

Purple Mash: The Evidence & The Impact

Independent research review



Dr Fiona Aubrey-Smith EdD MA(Ed) MMus PGCE BA(Hons) FCCT FRSA

October 2022

Background	3
Research Scope, Aim and Lines of Inquiry	3
Methodology.....	4
Findings	7
The Computing Curriculum	8
The Purple Mash Computing Scheme of Work.....	9
Cognitive Load.....	19
Assessment	21
Progression for Higher Prior Attaining Children	28
Appropriateness of Purple Mash for Upper Key Stage Two	31
Inclusion	40
Gender	42
Impact of the pandemic.....	44
Purple Mash across the Curriculum.....	46
Home Use and Parental Engagement.....	56
Impact on Learning	58
Professional Development and Support.....	59
Support from 2Simple.....	71
Conclusions	73
Recommendations	76
References	77
Acknowledgements.....	82
About the Author	84

Background

2Simple have been creating educational software for schools since 1999, starting with the launch of the 2Simple Infant Video Toolkit which introduced young learners to simple painting, publishing, graphing and branching decision trees. In 2010, 2Simple launched Purple Mash, providing an all-in-one solution for primary schools.

Purple Mash is now a widely recognised learning resource across primary schools in England as well as further afield around the world. Users include 2 million learners, across 8,188 schools, in more than 74 countries.

In 2022, 2Simple commissioned this independent research review to investigate the extent to which Purple Mash is meeting the needs of learners and teachers.

The research takes place within the context of 2Simple's overarching aim which is to provide excellent, accessible, and inspiring software to encourage children to love learning, develop their creativity and prepare them for later life.

Research Scope, Aim and Lines of Inquiry

Research Aim: To identify the extent to which **Purple Mash is meeting the needs of teachers and learners** in

- achieving the aims and requirements of the computing curriculum, and
- achieving 2Simple's overarching aim to provide excellent, accessible, and inspiring software to encourage children to love learning and prepare them for later life.

This aim has been addressed by investigating a number of lines of inquiry. Each line of inquiry invited teachers, school leaders and learners to share their perspectives and insights about the extent to which Purple Mash is;

- 1) **Inspiring learning** for all children – specifically in relation to computing
- 2) Building children's skills, knowledge, understanding and application through delivery of a **high-quality computing curriculum**
- 3) Providing **progression for all children** in their learning
- 4) Preparing children for **secondary school** and their **later life**
- 5) Contributing to **raising standards** – in computing, and across the wider curriculum
- 6) Increasing **teacher skills and confidence** in developing children's knowledge about computing
- 7) Supporting **teacher professional development** and **workload**.

This research review does not interrogate the products and services themselves (e.g. the functional specifications of Purple Mash or the specifications and mapping of the Purple Mash Computing Scheme of Work).

Methodology

In order to respond to the research aim and lines of inquiry as set out above, this research has taken a mixed methods approach, utilising

- large scale quantitative surveys
- smaller scale qualitative questionnaires
- semi-structured interviews
- unstructured interviews
- focus groups
- classroom observations
- website usage reports
- business intelligence analytics reports

Data has been generated through engagement with **6,328 teachers, school leaders and children** from across **1,003 schools** in England between January 2022 and July 2022.

Data was collected in five phases – each building upon findings from the previous phase.

Phase 1: Site usage data reports and business intelligence analytic reports

- ✓ To identify benchmarking data about the scale and nature of Purple Mash usage across schools.
- ✓ To identify features common across schools using Purple Mash successfully within their computing curriculum.
- ✓ To identify potential sample schools for Phase 3 (interviews) and Phase 4 (visits).

Phase 2: Multiple user surveys (school leaders, computing leaders, classroom teachers)

- ✓ To draw out data about the nature of Purple Mash usage across schools.
- ✓ To identify features common across schools using Purple Mash successfully within their computing curriculum.
- ✓ To identify potential sample schools for Phase 3 (interviews) and Phase 4 (visits).

Phase 3: Interviews (school leaders, computing leaders, classroom teachers)

- ✓ To identify ways in which school leaders are utilising Purple Mash within their computing curriculum – particularly focusing on decision making and evaluation.
- ✓ To unpack how teachers plan, facilitate and assess computing using Purple Mash.
- ✓ To unpack the relationship between Purple Mash and Teachers' 3Cs (Cognisance, Competence and Confidence) in teaching computing.
- ✓ To explore hypotheses that emerged from Phase 1 (site usage and analytic reports) and Phase 2 (school leader, computing leader and teacher surveys).
- ✓ To draw out and explore further lines of enquiry as they arise through interviews (e.g. exploring the potential connection between Purple Mash and increased quality and regularity of formative assessment).

