaching and learning activities, including:

- instructional videos, sometimes pre-recorded by the class teacher or created using screen-capture technology to help with revision
- online tools such as Microsoft Forms used to set quizzes and check pupils' understanding

- online apps to support different subjects, such as Minecraft Education Edition to teach history and Time Tables Rockstars to teach mathematics
- online tools, such as OneNote and Google Classroom, to set and upload homework.

Some case-study schools and colleges, especially in the independent sector, had invested more substantially in EdTech prior to the pandemic, which meant they felt relatively well-placed to respond to the challenges posed by the need to move to remote teaching. This included providing individual devices to staff and pupils as well as tools and platforms that support remote education, as illustrated by the boxed example below. (Chapter 3 provides a more detailed discussion of the range of products and tools used by schools and colleges to support remote teaching.)

Box 2: A college with experience of investing in EdTech prior to the first national lockdown in March 2020

This post-16 provider began to pilot Google workspace in 2018, and then introduced Chromebooks in a few departments. At first, teachers used Google workspace to set homework and assignments for students. Training was then rolled out by 'in-house early adopters' to support their colleagues to use Google's full suite of tools. Rather than CPD being delivered to all staff at once, it was rolled out to groups in phases. They did this to enable teaching staff to have more in-depth discussions about using technology to support teaching and learning. The early adoption of Google's tools meant the college was relatively well placed to move to remote education during the Covid-19 lockdown in 2020, although this was not without its challenges.

> 'We were in a good place to begin remote teaching and learning, but there were still some gaps in staff uptake, and some reluctance and nervousness from moving away from traditional [teaching and learning] approaches.' *Senior leader*

2.3 Use since the pandemic

Case-study interviewees reported that, since March 2020, live remote teaching had been used for a range of purposes. These purposes can be grouped into activities delivered as part of an initial emergency response to the pandemic[3], and those that were delivered more recently.

[3] In England, some schools and colleges were partially or fully closed between March-July 2020 and January-March 2021.

Use of remote teaching as part of an emergency response to the pandemic

Not surprisingly, the main reason schools and colleges used remote teaching during the pandemic was to support pupils and teachers who were isolating, or who were unable to be in school or college. This was delivered in different ways. Some schools replicated the normal school day, offering live-streamed lessons in place of face-to-face lessons, as illustrated by the boxed example below.

Box 3: A primary trust's approach to live remote teaching which aimed to replicate the in-class experience

During the pandemic, schools in this publicly-funded primary trust delivered live remote lessons to their normal timetables. Teachers used OneNote to provide links to the meetings and to lesson resources, and delivered their lessons using Teams.

> 'Everything we did aimed to replicate what we did in school so the virtual learning experience is as similar to in-class experience as possible.' *Senior leader and EdTech procurement lead*

Each OneNote lesson page included details of the activity, an information video, and a form for the pupils to record what they had learnt, together with a rating of their enjoyment of the lesson. Teachers shared their screens and annotated the activity slides, as they would on a whiteboard in the classroom. At the end of the lesson, teachers uploaded a recording of the lesson to the OneNote page, for pupils to play back whenever they wanted.

Some schools and colleges opted to live-stream a range of activities in addition to classroom lessons, including assemblies, concerts and sporting activities. This was reported to have been particularly well received by parents, as it gave them access to activities they otherwise would have been unable to attend.

Other schools and colleges offered a more limited number of live lessons, either through choice, or through necessity. This was a pragmatic approach for some, reflecting uncertainties regarding pupils' access to appropriate devices and robust Wi-Fi at home. Others were concerned about the workload implications of asking teachers to deliver more frequent live lessons, particularly during the early months of the pandemic when many staff were at home looking after their own children. Some schools chose to provide a short live component in all their lessons, for example as a starter or reflection activity, with pupils working on a task for the rest of the time. The task would typically involve pupils accessing PowerPoint presentations, videos and quizzes to check their understanding.

Some schools used a hybrid approach, whereby some pupils were taught in the classroom with the teacher, while lessons were live streamed to others at home, as illustrated in the boxed example below.

Box 4: One college's approach to hybrid remote teaching

Staff at this large post-16 provider have been using state-of-the-art digital resources for teaching and learning for several years, and have trialled different modes of live, remote delivery. It has several immersive classrooms, each featuring five livestreaming screens. This technology enables teachers located in one immersive classroom to deliver lessons to students spread over a number of classrooms across campuses. Students are also able to interact with those in other locations, thanks to the mirrored screens. During the pandemic, the college extended its existing provision by setting up dozens of rooms with single 50" screens to support live remote teaching. Some lessons involved a hybrid approach, with the teacher and a group of pupils in the classroom and others connecting remotely from home, using Teams. Teachers found Teams worked well for this purpose

> 'The main thing is functionality for teachers. That's what they're after. Something that offers the most functionality to ensure their lessons are the most effective as can be, especially when forced into the situation that was unknown to them'. Senior leader

The college provided teaching staff with small portable microphones. These enabled them to move around the classroom when teaching, which supported hybrid delivery. For example, when needed, they could move the microphone to enable a pupil in the classroom to communicate with remote learners.

However, some settings found the hybrid approach difficult to implement, particularly where they were simultaneously supporting pupils who were both in a classroom and joining remotely. As a result, several interviewees reported that they preferred to have all pupils join the lesson online, regardless of whether they were in school/college or at home.

Schools and colleges were using live remote teaching as part of a blended approach. This could involve pupils receiving a mixture of face-to-face and remote teaching. Some schools and colleges combined live teaching with asynchronous online teaching, and some used a combination of digital and paper resources. Some interviewees also used the 'flipped classroom' approach, where the main lesson content was delivered remotely (for example through the use of pre-recorded videos, PowerPoint presentations and quizzes), while live remote lessons were used to check and develop pupils' understanding. One school's flipped learning approach is described in Chapter 6 (see example 5).

Interviewees also gave examples of live remote teaching being used to engage specific groups of learners, including those with special educational needs and disabilities (SEND). The boxed example below describes how a special school supported their learners during the pandemic.

Box 5: A special school's approach to delivering live remote teaching

This special school serves primary, secondary and post-16 students. Their main EdTech tool to support parental engagement and celebrate students' work before the pandemic was Seesaw. Staff scaled up their use of this tool during the pandemic to set work, support communication with families further and enable interaction between pupils during absences.

A senior leader explained that Seesaw was their preferred platform to support remote teaching, owing to its breadth of features, being simple to use, and because it was perceived to be a safe platform.

> 'Seesaw is great because it allows students to communicate with each other, so they don't miss out socially… teachers [were] already stressed during the pandemic with factors outside of work so this had to be simple and easy to use and not time-consuming so as not to add to their workload.' *Senior leader*

During the pandemic, all pupils received one lesson a day in English, mathematics and another foundation subject, supported with an extensive resource loaning library. These included both live and pre-recorded content, based on pupil and class needs. Lessons consisted of a 20-minute live component, delivered using Zoom, followed by an interactive activity. Staff recorded the live content and uploaded it to Seesaw, along with instructions (written and audio-recorded) for pupils accessing it outside of the timetabled lesson. Some pupils were able to access the live lessons every day, although many needed parental support to do so. Staff felt the pre-recorded model worked better than live remote lessons for families where both parents were working and could not support their children's learning during the live lesson.

Some interviewees spoke of the benefits of using technology to differentiate homework for groups of learners of different needs and abilities. For example, several reported using the 'Immersive Reader' function within Teams to support pupils with SEND. This allows pupils to have their homework assignments read aloud to them, and to dictate their answers which are then automatically transcribed, ready for marking. To ensure their pupils were being appropriately challenged by remote teaching, one school also offered mathematics and English lessons via Zoom to their most able pupils in Years 5 and 6.

In addition to using remote teaching to support pupils with their academic work during the pandemic, schools used video-conferencing for other purposes, including to:

- provide pastoral support
- provide access to subject specialists/ increase curriculum offer
- deliver a British curriculum/educational experience internationally (in the case of the virtual school)

- support teacher wellbeing and reduce workload (e.g. through enabling team teaching)
- support specific groups of learners such as those with SEND, the most able, other groups or individuals
- make enrichment activities more accessible (e.g. guest speakers can appear via live video, removing the need to travel to school).

Some of these purposes are discussed in more detail below.

Interviewees acknowledged the need to support pupils with their social and emotional needs during the pandemic, and some saw live streaming as a way to do this. This took different forms. For example, one post-16 provider implemented a programme of pastoral support, whereby tutors held one-to-one meetings with pupils to check on their wellbeing and academic progress. This was facilitated using Google Meet. Some provided opportunities for friendship groups to communicate/socialise using video-conferencing software. One publicly-funded primary school used Teams to set-up chat groups for pupils, alternating the groups each week so the groups were not too insular and everyone had different children to talk to. The senior leader of an independent school spoke about the need to create opportunities for pupils to engage less formally with their peers:

> 'The children were having an intensive time with the teacher, sometimes in breakout rooms with their friends, but it was all very structured, and we knew they were missing out on that opportunity to engage with their peers. They need that, particularly when they are young, they need to learn how to interact with their peers. We insisted that they had time where the teacher was there, but they had time to play a game, [to have a] free chat and [to] take the pressure off everything that was going on.' *Senior leader, independent school*

However, some interviewees suggested that remote teaching could be a cause of stress and emphasised that it was important to give children the time to 'get up and move around, [to] get fresh air and [to] ensure they were not sat in front of a laptop all day'.

There were mixed views on the impact of live remote teaching on teacher wellbeing. This was despite the fact that the schools and colleges included within our sample could be regarded as EdTech innovators, and may therefore have been more successful in their approaches to remote teaching than most other schools or colleges. Some case-study schools and colleges reported that the move to remote teaching had supported teacher wellbeing and reduced their workload, but others reported that it had the opposite effect, particularly at first. One of the main ways in which remote teaching reduced workload was by facilitating team teaching, whereby two or more teachers planned and/or taught their classes together. Having some teachers focussing on lesson planning and others delivering live lessons freed up other teachers' time, as the remote education lead for a primary school explained:

> ‘Teachers found that they had a lot more time to prepare in a much more detailed and fulfilling way than in a normal school setting, because they were delivering some lessons as part of a rotation within their phase team. They might find they only deliver one afternoon session in every 4, so the other afternoons they would be planning and preparing and resourcing and creating content to support learners’. *Remote education lead, primary school*

It should be noted that while the gains described above were achievable due to classes being merged, this approach may not be replicable outside of the emergency created by the pandemic.

In a similar vein, research by the Oak National Academy (2021) found that Oak users, who were using pre-prepared lesson materials had a statistically significant higher wellbeing score than non-users and scored on par with the pre-pandemic national average benchmarks. Several of the case-study interviewees reported using Oak National Academy lesson materials, both as part of synchronous and asynchronous approaches to remote education. Several interviewees also reported that the use of self-marked quizzes, created using platforms such as Microsoft Forms, provided useful assessment data, while helping to make teachers’ workloads more manageable.

By contrast, some interviewees reported that the initial move to remote teaching, particularly in the early months of the pandemic, had been quite stressful for staff. However, this became less onerous over time because: teachers became more familiar with the software and tools at their disposal; schools and colleges rolled out training and guidance for their staff; and teachers became familiar with a range of resources, including those provided by Oak National Academy.

More recent and ongoing uses of remote teaching

Case-study interviewees reported that they learned a great deal from their experiences of delivering live remote teaching (see summary in Section 2.4). However, while many were doing more compared to the period before the pandemic, most had scaled back their efforts as they had returned to face-to-face teaching.

Schools commonly reported they were continuing to use remote teaching to support individual or small groups of isolating pupils since most pupils had returned to school. One primary senior leader explained that this approach was designed ‘for children who can’t come into school but can still learn’ and helped ‘to reduce lost learning days’.

Staff in one publicly-funded primary school reported they had employed a member of staff for the sole purpose of delivering remote teaching. While work was still set by the pupils’ class teachers, it was delivered by the remote teaching specialist, leaving their colleagues to focus on face-to-face teaching.

One independent school used live remote teaching to bring in subject specialist teachers shared across different campuses. For a detailed description, see Chapter 6, example 1.

Case-study schools and colleges reported that since the start of the pandemic, they were placing lesson materials online for pupils who were sick or isolating but able to work, as well as for pupils who wanted to review lesson materials for homework or revision. For the same reasons, some of those schools and colleges who continued to deliver live lessons were recording those sessions and making them available online. The senior leader from a primary school trust explained that this was a way to 'scaffold learners without any additional teacher workload'. The fact that this supported the school's blended learning approach, meant, 'it's the way we want learning to go regardless of whether children are home'.

However, while case-study schools and colleges appeared to be continuing with some form of remote education, for many, this focused on asynchronous learning, whereby the teacher prepares the material and the pupil accesses it at a later date, rather than live remote teaching. This typically involved one or more of the following activities.

- Recordings and content that staff created during lockdown being used to support those children isolating and for revision.
- Use of self-marked quizzes.
- Diversifying the way in which pupils could complete homework, by, for example, allowing them to record themselves and/or upload videos.
- Using technology to inform parents/carers of homework assignments that have been set for their children and notifying them when they have been completed.

2.4 Lessons learned

Interviewees identified a number of learning points from their experiences of delivering remote teaching. Some of the key messages are described below.

It is important to have a digital strategy to establish expectations, maintain a high-level of teaching quality, and to ensure consistency across subjects/phases

Few institutions within our sample reported having a digital strategy prior to the first lockdown. For some case-study interviewees, the development of a digital strategy was a 'fluid process', which developed rapidly after the first lockdown in March 2020. For example, the senior leader of a publicly-funded secondary school explained that by the time of the second period of partial school closures, in January 2021, the school was 'much better prepared', with a 'consistent approach to teaching' across subjects. The leaders set an expectation that all teachers would deliver 75% of their lessons through live remote teaching.

> ‘There was a big difference between our preparation for the first and third lockdowns and to our teaching approach… Student engagement [with remote teaching] was dwindling, and we needed to move to live lessons… [However], we recognised that teachers would have their own home struggles with childcare or connectivity issues and that we wouldn’t be able to deliver 100% of lessons live’. *Senior leader, secondary school*

In some cases, where a school or college was part of a MAT, the digital strategy was developed at the trust level, with individual settings able to personalise the plan to meet their specific needs and contexts. One senior leader commented that the pandemic had resulted in greater scrutiny of their MAT’s schools’ digital strategies, resulting in a strengthening of some schools’ plans.

> ‘The pandemic exposed differences within the group… We decided to close that gap to ensure all schools had a digital strategy. There’s not one strategy for all schools – they’re too different… We [the trust] provide a framework or a tool kit to write, develop and implement a digital strategy… We also put in place a governance process to ensure that schools develop a strategy’. *Senior leader, MAT*

For some schools, the digital strategy was not a single document, but a collection of various folders and files that related to the delivery of online teaching. Rather than there being a single strategy document, staff were given access to Google Drive where all these materials and resources were stored. As the EdTech procurement lead for one secondary school explained:

> ‘[Our digital strategy includes] online etiquettes and practicalities, safeguarding and processes for teaching and learning. While some of the strategy is related to policies and procedures, it also includes guidance, including for tools, how to get online [and] access to training materials.’ *EdTech procurement lead, secondary school*

For others, the digital strategy was more comprehensive and integrated, encompassing their vision/mission, expected outcomes, expectations of children, infrastructure, and financial models. In at least one setting, the environmental credentials of EdTech equipment suppliers were considered when making procurement decisions, as was the perceived longevity and energy efficiency of their devices. Perhaps not surprisingly, case-study interviewees also reported that their digital strategies were developed alongside their Covid recovery strategies, with technology playing a key role in supporting staff and pupils during the period of partial school closures and when individuals were isolating.

Live remote lessons can help to support pupil engagement in remote education

Several interviewees spoke about the importance of offering live remote lessons as a way to engage learners in remote education, as illustrated by this quotation from the senior leader of a publicly-funded secondary school:

> 'Live lessons are key. Sending work to students and trusting that they will do it well doesn't work. They could Google it, copy it from friends – it's too easy for them to disengage so getting them to verbally answer in a live lesson is really good.' *Senior leader, secondary school*

Similarly, pupils were reported to respond positively to a varied programme of activities, including regular forms of assessment/quizzes as well as interactive activities, such as sharing and discussion of pupils' work on screen.

High-quality training needs to be offered to both staff and pupils if schools and colleges are to get the most from remote teaching

Many case-study schools and colleges provided training for their staff, and some also did so for their pupils. Most, if not all of this training, appears to have been delivered by specialist in-school staff, including 'early adopters' and 'EdTech enthusiasts', rather than by external trainers/experts. Some also featured peer support. For example, some members of staff created videos on how to set up Google Classroom and other software. This evolved into a place for staff to share ideas, tips and work collaboratively to support each other. The senior leader of a secondary school said:

> 'It really levelled that hierarchy in the school. It was really collaborative in teaching and learning.' *Senior leader, secondary school*

Another secondary school held a regular CPD session for teachers lasting around 30 minutes every week. Sessions focused on how to use various aspects of the software, such as Forms, Teams, OneNote and Quizizz. Those who realised they were more proficient volunteered to lead sessions and formed a support group for their colleagues.

In general, EdTech training focused on how to use the more advanced features of their chosen tools, such as the use of break out rooms within video-conferencing software, and the use of digital interactive whiteboards. Schools and colleges also provided more general guidance for staff on how to deliver remote lessons, such as the need to sit close to a microphone, to ensure slides were clear and uncluttered, and to consider the structure and pacing of live remote lessons. Some schools and colleges also provided training to pupils, including on how to access, and share documents, use interactive features (such as emojis and the 'raise hand tool'), as well as guidance on online etiquette. While the research team did not review training materials, there was no suggestion that the development of this training/guidance followed any specific standards

or quality criteria, although staff feedback on the quality/usefulness of the training was sought by some case-study settings.

Approaches to remote teaching need to work for everyone

In order to make their approaches more accessible and effective for more learners, several interviewees spoke of the need to make adaptations to their early approaches to delivering remote teaching. For example, one primary school trust had the ambition of replicating the whole-school day online, to include before-school activities, registration, lessons, breaks and after school activities. However, they found that this approach was unfeasible for many parents who were trying to supervise children in different year groups whilst also needing to work themselves. However, other parents wanted the structure of a full timetabled day, as it meant their child was supported by the school and they could get on with their own work. These sorts of contradictions led interviewees to reflect on the challenges of offering a 'one-size- fits-all approach', and of the need to match the school's or college's ambitions for remote teaching with the needs and preferences of pupils and their families[4].

[4] Note that while it is possible that schools/colleges consulted families about the remote teaching/learning approaches they were planning to use, interviewees did not mention doing so.

3 Products and tools used to support remote teaching

3.1 Introduction

This chapter explores the range of products and tools case-study schools and colleges used to support remote teaching. Building on the perspectives of different users, it also explores what has worked well and less well and the perceived gaps in functionality of schools' and colleges' existing software solutions.

3.2 Applications and devices used to support remote teaching

Case-study participants reported using a variety of applications ('apps') and devices to support remote teaching. These are discussed in the sections below.

Applications used to deliver live lessons

Case-study interviewees reported using one of four applications to deliver live remote teaching: Microsoft Teams; Google Meet; Zoom; and Adobe Connect.

Microsoft Teams and Google Meet were the most popular platforms owing, primarily, to their integration with case-study schools' and colleges' existing software. Many interviewees' spoke of the simplicity of using these tools, at least to access basic functions. However, those using Adobe Connect said it required staff training to get the most from it.

A minority of interviewees reported they started with Zoom in the first few months of the pandemic, and later moved to either Google Meet or Microsoft Teams, because these were easier to integrate with Google Workspace or Microsoft Office 365 respectively.

Other supporting applications

In addition to the applications used to launch the live-streamed lessons, case-study schools and colleges reported using a range of supplementary applications to deliver remote teaching. These included:

- **subject-specific applications**, such as Times Table Rock Stars, which offers a sequenced programme of daily times-tables practice
- **recording and storage applications**, such as Microsoft OneNote, which allows teachers to organise and share lesson plans in searchable digital notebooks
- **Learning Management Platforms (LMPs) or Virtual Learning Environments (VLEs)**, such as Canvas, which provides rubrics, modules, calendars, quizzes and analytics.

- **online whiteboards**, such as Miro, which provides a web-based canvas with real-time and asynchronous collaboration tools
- **tools for engaging parents and carers**, such as Firefly, which uses a single central hub for schools to share information and parents to monitor and support their children's progress.

A more comprehensive list of supporting applications is provided in Box 6 below[5]. It should be noted that not all of these applications were used solely to support live lessons. For example, while PowerPoint and online whiteboards were frequently used in conjunction with live-streamed lessons, online games and subject-specific applications and websites were more frequently used as part of asynchronous learning activities.

Box 6: Applications used by case-study schools and colleges to support remote teaching

subject-specific applications or websites: Book Club Phonics; Clicker; Code Combat; GeoGebra; Hegarty Maths; Hour of Code; iDEA; Integral; Lexia; MathsWatch; MyMaths; Purple Mash; Snakify; Spelling Shed; Times Tables Rock Stars

recording and storage applications: Loom; Media Pod; Mote; OneNote; Panopto; Tapestry

LMPs or VLEs: Canvas; Dynamic Progress Reporting (DPR); Flipgrid; formative; Jamboard; Moodle; Nearpod; Padlet; Satchel One; Seesaw; Vscene,

presentation software: Goggle Slides; Mentimeter; PowerPoint;

online whiteboards: IDroo; Miro; Whiteboard.fi

games, assessment and quiz tools: Classtools; Google Forms; Kahoot; Microsoft Forms; Minecraft Education Edition; Seneca; Socrative; Quizizz

tools for engaging parents/carers: Firefly

classroom monitoring/management software: Dyknow; Jamf.