Phase 4: School visits (children, teachers and leaders)

- ✓ To surface ways in which school leader and computing leadership intentions for Purple Mash are lived out through teaching and learning classroom practices.

- ✓ To unpack how children experience Purple Mash in their learning at school (through observation, focus groups, interviews and data reports).
- ✓ To unpack how children experience Purple Mash in their learning at home (through focus groups, interviews and data reports).
- ✓ To probe specific lines of inquiry that have emerged from Phase 2 (surveys) and Phase 3 (interviews). For example, the appropriateness of Purple Mash for Year 6 / More Able Upper Key Stage 2 learners.
- ✓ To build on the findings of Phase 3;
 - ✓ To identify ways in which school leaders are utilising Purple Mash within their computing curriculum – particularly focusing on decision making and evaluation.
 - ✓ To unpack how teachers plan, facilitate and assess computing using Purple Mash.
 - ✓ To unpack the relationship between Purple Mash and Teachers' 3Cs (Cognisance, Competence and Confidence) in teaching computing.
- ✓ To draw out and explore further lines of enquiry as they arise through observations, focus groups and interviews.

Phase 5: Multiple user surveys (children)

- ✓ To unpack how children experience Purple Mash in their learning – drawing on a broad range of child demographics and school contexts.
- ✓ To probe specific lines of inquiry that have emerged from Phase 3 (interviews) and Phase 4 (school visits) findings with a wider data set.
- ✓ To test teacher and school leader hypothesis with a wide range of children's perspectives.

Participant Summary

Data has been generated through engagement with **6,328 teachers, school leaders and children** from across **1,003 schools**.

A direct invitation to contribute to the research through an online survey was sent to all staff at schools who had an active Purple Mash subscription in January 2022 (n= ~80,000). In addition, the opportunity to contribute to this part of the research was promoted to a wider audience through a public facing website and a campaign of social media posts.

Of the responses to the Phase 2 survey, 96% were current classroom teachers or leaders. Of these, 39% were computing leaders, 37% were classroom teachers, 10% were part of the school senior leadership team (including deputy headteachers and headteachers) and 6% were Higher Level Teaching Assistants or Teaching Assistants. The remaining 4% held roles working with schools (e.g. freelance trainers, advisers or education consultants).

As part of the Phase 2 survey, teachers and leaders were invited to register their interest in taking part in further phases of the research. The 15% of respondents who had registered their interest were accordingly engaged through follow-up direct invitations with further details. In addition, a broad range of schools identified through phase 2 data analysis were

directly approached with an invitation to participate in phase 3. Schools working closely with 2Simple (e.g. Pioneer schools) were not included in order to avoid undue data bias. Of the school staff who participated in the phase 3 interviews, 75% were computing leads and 25% were senior leaders. All of the participants who held the roles of computing leads had classroom teaching responsibilities with a majority being full time classroom teachers and some providing specialist computing teaching for all year groups in their school. Teaching expertise and experience of the participants ranged from Nursery to Secondary with 50% having taught both key stage one and key stage two within the last 3 years.

As part of the Phase 1 data analytics, a broad range of schools were identified who had the potential to offer either diverse perspectives, or specific insights. These schools (all located within England) were directly invited to engage in phase 4 of this research. The schools included academies who were part of a multi-academy trust, local authority schools, independent schools, small schools, large schools, and schools with particular intakes (e.g. children with a range of special educational needs and disabilities, children experiencing a range of disadvantages or barriers to their learning, children for whom English is a second language, schools with different religious affiliations (or none), and schools attended by children from a wide range of different economic and/or sociocultural backgrounds). All of the schools had received either Good or Outstanding Ofsted judgements (or the Independent Schools Inspectorate equivalent) at their last inspection.

In phase 5 of this research, children were encouraged to share their views and insights through 2 types of survey. Children who were independently able to read and respond to an online survey were invited to complete the 'KS2' survey – with 1,201 responses from 615 schools received. Of these responses, 17% were children in Year 3, 33% were children in Year 4, 32% were children in Year 5, and 18% were children in Year 6. Of these children, 28% identified as a boy, 62% identified as a girl and 11% preferred not to say. Children who were keen to participate but were dependent upon a teacher/adult to do so were invited to complete the 'EY/KS1' survey – with 4,636 children from 199 schools contributing. Of these responses, 6% were children attending Nursery, 10% were children in Reception, 27% were children in Year 1 and 57% were children in Year 2.