Many of these applications were used across different phases and types of school and college. However, some were more likely to be used by case-study schools and colleges with specific-age groups or types of learners, as illustrated in Box 7 below.

[5] Please note, while the research team has tried to place these applications and websites into groups, some of the applications had multiple functions and/or were used by teachers in different ways, making classification difficult.

Box 7: Examples of applications used with specific age groups or types of learners

	Primary	Secondary/post-16
Phase specific	• Clicker – writing solution for the primary classroom • Purple Mash –primary computing solution • Seesaw – learning platform supporting multimodal tools	• Dynamic Progress Reporting (DPR) – online whole school learning management system • HegartyMaths – instructional maths videos covering KS3, GCSE and A-Level • Vscene – equips classrooms with a VLE that supports live communication and engagement
Pupils with SEND	• Boardmaker – provides software, symbols and pre-made curriculum and assessment products	• Boardmaker (see opposite)

Some case-study schools and colleges reported they had developed their own applications to support remote teaching. One school trust had developed an app for pupils' iPads which allowed teachers to devise simple multiple-response questions.

In delivering live lessons, most interviewees reported they had used, or adapted, lesson materials they would normally use for in-class teaching. However, as reported in Chapter 2, some schools and colleges also used resources provided by the Oak National Academy. Representatives for the National Academy, interviewed as part of this study, explained how their resources would typically be used:

> 'A teacher will play a video, initiate discussion, and check for understanding… This takes away the heavy lifting so the teacher can do extra scaffolding, behaviour management, assessment for learning etc. as the lesson is already there, and this is really valuable because it's harder to do those extra things when you are teaching remotely.' *Oak National Academy representative*

A summary of the key features of applications that interviewees thought worked well, and less well, is provided in Sections 3.4 and 3.5 below.

Devices for teachers

In addition to the software used to support remote teaching, interviewees reported using a range of hardware to deliver remote teaching. Many teachers used a Chromebook or a Windows- or Mac- supported laptop, with some using an iPad, Surface tablet or desktop computer. Some reported using additional devices, including visualisers, graphics pads (with stylus), headphones, external webcams and microphones.

Devices for learners

Pupils were reported to use a wide range of equipment to engage with remote teaching. Some of this equipment (such as laptops or tablets) was provided by the school/college. In addition, staff reported that pupils were using other types of laptops or tablets, desktops and some had access to peripherals, such as headsets. Some interviewees said they wanted pupils to use devices with a touch screen, including those with a stylus, as it allowed pupils to complete work in a wide range of subjects, including mathematics, science and arts.

However, other schools and colleges did not provide their pupils with a device, so their pupils connected to remote lessons using their own laptops/tablets, mobile phones or even smart TVs and games consoles.

For some settings, pupils' access to devices improved during the pandemic, with publicly-funded schools and colleges making use of the government scheme to provide laptops. However, as the senior leader of one post-16 provider explained, this constrained teachers' lessons during the early stages of the pandemic.

> '[Until the government laptops arrived] some pupils used their mobile phones, which was… frustrating because the screens are so small. It limits what you can do'. *Senior leader, post 16 provider*

While pupils in publicly-funded schools and colleges were often using low-powered devices, such as Chromebooks, and/or were having to share devices with other family members, independent schools were better resourced. For example, staff in independent schools could rely on all their pupils having access to their own devices and teachers tended to report using more expensive equipment such as a MacBook Pro or Mac Studio with an additional monitor.

3.3 How tools were selected

At the start of the pandemic, most schools and colleges had limited experience of delivering live remote lessons, and so had to adapt quickly to this new way of teaching. Some case-study settings piloted new tools, for example by asking different subject departments to identify and test the use of different applications, including their setting's preferred video-conferencing tool. Others adopted a more ad hoc approach, with different teachers trying out different applications and approaches. Many settings chose to continue to use their familiar applications. Some interviewees adopted tools based on guidance/recommendations from other teachers, both from within and from outside their own settings. When adopting a new application, teachers were commonly looking for a range of features, as set out below.

3.4 What has worked well

Schools and colleges highlighted a range of EdTech features that worked well, including:

- cloud-based software, which reduced server costs and allowed pupils and teachers to access it on a range of devices
- user-friendly platforms and devices so that teachers, pupils and parents could confidently use the technology to access learning
- a software interface that looks the same regardless of the device pupils are using
- using devices and software from the same manufacturer and integrating apps across platforms, both of which increase familiarity and reduce the likelihood of technical problems
- using the chat function to: reduce email traffic; giving pupils a method to contribute to live lessons when they do not have access to a microphone; and socialise with one another outside lesson time.

In addition to these functions, interviewees highlighted the importance of a consistent, whole-school approach, which benefits pupils because it enables them to develop their digital skills as they progress through the school. One EdTech lead commented:

> 'It fails when teachers are using more than one platform, when parents are unsure of different passwords. The websites we use all open within Teams so they don't need to log in every time.' *EdTech lead*

Teachers were continuing to use the platforms set up during the pandemic. They built up a bank of resources (such as video tutorials, lesson recordings and work sheets) to support pupils with homework and revision, or if they needed to catch up on a lesson.

Schools and colleges valued EdTech platforms that enabled them to provide pupils with a range of formative feedback. The feedback platforms teachers used and the benefits of these are outlined below.

- Teachers valued the opportunity to design self-marking quizzes for pupils (such as through Kahoot, Google/Microsoft Forms) when preparing their remote lessons. These are valuable assessment tools because they provide pupils with rapid feedback without adding to teacher workload. They also enable teachers to respond instantly to any general areas of weakness highlighted by the software analytics.
- The opportunity for pupils and teachers to provide audio and video feedback (such as through Flipgrid) is particularly valuable for pupils with SEND and EAL. A primary school teacher commented:

> 'It's through a video response rather than comments – I think that creates a much more inclusive environment in and outside of the classroom because

those children who cannot read or write to the same ability aren't being picked up on it in the same way.' *Primary school teacher*

- Microsoft's Reading Progress tool automatically grades pupils as they read aloud, thereby reducing teacher workload while also allowing teachers to identify pupils' reading strengths and weaknesses.
- Screen-sharing functions and platforms (such as Miro and whiteboard.fi) contribute to teachers' ability to scaffold and model practice to pupils, such as through annotating calculations or texts.

The range of accessibility tools embedded into EdTech platforms were particularly helpful for younger pupils, pupils with EAL and SEND. For example, the Immersive Reader tool in Teams enables pupils to access a written transcription and translation of their teacher's spoken input as well as an oral version of written text. A senior leader reported that through Apple, pupils can see subtitles on video clips, and commented that this supports literacy development of all pupils. Seesaw displays all commands as a symbol rather than text (for example the button to upload completed work is a tick rather than saying 'submit') and when pupils scroll over a word, it will read it back to them.

3.5 What has worked less well

Pupils and teachers experienced issues with access to devices and connectivity. Interviewees reported that they needed to respond to differing access to space, devices and internet connectivity in pupils' homes. Although staff in publicly-funded schools and colleges appreciated the DfE laptops scheme, several commented that these arrived too late. Teachers and pupils alike experienced issues with Wi-Fi dropouts or connections that were not strong enough to stream live lessons.

Teachers' confidence and competence to use EdTech grew over the periods of remote teaching, but some initially feared the technology and struggled to adapt to the new way of teaching. Interviewees reported that some more experienced members of staff struggled to adopt live remote teaching because they felt the pedagogy was so different and they lost motivation if they could not get the tech to work. For example, the processes by which a teacher taught whole-class groups, checked pupils' understanding and reviewed their work was handled differently online compared to in a bricks-and-motor classroom. One remote education lead commented that they were therefore encouraging a culture of perseverance and resilience, explaining that the experience was a learning curve for all. Some interviewees commented that since schools have re-opened to all pupils, some teachers have discarded the use of EdTech in the classroom. As a senior leader in a post-16 provider commented:

'Some staff have struggled with the IT, and aren't using more advanced features like breakout rooms within Teams… Some are also naturally fearful of the IT, and overcoming this continues to be a challenge.' *Senior leader, post 16 provider*

Engagement in lessons did not replicate that of in-person lessons, particularly in secondary schools.
Interviewees pointed to three main reasons for a lack of engagement: safeguarding concerns; lesson style; and the challenges for pupils with SEND.

Schools and colleges raised safeguarding concerns, which posed challenges to their delivery of live lessons. These challenges included: pupils sharing meeting links with friends outside their school/college; pupils using Teams chats late at night when teachers could not monitor them; and teachers not using breakout rooms because they were unable to supervise each group.

In response to these concerns, schools and colleges established home-school agreements with strict boundaries around the use of chat functions, which protected pupils and teachers from receiving messages at unsociable hours. Some schools and colleges reported that they could not use breakout rooms because they were unable to supervise them adequately. This reduced teachers' ability to replicate an in-person classroom, as it took away the small-group, collaborative element of lessons. Staff were able to use these functions if another member of staff was available to attend and supervise pupils in small groups. It is not clear from the interviews, how, if at all, other schools or colleges may have resolved these issues. It is possible that some schools were better at utilising the skills of teaching assistants to support the delivery of these activities, although we do not have any evidence to support this. It is also important to note that over time, Microsoft has updated and refined their platforms to support schools and colleges with these safeguarding concerns.

When they first moved to remote teaching during partial school closures, some teachers expected to deliver online the same presentations they used when teaching in-person but found these were not engaging pupils online. Either due to safeguarding or pupils being too self-conscious, some pupils did not turn their cameras on, and teachers described this delivery into a 'black hole' as demoralising.

Teachers overcame these challenges in a variety of ways. They scaled back presentations and made them more engaging by including: videos to explain concepts; links to a range of resources; quizzes to assess learning and increased the opportunities for pupils to interact with teachers and peers. Teachers also used 'cold calling' (i.e. nominating pupils to respond), which meant that pupils had to be paying attention even if their camera was turned off.

A senior leader in an independent school reported that they implemented 'screen-free Wednesday' for primary pupils to overcome 'Zoom fatigue'. Teachers would set pupils creative or family activities (such as building a den or going for a picnic) and pupils reported back on their activities when they met with their teacher and peers the following day.

Despite adapting their lessons, interviewees reported that pupils with SEND did not always benefit from remote learning as much as their peers. A secondary senior leader commented:

> 'Their learning is often very nuanced, and remote learning can be a bit literal… They need someone to sit next to them and have the content explained in a more comfortable tone, with hand gestures, which cannot be delivered online.' *Senior leader, secondary school*

3.6 Gaps in functionality

Although schools and colleges were able to overcome many of challenges they encountered, they had several suggestions for improvements to EdTech. It is important to note that some schools and colleges had found solutions to the gaps in functionality that others mentioned. This suggests some lack of awareness of the capabilities of the EdTech that is currently available. EdTech platforms have also updated over time in response to feedback from educators, thus addressing some early gaps in functionality.

Interviewees reported that it was difficult to monitor engagement and see who had left the video call part way through the lesson when they were presenting content via screen-share. A secondary school teacher who had worked around this issue commented:

> 'Staff really need two monitors or two devices to make this work. If you are in a meeting [lesson], I can no longer see anything else on the PowerPoint. You need another screen to monitor the chat box and to see students' cameras if they are turned on.' *Senior leader, secondary school*

Teachers would welcome software that produces high quality scans of pupils' handwritten work. They commented on the discrepancy between remote learning, which involves pupils typing, and exams, that require pupils to handwrite answers. Because of this, teachers still asked pupils to handwrite practice exam answers, but found that the quality of scans or photos of this work was often poor.

Schools and colleges using one of the popular video conferencing tools experienced a range of gaps in functionality and suggested several improvements. The research team took the decision not to name the tool in the discussion below.

Several schools and colleges reported that when the application launched, teachers did not have control over the call. This meant that pupils could mute their teacher and pupils could freely share their screens, which made classroom management challenging. Interviewees reported that the developer quickly resolved this and, for the most part, have responded to their other challenges and suggestions to make the platform more education-friendly for schools and colleges. However, they felt there were still functions that required further attention.

Suggested improvements included the ability for teachers to:

- annotate pupils' work, as they would in exercise books and attach verbal feedback to documents
- group pupils by ability and assign groups differentiated tasks, rather than having to assign tasks individually
- add live subtitles to calls to support pupils with hearing impairment
- share documents with colleagues, who can make their own amendments.

Teachers reported challenges with organising files and folders within the application and felt that if this replicated the current file explorer system, this would be more user-friendly for teachers and pupils to navigate.

Teachers experienced several challenges with the companion survey tool. Teachers would welcome a system to store quizzes within folders so they can easily revisit them in the future. One secondary teacher said:

> 'The lack of ability to store [quizzes] within folders – it's incredibly difficult to go back and find things to use again the next year… it's like you've taken a library and dumped all of the shelves on the floor, and you've got to look through everything to find one book.' *Teacher, secondary school*

Teachers would like the ability to copy questions from the quizzes they have created previously, into new quizzes. One teacher suggested that the Quizizz platform offered more functionality, allowing teachers to copy questions from end-of-topic tests into end-of-year tests, and to use questions that other teachers have shared on the platform.

Teachers would also like to be able to create a more complex marking system within the application that replicates exam-marking systems. For example, one teacher commented that if they set a two-mark question where pupils were required to identify three correct statements, the application would only award marks if pupils got all three statements right. This caused frustration among pupils who correctly selected two of the three statements and did not achieve any marks, though they would have in an exam.

4 Assessment of effectiveness

4.1 Overview

This chapter explores the data that schools and colleges have collected to measure the effectiveness of their EdTech and remote teaching strategies. It also includes analysis of effectiveness data.

4.2 How have schools and colleges assessed effectiveness?

Schools and colleges largely used practice experience (such as teachers' perceptions of how pupils responded to their questions and of the overall success of the lesson) to inform their views of the effectiveness of their EdTech and remote teaching strategy. Where organisations were able to collect more data, this usually focused on pupils' attendance and engagement with live lessons, and their progress during periods of remote learning. Some schools and colleges had also conducted surveys with pupils and teachers to seek their views.

Schools and colleges collected attendance data either by using traditional methods such as calling a register at the beginning of each live lesson, or through platforms such as Teams or Dynamic Progress Reporting (DPR), which provide teachers with attendance reports.

Schools and colleges used several methods to track pupils' engagement in lessons, including developing coded logs for teachers to complete. Teachers assigned pupils a code based on four criteria:

- pupil attended live lesson and completed work
- pupil attended live lesson but did not complete work
- pupil did not attend live lesson but completed work
- pupil did not attend live lesson or complete work.

Interviewees reported that use of these engagement logs and monitoring of attendance data supported their ability to safeguard pupils, which was particularly important during periods of partial school closures. For example, when a pupil was persistently not engaging with remote learning, pastoral teams would phone home to check on the pupil and conduct a home visit, if necessary. One senior leader of a secondary school reported that their pastoral team made thousands of phone calls during an eight-week period, to monitor pupils with low attendance. The school prioritised these pupils to attend school during the second period of partial school closures.

Other schools and colleges reported using their main EdTech platform to monitor engagement. The 'Insights' feature in Microsoft Teams allows teachers to identify individual pupils' levels of interaction with the lesson, for example by posting comments

in the chat or contributing to discussions. Google Classroom enables teachers to see when pupils have accessed the work set for them and monitor their progress with completing work.

Schools and colleges also collected data on pupils' progress and level of understanding. Interviewees reported using software such as Kahoot or polls in Teams and Zoom to pose questions which enabled them to assess pupils' understanding during lessons. Teachers also set quizzes for pupils to complete after the lesson via platforms such as Google or Microsoft Forms. When all pupils returned to school, interviewees reported conducting assessments to identify the gaps in pupils' learning and compared their results to their expected progress. These assessments supported teachers with identifying where to target catch-up interventions. One remote education lead also commented that these assessments enabled them to identify which forms of technology/platforms worked best for teaching different aspects of the curriculum.

4.3 Assessment of effectiveness findings

For the most part, schools and colleges reported that their EdTech and remote teaching strategies were effective in providing pupils with access to the curriculum they would have received in school, especially during periods of partial school closure. These successes, along with the challenges schools and colleges experienced, fell into four main themes: attendance, engagement, pupils' feedback and teacher workload.

Attendance

In relation to remote teaching, attendance was measured in terms of whether a pupil attended a live remote lesson or 'touch point' (e.g. informal class video call) or not. Schools and colleges which provided the research team with data tended to report high attendance figures (between 85 – 97 per cent). One primary school senior leader commented:

> 'Pupil attendance [during periods of partial school closure] was high. We were really intent on making sure that any non-attenders were tracked, and we found out why they weren't attending. If they weren't attending, we said they had to come into school physically.' *Teacher, primary school*

Several schools reported a correlation between the use of EdTech, attendance during live remote lessons, and completion of work, identifying higher attendance and completion of work after the first round of partial school closures when the use of EdTech, and processes for tracking attendance, were more established. For example, one secondary school senior leader reported that their initial response to the pandemic was to email work booklets to pupils' homes but found that very few pupils emailed work back to teachers. However, once teachers started to use Microsoft Teams for conducting

live lessons and setting work, around 85 per cent of pupils were joining lessons and returning work.

Other schools and colleges reported higher attendance to remote lessons, compared to school attendance pre-pandemic, among individual pupils who found it challenging to attend school in person. This included pupils who found school anxiety-inducing, school refusers and pupils with health issues who were not well enough to be in school. For these pupils, remote teaching made their education more accessible. For example, pupils who found factors in the school environment anxiety-inducing, such as problematic peer relationships, were much more content to access lessons remotely from home. They could work through lessons independently, with reduced engagement with peers if they chose. Some schools and colleges who had experience of teaching pupils with long-term health issues reported that prior to the pandemic, teachers would send resources and work home to pupils, however they would often miss out on the teaching input. Remote teaching changed this, as these pupils had access to the same quality input their peers received so even if they had to remain in bed, or were in hospital, providing they were well enough, they could still attend and be registered in the lesson.

Engagement

Several schools and colleges reported links between pupils' level of engagement in remote learning during periods of partial school closure and the learning gaps identified when all pupils returned to school. Interviewees said that those pupils who engaged more in remote learning returned to school with fewer and smaller learning gaps, compared to their peers who did not engage with remote learning. Interviewees reported differing levels of engagement both across and within case-study schools. A senior leader of a primary school with high pupil engagement commented:

> 'Our children returned to school without any gaps in their knowledge because they carried on with maths and English but more importantly, they returned happy children because they hadn't felt isolated, they had that constant communication with their teachers and friends.' *Senior leader, primary school*

In comparison, a primary school teacher who experienced differing levels of pupil engagement commented:

> 'Children who did engage with online learning made at least expected progress. Their progress didn't take a dip over that time compared to the children who weren't actively engaging with live lessons – their progress did drop.' *Primary school teacher*

Interviewees reported that remote learning was not effective for two groups of pupils: those who could not reliably access remote learning and pupils who lacked intrinsic motivation. Interviewees in schools and colleges with large proportions of pupils from disadvantaged backgrounds were keen to point out that it was not that their pupils did not

want to engage with learning, but that they could not. Reasons for this included sharing a device with other members of their families, having poor internet connection or not having a quiet, suitable learning environment at home. As a senior leader explained:

> ‘The [disadvantage] gap has been widened and that is the biggest consequence of lockdown. Those who had the hardware and the software at home, or both of their parents were key workers, and they were therefore in school, made good progress.’ *Senior leader*

Other interviewees commented that while remote teaching works well for self-motivated pupils, teachers could not monitor and encourage pupils in the same way remotely as in the classroom and could not always rely on parents to provide this encouragement.

Some interviewees commented that despite gaining pupil engagement and delivering high-quality lessons, remote teaching was not as effective as in-person delivery because pupils did not make the level of progress they would expect. It is likely this was due to a combination of factors, including teachers’ ability to pick up on and address any confusion or lack of engagement more rapidly face-to-face than virtually. Interviewees also reported that some pupils took longer to complete work remotely compared to in the classroom, which meant that progression through the curriculum was slower.

Pupils’ feedback on remote learning

Some schools and colleges used surveys and discussions with pupils to gain feedback on pupils’ perceptions and experiences of remote learning. Interviewees said that pupils’ responses were generally positive, especially among those who were self-motivated. They reported that pupils enjoyed live lessons and the ability to complete tasks independently, with support available if required. As one secondary teacher explained:

> ‘Quite a lot of learners liked remote learning – they liked that they could learn at their own pace, they could go off and get things done. We would give them the input then they had a choice of tasks – they had to do one, but they could do more. They liked the ability to choose what they do and be creative.’ *Secondary teacher*

Teacher workload

Some interviewees reported that using EdTech and delivering remote teaching had been effective for reducing teacher workload. Teachers working within multi-academy trusts or large schools were delivering lessons on a rotation with their year group colleagues, so only needed to plan and deliver selected lessons within the curriculum. This in turn had resulted in positive benefits for teacher wellbeing. One remote education lead commented:

> ‘Teachers found that they had a lot more time to prepare in a much more detailed and fulfilling way than in a normal school setting because they were delivering some

> lessons as part of a rotation within their phase team… Teachers really enjoyed that and said they had so much more pride in what they shared with their children because they had so much more time than they otherwise would because they could make sure it was absolutely top notch.' *Remote education lead*

Findings from Oak National Academy's teacher surveys[6] complement this MAT's experience. They found that 61 per cent of teachers reported that, although workload had not decreased, using Oak gave teachers time to focus on other things such as giving more personal feedback and identifying the level pupils were working at so they could provide the scaffolding needed to help pupils make progress.

Despite the positive findings reported above, the DfE's EdTech survey (CooperGibson Research, 2021) found that a minority of teachers believed that technology (though not remote teaching specifically) had contributed to increased workload (16%), with secondary teachers being significantly more likely than primary teachers to provide this response (secondary 22%, primary 14%). We did not find any evidence of phase-specific differences in views on workload, but as discussed in Chapter 2, some interviewees were concerned about the workload burdens associated with live remote teaching. This was particularly the case during the early months of the pandemic, when staff were less familiar with the software, and many were at home looking after their own children. This was despite the fact that the schools and colleges included within our sample could be regarded as EdTech innovators, and may therefore have been more successful in their approaches to remote teaching than most other schools or colleges.

4.4 Analysis of schools' and colleges' data

Some case study schools and colleges provided the research team with the data they collected from pupil surveys.

This suggests that pupils preferred lessons that included live input, in which their teacher explained the content and stayed on the call while pupils completed independent tasks. Pupils liked teachers to set a variety of independent tasks, such as study packs, exam questions and model answers and podcasts, for completion during lessons. Pupils said this lesson format (live input followed by independent tasks) was more helpful than other lesson formats, such as being provided with pre-recorded or written instructions to aid completion of independent tasks, or just joining the lesson at the end for a review of independent tasks.

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6 https://assets.ctfassets.net/ygggx3rcdvia/71qzpQA2MqlkvDs5OEDCv4/1d3ba8ab1743e40c167d6cdab3fc398c/Oak_Evaluation_Report_-_FINAL_Sept_2021.pdf

Pupils said they knew how well they were progressing from assessment/exam scores, quizzes, teacher feedback, and pupils' own judgement of their performance based upon the ease with which they completed the work. A student satisfaction survey in a post-16 provider found 94 per cent of learners felt that live remote teaching had helped them to make progress. This was because students received feedback more efficiently via the platform (compared to written feedback in books) and they had greater opportunity to act upon this feedback.

However, not all feedback was so positive, with the majority of pupils in one publicly-funded secondary school reporting they enjoyed remote learning 'a bit'. In another publicly-funded secondary school, pupils said that they would enjoy lessons more if there were additional opportunities for interaction with teachers and increased participation from other pupils.

The data schools and colleges provided in their assessments of effectiveness were largely based on pupils' responses and the perceived impact. This included both positive and negative views about the impact EdTech tools were having upon their progress during the periods of remote teaching. However, this data was largely anecdotal, with several schools and colleges reporting that they had not yet completed full analysis of their surveys and would be in a better position to assess the full impact of remote teaching once pupils had received results from national assessments, including key stage 2, GCSE and A-level results.

5 Future plans

The research team asked interviewees about their schools' and colleges' future plans for remote teaching. The findings are explored in the section below.

5.1 Potential future opportunities and benefits

Compared to the high-water mark of EdTech use during the periods of partial school closure, many case-study schools and colleges planned to downsize their remote teaching offer in future, or had already done so. However, others planned to increase and/or diversify their remote teaching offer, with some doing so in response to specific challenges or barriers, as described below.

Amongst those schools and colleges planning to downsize their remote teaching offer, there appeared to be a view that while remote teaching had been a useful tool during the pandemic, they were now focussed on a return to face-to-face teaching, and only planned to use remote teaching in isolated cases. **Staff in these schools commonly wanted to maintain asynchronous forms of remote education and reduce or completely remove the live remote teaching component.** For example, several interviewees reported that their schools/colleges planned to increase pupils' access to recorded videos and other online materials. To make this approach manageable for staff, they were being asked to more routinely upload such materials to a VLE (or equivalent) and/or to record lessons for pupils to play back later. The benefits of this approach were wider than just supporting sick or isolating pupils, as the teacher of one publicly-funded primary school explained:

> 'Even if no one is required to be at home… recording the lessons… supports the continued learning of children. If they want to go home and pick up a lesson they have missed, or if they were off and need to watch it, or if they were confused, their parent can watch it with them. Having the ability to do that far outweighs not having the technology in the first place'. *Primary teacher*

Interviewees were asked if there were any potential barriers or disadvantages to their schools' and colleges' future plans for remote teaching. The challenges they anticipated commonly mirrored those they had already experienced, including limitations with:

- pupils' access to appropriate devices and adequate Wi-Fi
- teachers' confidence and skills in delivering live remote lessons.

In an effort to tackle the problem of 'lost school days', interviewees commonly reported that their schools/colleges planned to offer remote teaching to those pupils who were sick or isolating, but still able to work. In a similar vein, some also planned to:

- ask self-isolating teachers who were well enough to work to deliver lessons remotely, while other staff managed the classroom
- offer intervention and/or revision classes online, sometimes during holidays and weekends.

The detail behind these approaches was not always clear. For example, it was unclear how staff would determine whether a sick pupil was well enough to participate in remote teaching, or how remote teaching might be used to support long-term sick pupils to re-enter the classroom.

Another challenge associated with remote teaching was that of sustaining the engagement of learners and facilitating more interaction between pupils (see Chapters 2 and 3). This challenge was not unique to any specific kind of setting, and schools and college staff were thinking creatively about how best to address this. For example, one post-16 provider was planning to introduce virtual reality headsets into virtual breakout rooms to improve the level of interactivity afforded by remote teaching. Staff hoped this would help students, located in different parts of the college campus, to develop relationships and overcome issues of 'camera shyness', as one senior leader explained:

> 'A lot of the feedback from students is that they don't like to have their cameras on. The reason for this [is that students can be] embarrassed about [their] home settings… [and this can lead to them not being] as engaged. With the VR platform, they are there, they are involved, but they haven't got any backgrounds to be embarrassed about and they are able to use an avatar'. *Senior leader*

Interviewees from publicly-funded schools and colleges (as distinct from those from the independent sector) also commented on the challenges of funding effective remote teaching. This reflects the findings of a recent national survey (CooperGibson Research, 2021). Funding concerns included meeting the costs of purchasing and maintaining a ratio of one device for every pupil. One senior leader of a publicly-funded school explained that while their staff had been able to access the government's 'Get help with technology programme (GHwT)', which provided laptops and tablets to help disadvantaged children and young people access remote education and social care services, they still had to ask parents for financial contributions, so they wanted the government to develop an EdTech investment strategy to support schools in the longer term:

> 'We are investing heavily and will continue to do so for our pupils to have one-to-one devices, but we've had to ask parents for contributions, which we didn't really want to do. DfE devices are great, but our most deprived families don't have Wi-Fi. We want all our pupils to have access for their independent learning (homework) but we need support with the infrastructure. We're not letting it be a barrier, but government needs to see it as a long-term thing, not just a pandemic response'. *Senior leader*

One interviewee, also from a publicly-funded school, raised concerns about the increasing costs of software licenses and subscriptions used to support remote teaching. During the height of the pandemic, many software companies offered access to their products for free, but some had informed users that they were planning to charge for continued use. This, it was suggested, was forcing institutions to scale back and/or restrict levels of access to tools and platforms across different settings and age groups.

While, as discussed above, some case-study settings were exploring ways to increase the interactivity afforded by remote teaching, some interviewees reported that their pupils continued to feel disconnected from their peers when learning remotely, as illustrated by this comment from a primary teacher:

> ‘Even today, children who are learning at home do still feel a bit detached from their peers who are in the classroom, but we facilitate that as best we can through online groups where there may be some children at home and some in class.’ *Primary teacher*

Similarly, the class teacher of a post-16 provider highlighted the importance of the social interactions for pupils of face-to-face learning, and the feeling that remote teaching could be ‘draining’ for teachers:

> ‘A crucial aspect of teaching is the social aspect – learning and interacting through a screen can be draining over a long time, especially if you have a class who all have their cameras off.’ *Post 16 teacher*

These views appeared to be influencing schools’ and colleges’ plans to downsize their remote teaching offer, and particularly those from the state sector.

Some interviewees from publicly-funded schools and colleges also expressed concerns about the ‘fairness’ to pupils of continuing to use remote teaching in the future. The concern was that while some pupils had engaged fully with remote teaching, other pupils (typically those with lower attainment and from more deprived backgrounds), had engaged to a lesser degree. As a class teacher from one publicly-funded secondary school explained:

> ‘The worry I have is that the more able… are getting more benefits from remote teaching, while the less able are disadvantaged further because they haven’t got the devices or the parental support. All of these wonderful platforms we’ve got are great… if they can engage! Until every pupil has reliable access, it won’t work.’ *Secondary teacher*

Some interviewees commented on the challenges of delivering remote education to younger children, particularly those in Reception and Year 1. They recognised that successful implementation with younger age groups requires parents to play a greater role. While this was possible for some parents who were working at home during

the national lockdowns, they pointed out that such support could not be relied on in future. Interviewees also expressed concerns about young children's ability to concentrate for extended periods of remote teaching, and for the potential negative consequences for children's social and fine motor skills (such as being able to write or hold a pencil or a paintbrush) as part of remote education. For these reasons, interviewees questioned whether remote teaching would be feasible or desirable with younger children over the longer term.

One class teacher mentioned that their school's senior leadership team (SLT) was not supportive of the continued use of live remote teaching. Some SLT members were reported to believe that while remote teaching had served its purpose as a tool to respond to the challenges caused by partial school closures, there was little value in building on the skills that had been developed by staff and pupils since most pupils had returned to the classroom, and face-to-face provision was better than anything that could be offered remotely.

Despite these challenges, some schools and colleges, including those from both the state and the independent sectors, were planning to continue to deliver or even expand their remote teaching provision. In addition to retaining live remote teaching as a means of sharing subject expertise, some schools were planning to increase their pupils' access to specialists by **inviting experts or guest speakers, such as STEM Ambassadors, to deliver live lessons/presentations remotely.**

Some interviewees were keen to use their skills and expertise to support pupils outside of their immediate settings. For example, one publicly-funded primary school was in discussions with their local authority to set up a 'remote school'. This would be available to children across the county, who, for whatever reason, were not currently attending school. The senior leader explained:

> 'We want to build on the successes of lockdown and want to ensure they [the children] are at a stage where they are enjoying school again and would like to return to full time education'. *Senior*

6 Specific case-study examples

This chapter provides case-study descriptions of the use of live remote teaching in 5 schools/colleges. These focus on some of the organisations which have used live remote teaching most extensively, selected to provide a range of EdTech examples and experiences from schools and colleges working in different contexts.

Using EdTech and remote teaching to broaden the curriculum across a global network of schools

OneSchool Global is a network of independent schools which has 126 campuses globally, in North and South America, Europe and Oceania. There are 24 small campuses in the UK (19 of which are in England), teaching students from Years 3 to 13.

The network has developed a ‘Learning to learn’ framework which provides the founding principle of all teaching and learning across the global network of schools. They use digital technology to develop life-ready students who learn how to learn and achieve. Remote teaching is a key part of the teaching and learning strategy and seen as vital in providing students with a broad curriculum and access to subject specialists in a way that is financially viable.

Previously, campuses used video conferencing units and software (Cisco) to connect A-Level students on campuses that did not offer subjects they wished to study, with a subject specialist based at another campus. They now use Zoom and the built-in whiteboard feature to deliver lessons remotely to both GCSE and A-Level students, and to some other secondary and primary year groups. Dyknow is a key tool the network uses for teacher-student feedback, safeguarding, e-safety and monitoring. This software allows teachers to monitor students’ screens and block access to certain websites and platforms. It also enables teachers to connect to students’ screens to offer tailored support with tasks. The Learning to Learn Framework is the founding principle of all teaching and learning across the global network of schools and through this, students complete ‘Assignments’ (a sequence of teaching and learning) in each subject. Teachers use the LMS platform Canvas. This enables teachers to upload the resources and tasks for each part of an 'Assignment' and allows students to see the full learning sequence and submit their work.

Before the pandemic, the network had a three-year plan to roll out individual devices and develop teachers’ skills in using the LMS platform Canvas. The pandemic accelerated these plans, as all students required their own devices (Lenovo Thinkpads) to access their lessons remotely and all teachers were trained in using Zoom and Canvas to deliver live, remote teaching.

The network ensured all teachers received the necessary continuing professional development (CPD) on remote teaching and all staff have the opportunity, facilitated

through their in-house Teacher Academy. At the department level, CPD focussed on how teachers effectively use EdTech tools within their subject, to plan for blended learning. At the campus level, CPD involves discussions around how EdTech works for individual campuses and is an opportunity for teachers to share good practice. At the national level, new starters receive an internally-delivered programme of support, which includes live training on software and the pedagogy of remote teaching as part of their Learning to Learn Framework, and all staff have the opportunity to attend events such as a digital conference. National digital learning leads have also created a bank of short tutorials to support teachers with developing their digital skills.

Before the pandemic, teachers who taught secondary students across multiple campuses did so by delivering hybrid lessons – students at the same campus as their teacher would be taught face-to-face and students on other campuses would access the lesson remotely. During the pandemic, campuses delivered the full timetable live to their students and teachers saw the benefit of all students engaging in lessons remotely. This has led teachers to move away from the hybrid approach to teaching lessons. Now all students, regardless of their campus, access the lesson remotely: those who are on the same campus as their teacher access the lesson remotely from their campuses' Learning Centres - specialised open learning spaces within the school.

Secondary students have 'The Lesson', which is teacher led and 'The Study', which is student led. The use of EdTech has allowed primary schools to replicate this element of the secondary school pedagogy because now that primary students have individual devices, they too can engage with 'The Study'. Students have tasks to complete each week on a range of platforms such as Lexia, Purple Mash, and MyMaths. Students have the choice of which of the activities they will complete at home and which they will do in school, based on the activity and resources needed. This is designed to encourage students to become self-directed learners and prepare them for the expectations at secondary school.

A senior leader explained that remote teaching has enabled all schools in the network to 'offer a tremendously broad curriculum to students'. Their model protects individual campuses from staffing and recruitment issues in high-demand subjects and reduces the risk of losing learning time due to bad weather. It also enables students with long-term illnesses to keep up with their learning from home.

Teachers did identify some limitations to the use of remote learning. It is difficult to teach practical skills (such as art and science experiments) so teachers prioritise in-person delivery of these activities. Children's fine motor skills and handwriting has been affected by the switch from writing to typing during remote teaching, and this has affected younger children in particular. To address this, the school has introduced a specific handwriting intervention for students in Year 3.

Before the pandemic, campuses started to form clusters to broaden the curriculum offer at GCSE as well as A-Level. The network is currently trialling delivering mathematics and

French lessons remotely, in ability groups for students in Years 7 – 11. If they find this works well, they will consider adopting it for other subjects.

At primary level, campuses have started to use Zoom to connect students with others in the same year group at other campuses. The intention is for students to begin building relationships with the peers they will learn with when they move to secondary school. Staff have also been using remote teaching in English and mathematics for students in Years 5 and 6 identified as gifted and talented, to provide them with additional challenge.

The use of EdTech across this network of schools allows students to access a broad range of GCSE and A-level options, which, without the technology, would not be available at small campuses. This will continue in the future, alongside the increasing use of EdTech with primary students to prepare them for secondary education. Teachers' and students' digital skills improved during the periods of remote learning and the network is committed to building on these skills. They will however ensure that the development of other skills continue to receive the same priority. One senior leader commented: 'We are building on the tech and the excellent skills the children have learnt so they don't become lost, but there is a balance between using the technology purposefully to enhance the curriculum and also making sure children don't lose out on those soft skills.'

Creating a blended learning curriculum in a primary school

Danemill Primary School is part of a 15-school multi-academy trust based in the Midlands. The Trust is committed to delivering a blended learning curriculum to incorporate technology into teaching and learning. It is part of the EdTech Demonstrator Programme, and this school is one of the trailblazers for the Trust.

Before the pandemic, Danemill Primary School was using Microsoft Teams and EdTech tools such as Accelerated Reader and Times Tables Rock Stars to enhance their curriculum. During the partial school closures in 2020 and 2021, all teachers delivered a minimum of three live lessons per day, including English, mathematics and a core subject. Teaching Assistants (TAs) also continued to deliver interventions to small groups of pupils.

The Trust has a comprehensive blended learning strategy, which stipulates that 25 per cent of the curriculum will involve technology. For each year group, the blended learning road maps sets out the apps that will be used each term, how they will be used and the skills that pupils will develop. A class teacher commented:

> 'We felt that we came so far during Covid-19, we learnt so much and we need to keep doing this because this generation of children, their lives revolve around technology, so we need to teach them how to use these things effectively and safely and it can enhance lots of lessons.' *Teacher*

The SMT decided to adopt Microsoft software because of its level of data protection. The Trust EdTech lead reported: 'We felt more secure with Microsoft… With some of the [other] apps, we didn't know where the children's data was going, and we were very aware that we needed to protect that.' During the pandemic, the school used Teams for delivering live lessons and for setting work. Teachers used Flipgrid for providing pupils with video feedback and for giving pupils who are less confident with writing the opportunity to verbalise their ideas. In 2022, the school was continuing to use a range of platforms for various purposes to supplement the use of Microsoft apps, such as:

- Mentimeter for starter tasks so that pupils have an opportunity to reflect upon and consolidate prior learning
- Minecraft for Education which allows children to be creative and bring the curriculum to life, for example through building WW1 trenches in History
- Century which uses Artificial Intelligence (AI) to provide pupils with tailored tasks based on their specific needs
- Kahoot for quizzes to support teachers with understanding pupils' knowledge gaps.

The Trust also has equipment including drones and VR headsets which it sends to all schools on rotation. Teachers know in advance when they will have access to this equipment, so can plan to use it in their lessons.

The Trust's EdTech lead described how blended learning is being rolled out across schools:

> 'We trained a blended learning champion in each school who would be an expert in the different apps. They are passionate about this way of teaching and learning; they are able to drive it and cascade it out to other members of staff. Teachers listen to other teachers, they learn from each other and know they will talk honestly about an app, share how it has worked well but [also] how it hasn't been so successful.' *EdTech lead, trust*

Teachers have their own development time for completing research and CPD. For example, teachers are encouraged to complete Microsoft Education Courses and gain Microsoft Innovative Education status. The blended learning champions provide CPD focussed on the pedagogy and theory for supporting teachers to implement EdTech to enhance the curriculum. A teacher also said: 'Our IT leads teach us something new every fortnight which is amazing because after you've been shown and it's been modelled to you, you can see how easy it is and it works so well.'

The implementation of a blended learning curriculum is helping teachers to enhance the curriculum and bring learning to life. For example, the use of VR headsets simulates experiences such as visiting the beach, which some pupils may not experience physically outside of school and this experience can then be used to support their creative writing. One teacher gave the example of using Minecraft in Geography: pupils had learnt about

sustainable farming in class and had then used Minecraft to build a sustainable beef farm.

Staff also commented on the value of online quiz and assessment platforms, such as Microsoft Forms, Kahoot and Socrative for assessing pupils' understanding. These provide teachers with instant feedback so they can quickly identify the areas they need to focus on in lessons based on pupils' responses. They can also correlate the use of EdTech with results, so can see which EdTech platforms work well for different aspects of teaching and learning.

The school has however experienced challenges from some parents who are not convinced about their use of technology. Staff have decided to run a series of workshops for parents, who will be invited into school and given a task to complete on their child's device, assisted by their own son or daughter. Teachers hope this will help parents to understand the potential of EdTech to support their children's learning.

A senior leader explained how remote teaching had enabled them to increase pupils' access to subject specialists. For example, the Trust IT and Art leads deliver lessons remotely to pupils, which gives pupils access to an area of expertise their class teacher may not have, as well as enabling pupils to experience a variety of teachers. Another benefit is that pupils who may not be well enough to be in school but are well enough to learn can access lessons from home.

This Trust's commitment to delivering a blended learning curriculum will mean that the momentum with the roll out of EdTech during the pandemic continues, teachers' and pupils' skills continue to be built upon and pupils are provided with highly engaging lessons and the 21st Century, digital skills they require for the future.

Using EdTech to develop independent, proactive learners in a Sixth Form College

Oldham Sixth Form College (OSFC) is in the North West of England and is part of the EdTech demonstrator programme. The college first introduced EdTech to support teaching and learning in 2018. Staff piloted Google Classroom in vocational and A-Level departments. Remote teaching did not feature before March 2020, but the roll out of EdTech meant the college was in a strong position to deliver the full timetable through live, remote lessons during the periods of partial school closures.

There are two strands to OSFC's approach to EdTech.

1. Use of Chromebooks and Google Classroom.
2. Development of interactive platforms for each subject to provide students with the best resources, such as videos, quizzes, past papers and model answers. The aim is

to support retrieval practice and self-regulation, feeding into the college's ethos of helping students to develop metacognitive skills.

The college uses Chromebooks and Google Classroom for: setting work and providing feedback; increasing interactivity and collaboration in lessons through features such as Jamboard; and (when appropriate) delivery of remote lessons. Factors feeding into OSFC's decision to use Google Classroom included:

- recommendations from other colleges
- the platform being simple to use, cloud based and free
- the ability to monitor students' engagement in learning outside of college
- successful piloting across departments which demonstrated how EdTech could be embedded within the curriculum.

Teachers have been supported to implement EdTech into their practice with the support of early-adopter staff. These early adopters were involved in the piloting of EdTech, as they were particularly keen and/or confident in using EdTech to support their teaching. The college has also created a Google CPD site, which provides a resource-bank of recordings of CPD sessions as well as short tutorials on how to use the features of Google Classroom.

The implementation of Google Classroom and the subject sites has been successful, with usage data indicating that students are taking greater ownership of their learning and are becoming more proactive learners. Through Google Classroom, students receive notifications when teachers have provided feedback on their work and students are eager to view and respond to this feedback, quickly submitting revised copies. Google Classroom also supports teachers' monitoring of students. For example, teachers can see students' progress with a task, identify their areas of weakness and use this information to plan future lessons. A student survey showed that most students felt that Google Classroom had supported them to make progress, and they enjoyed the ability to learn independently at home (i.e. to join the Google Meet for the input part of the lesson, then complete the task on their own, with support available if required).

The subject sites enable students to access resources *'around the clock'* to support them with homework tasks, to revisit learning from the lesson and to prepare for assessments. Ahead of a lesson, teachers can direct students to a quiz, video or short task to complete. This allows teachers to begin lessons with more pace and spend more time deepening students' understanding of the main content, as the foundations for learning are in place ahead of the lesson.

Despite OSFC's positive experience of using remote teaching, it is unlikely that remote teaching will expand to become part of normal practice, as there is concern that it is not appropriate for students from disadvantaged backgrounds who do not have a suitable learning environment at home.

However, the college does intend to use elements of remote learning to supplement the curriculum, and the use of EdTech will continue to increase as part of the college's ambitious plans for the future. All courses at the college now use Google Classroom as their primary source of communication and this has enabled staff to provide feedback to students more efficiently. The use of Google Meets will continue. This makes guest speakers more accessible as they do not have to travel, so the college will take advantage of this for providing enrichment sessions. The college also plans to use Google Meets and calendars to arrange meetings, supporting students to develop the digital skills they require for industry. The development of subject sites will continue as OSFC value its contribution to metacognition. The college is planning to expand their staff-coaching programme after its recent success, and this will become embedded into every teacher's review process.

In addition, the college is redrafting its digital strategy to utilise the devices provided by the DfE during the pandemic so that in future years, they can provide every student who studies at the college with their own device. They are currently keenly awaiting the outcome of their application to become a Google reference school.

Innovative use of EdTech to enhance teaching and learning across a primary and secondary trust

Windsor Academy Trust in the West Midlands consists of five primary and four secondary schools. The founding school, a large secondary school and sixth form, started to use Google Classroom in 2015 to enhance lesson delivery and set independent practice (homework). Digital learning and EdTech is an integral part of the Trust's broad strategy. Staff have noticed that it supports students with their self-regulation and retrieval and provides teachers with 'in the moment' intelligence on students' progress, allowing them to tailor their feedback and lessons in response.

All students received a full timetable of live lessons during the periods of partial school closure in 2020 and 2021. The Trust was in a good position to begin delivering live remote lessons for the first time in March 2020 thanks to their strong infrastructure and staff expertise. They used Google Classroom to create and share work with students, Google Drive to support staff to share resources and Google Meet to deliver lessons and a range of other platforms including the following.

- Whiteboard.fi which allows for live data gathering through allowing teachers to see students' virtual whiteboards.
- Jamboard for sharing ideas and replicating the collaborative nature of live lessons
- Explain Everything App to allow teachers to model and scaffold, through annotating onto tasks which are screen-shared with pupils.
- Mote for providing voice note feedback and the rubric function in Google forms for providing feedback on written assignments.

- The trust's own AFL app for asking hinge questions during lessons – multiple choice questions which allows teachers to quickly identify where students are at and if they are ready to progress.

Teachers have continued to use these EdTech platforms in their teaching since the schools reopened. This enables them to monitor students' progress with tasks and provide students with tailored feedback and support based on the level of understanding they are demonstrating.

A senior leader explained why they chose to use Google's platform: 'Google provides creative, innovative apps, but there is also a simplicity to it that students understand; and Google is very forward thinking – they are always making changes and additions to their technology.'

In recent years, the Trust has also started to roll out individual iPads to students. Considerations into this decision included their longevity, efficiency and their sustainability (which was an important consideration, given the Trust's values). The use of Google and Apple products also ensures students develop competence in using a range of technology.

The use of EdTech in the classroom has always been woven into CPD but this was scaled up to support teachers with remote teaching during the pandemic. The Trust's digital professional learning lead delivered weekly CPD sessions to empower staff and ensure they were confident to deliver live lessons. They also circulated a themed remote education bulletin, which gave staff bite-size tutorials. In addition, the Trust's digital learning lead has created a hub which gives teachers access to recordings of CPD sessions as well as subject-specific resources.

The leaders and teachers in the Trust have found the use of EdTech very powerful for transforming teacher and learner effectiveness. They find that the use of Google Classroom has led to increased levels of student engagement with independent learning beyond the school day, as well increased enthusiasm, self-regulation and resilience. A senior leader commented: 'Google Classroom is a brilliant platform for growing independent learners. When they are stuck, they can access key resources like knowledge organisers, screencasts and so on. This builds confidence and competence across the curriculum.'

Low stakes, smart start retrieval quizzes, delivered through Google Forms, feature at the beginning of all secondary school lessons. These encourage student engagement and have supported students' self-regulation, whilst also supporting teachers to plug gaps and accelerate learning.

> 'We place huge emphasis on the power of knowledge and students retrieving that knowledge so they can commit it to their long-term memory… Our students come in, they self-regulate; [the quiz] is posted onto Google Classroom, they start that and it's an embedded routine. It shows teachers which questions the students

didn’t do so well at, so it targets the feedback the teacher needs to give. So within the first few minutes of the lesson, we are closing gaps and improving students’ performance.’ *Senior leader*

Going forward, the Trust intends to be bold and innovative with how they weave EdTech into the curriculum, teaching and learning as well as professional development. They will be ensuring a balance between the use of EdTech to improve student performance whilst also making sure that other skills, such as social skills, primary pupils’ fine motor skills and secondary students’ ability to handwrite effectively in exams, are not lost. The trust intends to make creative use of remote teaching by deploying specialist teachers to deliver masterclasses or booster lessons across a number of schools in their family.

Windsor Academy Trust is proud of the way their staff and students are using EdTech to innovate and power up teaching and learning. They see EdTech as enabling staff and students to be even more daring with their planning and their teaching so that they can successfully unlock the personal and the academic potential of the young people they serve.

Using EdTech to deliver a high-quality online English curriculum worldwide

Launched during the initial phases of the pandemic, Harrow School Online delivers A-Levels entirely remotely to dozens of students based in the UK and overseas. The school uses online educational technology to provide an independent-school education.

Teachers adopt a flipped learning model whereby students come to a lesson having already studied the relevant material. Self-study lessons and materials make up for two-thirds of the delivery and live remote teaching accounts for the remaining third. Remote teaching takes place in small groups (for example, five students working with one teacher). Teachers use the data from students’ self-study to plan the focus and sequencing of their lessons. Students apply the self-study content during the live lessons while teachers work on supporting students in areas of greatest need. Live lessons are recorded, password-protected and made available to students afterwards.

Students are required to join lessons with cameras on so their engagement can be monitored. The school uses Adobe Connect for live remote delivery. They chose this software because, although it is more costly than some alternatives, they feel it offers a good mix of functions which suit their teachers and students. For example, Adobe Connect enables staff to set up breakout rooms, presentations and materials in advance and offers multiple communication channels – private with the teacher, collective, written and spoken.

The school has introduced other pieces of software to improve live remote classes. These include GeoGebra, Idroo and Miro, all of which offer shareable whiteboards in

combination with other functionality. Miro provides a scrolling whiteboard, which staff find particularly helpful for viewing problem-solving in mathematics and physics lessons.

The school provides teachers with writing and graphics pads, and teachers are already equipped with second monitors. The ability to mark online using a digital pen reduces the time and effort teachers would otherwise need to spend in printing out, marking, scanning and uploading assignments. Students use devices to write equations by hand. The school also requires students to use an external webcam during exams so teachers can invigilate and check on pupils' surroundings.

The school uses an in-depth training path to prepare new teachers to deploy the school's educational model. Adobe Connect is woven into the training because teachers need to be at a proficient stage of 'automation' with the software so they can focus on teaching instead of the technology. As one senior leader explained:

> 'You can't use Adobe Connect without training. You can't expect teachers who have previously worked in physical schools… for content-delivery to transition to teaching online, where you're not doing content-delivery - you're analysing data, you're targeting areas for remedial work, and you're supporting students to apply their knowledge. You need to get really robust training to change their approach and to ensure they're comfortable [with] the tech.' *Senior leader*

New teachers take part in a two-week induction and attend daily 30-minute meetings to review tech-related questions during the autumn term. A senior leader said they found this approach to be effective in helping teachers to focus on maximising interactivity in the live lessons. For example, while some teachers initially fall back on lecture-style lessons, they soon become increasingly confident with managing software and using breakout rooms. However, even with long-term experience, teachers may occasionally struggle to handle the technology and classroom management at the same time. The school also provides pupils with guidance on operating the technology in the student handbook and as part of an induction week.

The school uses information from student feedback to achieve the right balance between asynchronous and synchronous study. A senior leader commented that students always give more positive feedback about live lessons than asynchronous activities because:

> 'That's the fun in it, right? That's the bit you should be enjoying, where it's interactive. So our live lessons always get slightly more positive feedback than our self-study lessons, but they're serving slightly different purposes.' *Senior leader*

As interviewees pointed out, different students have distinct experiences with this approach. For example, individuals who struggle with taking responsibility for their studies and managing their time find it more challenging to keep up with the work. In response to this, the school offers a Study Skills and Mindset course where pupils learn about time management, avoiding procrastination, managing sleep and exercise, socialisation and building a daily routine.

Teachers have noticed that the existence of various communications channels in Adobe Connect tends to benefit students who are more reserved or anxious. In particular, these students tend to use a function that enables them to communicate with the teacher in private rather than share with the whole group. As one teacher commented: ‘What works really well is shy students being able to be shy and being able to come out gently and not lose out’.

We observed live teaching sessions which involved students using Adobe Connect’s chat and question-and-answer functions. The chat function was especially popular, and teachers often invited students to add their comments. However, interaction was largely contained to short comments in the chat. After the lesson, the teacher reflected that the software was limiting interactions: ‘I would like for people to be able to talk at the same time… It [Adobe Connect] breaks off… for example if I talk and you talk at the same time’.

This school was especially designed to provide remote learning. It was therefore able to continue as normal during the disruption caused by Covid-19. In future, staff plan to continue with their model, but will seek new software to enhance the quality of interactive learning.

7 Summary, conclusions and recommendations

This final chapter of this report draws together the evidence that has been collected to succinctly address each of study's underpinning research questions, and to provide recommendations to support the Department's next steps.

7.1 Main findings

What products and tools are schools and colleges using for remote teaching?

The schools and colleges included in this research used one of 4 applications to deliver live remote teaching: Microsoft Teams; Google Meet; Zoom; and Adobe Connect. Microsoft Teams and Google Meet were the most popular platforms owing primarily to their integration with existing software. They also used a range of applications to support live lessons, as part of a blended offer. These included:

- subject-specific applications
- recording and storage applications
- Learning Management Platforms (LMPs) or Virtual Learning Platforms (VLEs)
- online whiteboards
- tools for engaging parents and carers.

How did they select the tools they used?

In most cases, case-study schools and colleges adopted tools at speed in response to the pandemic, with little time for review or piloting. Some case-study settings piloted new tools, for example by asking different subject departments to identify and test the use of different applications, including their setting's preferred video-conferencing tool. Others adopted a more ad hoc approach, with different teachers trying out different applications and approaches. Many settings chose to continue to use their familiar applications. Some interviewees adopted tools based on guidance/recommendations from other teachers, both from within and from outside their own settings.

How have the tools been implemented in schools or colleges?

The case-study schools and colleges have very different contexts, which clearly influenced their approaches to remote teaching. Independent schools have greater resources and had different expectations regarding what should be provided during the periods of partial school closures. This led to them largely replicating their normal timetable during the Covid lockdown periods.

By contrast, some of the publicly-funded schools were more resource-constrained, both in terms of equipment, and, at the height of the pandemic, staff availability. They also

found it challenging to implement, especially for pupils from disadvantaged backgrounds who lacked access to suitable devices, internet connectivity and study space at home. This resulted in a more limited number of live lessons being delivered, with some settings also choosing to provide only a short live component in their lessons, for example as a starter or reflection activity, with pupils working on a task for the rest of the time.

All interviewees recognised the need for pupils to have a varied diet of online and offline activities, and noted the importance of parental support, especially for primary-age learners. There were some concerns expressed by primary school staff about whether and how live remote teaching could be used for younger age-groups.

Have they measured the success of the tools in any way?

Schools and colleges largely used practice experience to inform their views of the effectiveness of their EdTech and remote teaching strategy. Where organisations were able to collect more data, this usually focused on pupils' attendance and engagement with live lessons, and their progress during periods of remote learning. Some schools and colleges had also conducted surveys with pupils and teachers to seek their views.

The data schools and colleges provided in their assessments of effectiveness were largely based on pupils' responses and the perceived impact. It included both positive and negative views about the impact EdTech tools were having upon their progress during the periods of remote teaching. However, this data was largely anecdotal, with several schools and colleges reporting that they had not yet completed full analysis of their surveys and would be in a better position to assess the full impact of remote teaching once pupils had received results from national assessments, including key stage 2, GCSE and A-Level results.

What has worked well and less well, and why, in the use of different products and tools?

Schools and colleges reported that EdTech worked well to support remote teaching when it was user-friendly, cloud-based and consistent across different devices and where it enabled integration between applications and platforms. Conversely, it worked less well when users faced resource constraints or technical problems, where pupils were camera shy and/or reluctant to engage in learning, and when teachers lacked the skills or confidence to deliver high-quality lessons.

Some interviewees had suggestions for new or additional functions they would like to see added to the software they were using. Some of these were program-specific, but in general teachers wanted:

- full control over live remote lessons, including the ability to mute pupils and to simultaneously see every pupil's camera while presenting

- to better support the submission of handwritten work, including the ability to take high-quality scans of pupils' work
- support with file management, so that online documents could be more easily indexed and retrieved.

It should be noted that other interviewees had already found solutions to these gaps, reflecting both the pace with which software was being developed and updated, but also the variability in teachers' knowledge of the different ways in which different packages could be used.

What have they learnt as a result of remote teaching during the pandemic?

One of the key learning points from schools' and colleges' experience during the pandemic was that live teaching was key to pupils' engagement in learning during lockdown, and therefore helped prevent so-called 'learning loss'. However, keeping pupils engaged was also one of the biggest challenges for teachers during remote lessons. There were several reasons for this including the need for teachers to adopt different approaches to planning and sequencing lessons remotely compared to in-person, as well as safeguarding concerns placing restrictions on the use of cameras and group work.

Teachers also noticed that some pupils were more reticent to respond during remote lessons and the technology did not always support spoken interaction. Teachers' main response to this was to adopt a different pedagogical approach, using all the EdTech functions at their disposal. This included planning shorter presentations with direct questions and quizzes to check understanding and opportunities for interaction.

Teachers found it helpful to intersperse live, whole-class sessions with periods of self-study, to be online to assist individuals during their tasks and to provide rapid feedback on completed work. Some went further, by adopting a 'flipped learning' approach, whereby pupils were asked to engage in self-study before the live session with their teacher.

What are their future plans for remote teaching?

Compared to the high-water mark of EdTech use during the periods of partial school closure, many case-study schools and colleges planned to downsize their remote teaching offer in future, or had already done so. However, others planned to increase and/or diversify their remote teaching offer, with some doing so in response to specific challenges or barriers. In particular, some secondary schools and colleges recognised the value of live remote teaching as a way of sharing subject specialist teaching across sites, which was especially valuable for hard-to-recruit subjects. Some also planned to expand their online-only provision, to reach pupils located in different areas of England or internationally.

What are the range of purposes for which remote teaching has been used/considered?

Most case-study schools and colleges had no experience of delivering live remote teaching prior to the pandemic. This aligns with findings from national research (Montacute and Cullinane, 2021), which found that schools significantly increased their online learning provision during the second period of partial school closures, with over half of teachers (54%) delivering live online lessons in January 2021, compared with only 4% in March 2020.

Not surprisingly, the main reason schools and colleges used remote teaching during the pandemic was to support pupils and teachers who were isolating, or who were unable to be in school or college. However, schools and colleges also used remote teaching for other purposes, including to:

- provide access to subject specialists/ increase their curriculum offer
- provide revision classes and/or catch-up work outside of school/college hours, including during weekends and holidays
- support pupils who were absent from school/college for reasons other than Covid
- deliver a British curriculum/educational experience internationally (in the case of the virtual school)
- support teacher wellbeing and reduce workload (e.g. through enabling team teaching)
- support specific groups of learners such as those with SEND, the most able, other groups or individuals
- make enrichment activities more accessible (e.g. guest speakers can appear via live video, removing the need to travel to school).

In one case-study, a global network of independent schools was using EdTech and remote teaching to broaden the curriculum across member schools. This involved the use of video conferencing units and software to connect A-Level and GCSE students on campuses that did not offer subjects they wished to study, with a subject specialist based at another campus. All students, regardless of their campus, accessed the lessons remotely, with those on the same campus as their teacher accessing the lessons from their campuses' Learning Centres - specialised open learning spaces within the school.

In another example, a publicly-funded primary school was using remote teaching as part of a blended learning curriculum. The Trust has a comprehensive blended learning strategy, which stipulates that 25 per cent of the curriculum will involve technology. During the partial school closures in 2020 and 2021, all teachers delivered a minimum of three live lessons per day, including English, mathematics and a core subject. Building on the momentum with the roll out of EdTech during the pandemic, the Trust IT and Art leads continue to deliver lessons remotely to pupils, which gives pupils access to an area of expertise their class teacher may not have, as well as enabling pupils to experience a variety of teachers.

7.2 Topics to explore in further research

Although this study has focused on EdTech solutions for remote teaching, this research supports the observation made by the Education Endowment Foundation (2020) that the quality of teaching is more important than how lessons are delivered. We also agree with the All-Party Parliamentary Group on Education Technology (2021) that the Initial Teacher Training and Early Career Framework must equip teachers with the knowledge and confidence to source and deploy effective EdTech solutions.

Our recommendations for topics to explore in further research focus on key areas identified in the case studies and research literature. They are designed to support the Department's next steps, which entail scoping further research into EdTech tools and products.

1. The Government is committed to remote education 'allowing children to keep pace with their education when in-person attendance in school is impossible' (HM Government, 2022, page 59). We recommend further investigation into solutions for schools to provide remote live teaching for these pupils. In particular, there is a need to identify the best (most efficient and effective) hardware and software solutions to allow for simultaneous delivery and broadcasting of live in-person lessons. This could include consideration of the use and positioning of microphones and webcams as well as the use of different applications to create a more cohesive, integrated and managed learning experience.
2. Given the importance of interaction during live remote lessons for pupil engagement and learning, we recommend an investigation of which EdTech tools are most effective in enabling interactivity and how these can best be deployed. This needs to take account of the pedagogical and practical/workload challenges for teachers: they need to be simple and easy for teachers to use and address safeguarding concerns.
3. Some interviewees commented on the challenges of delivering remote education to younger children, particularly those in Reception and Year 1. For example, interviewees' expressed concerns about young children's ability to concentrate for extended periods of remote teaching, and for the potential negative consequences for children's social and fine motor skills (such as being able to write, or hold a pencil or a paintbrush). We recommend an investigation of remote teaching for younger children (i.e. children aged 3 to 6). This should include which products are most suitable for which age-groups, and any recommended limits on the length and frequency of live remote teaching, or the need to balance live remote teaching with other activities, such as play and other forms of learning, to enable the development of the whole child.
4. Some case-study schools and colleges were concerned that live remote teaching had widened rather than narrowed attainment gaps between pupils with different characteristics. This was attributed to some pupils not being able to reliably access remote learning, while others were reluctant or unable to engage. While the use of the government's 'Get help with technology programme (GHwT)' had helped with device

access, and the introduction of low stakes, smart retrieval quizzes had helped to increase pupil engagement, these approaches had not fully overcome these issues. In addition, while accessibility tools embedded within EdTech could be helpful for SEND pupils, the support needs of these pupils were sometimes regarded as ‘too nuanced’ to be wholly met by remote teaching. We therefore recommend that the DfE commission research into tools and products designed to support learners with a range of different special educational needs and disabilities. We also recommend that all future impact research and trials require consideration of the needs of learners with SEND and those from disadvantaged backgrounds.

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