Findings

Purple Mash is a widely recognised learning resource across primary schools in England as well as further afield around the world. Users include 2 million learners, across 8,188 schools, in more than 74 countries.

Desk based research probing Purple Mash user data identified that the number of children's accounts on Purple Mash in January 2022 equated to approximately **48% of all primary aged children** in England¹. In addition to this, the number of staff accounts on Purple Mash at the same point in time equates to approximately **70% of all teachers in primary schools** in England².

Purple Mash is designed to offer a wide range of curriculum activities, resources, tools, programs and games specifically to support learning for primary aged children (age 3-11). Purple Mash includes a specific scheme of work designed to deliver the computing curriculum³.

The predominant use of Purple Mash is within the classroom, with children using Purple Mash features as part of their learning across the curriculum. In addition, children are able to access Purple Mash anywhere, anytime through any internet browser. This means that many schools use Purple Mash to provide children with homework as well as utilising it for other forms of home learning and family engagement.

On average, **children using Purple Mash open 200 tools, resources, or applications each year as part of their learning at school or at home**. These range from coding tasks to maths activities, handwriting, phonics games, creative writing, geography activities, art actions, internet safety, music, SPAG tasks, touch typing, history activities, investigations, topic simulations, reading comprehension, science inquiries, PSHE and RE tasks and stories to be enjoyed.

¹ DfE (2022) Pupil Census data 2021/22. [<https://www.gov.uk/government/statistics/schools-pupils-and-their-characteristics-january-2022>]

² DfE (2022) School workforce in England November 2021. [<https://www.gov.uk/government/statistics/school-workforce-in-england-november-2021>]

³ DfE (2013) National Curriculum Computing Programmes of Study. [<https://www.gov.uk/government/publications/national-curriculum-in-england-computing-programmes-of-study>]

The Computing Curriculum

In England, the national curriculum for computing sets out what children should learn⁴. Whilst computing is not part of the current early years foundation stage statutory framework⁵, and there is an ongoing debate about the role of learning computing in the first years of schooling⁶, it is part of the national curriculum from year 1 upwards.

Whilst this independent research did not seek to undertake a systematic literature review about computing in primary schools, it is significant to note that the **majority of research concerning computing in schools** cited by salient texts, sources and authors **is framed around qualification and employment outcomes** (e.g. The Royal Society, 2017⁷; Rich et al., 2019⁸;). The consequence of this for primary schools is that **the focus on computing is often based on secondary school readiness and conceptualising computing as a requirement for career pathways**, rather than computing experiences being intrinsically valuable or valuing knowledge and skills as transferrable. Whilst not a core focus of this research, it may be useful to be aware that the most recent studies probing student perception on the role of the computing curriculum at secondary school (which include extensive literature reviews), have surfaced findings such as,

“young people did not feel the computing curriculums was adequately preparing them for the digital economy.”⁹

It may be pertinent therefore, to **consider any research (empirical or theoretical) regarding computing in primary school with a more holistic lens** – taking into account both student perception and the transferability of skills and knowledge to a broader range of contexts.

A review by Ofsted in 2022 found that there are a wide range of ways that schools provide the computing curriculum in primary schools¹⁰. In 2017, a report by the Royal Society found that **children in primary schools typically experience 1 hour of computing each week but that this varies considerably across and between schools**¹¹. Data collected as part of this independent research is **consistent with those findings** and found that **whilst children in some schools benefit from timetabled specialist teachers and teaching in computing, the majority are dependent upon non-specialist teachers and an already over-demanding timetable of curriculum priorities.**

⁴ DfE (2013) National Curriculum Computing Programmes of Study.

[<https://www.gov.uk/government/publications/national-curriculum-in-england-computing-programmes-of-study>]

⁵ DfE (2021) Early Years Foundation Stage Framework [<https://www.gov.uk/government/publications/early-years-foundation-stage-framework--2>]

⁶ Manches, A., and Plowman, L., (2017) ‘Computing education in children’s early years: a call for debate’ *British Journal of Educational Technology* 48(1) pp.191-201

⁷ The Royal Society (2017), *After the reboot: computing education in UK schools*. [<https://royalsociety.org/-/media/policy/projects/computing-education/computing-education-report.pdf>]

⁸ Rich, P., Browning, S., Perkins, M., Shoop, T., Yoshikawa, E., and Belikov, O., ‘Coding in K-8: international trends in teaching elementary/primary computing’, *TechTrends* 63(3) pp.311-329.

⁹ Wohl, B., (2021) The Impact of the English Computing Curriculum on Young People as Delivered at Key Stage 3. PhD Thesis. Lancaster University [<https://eprints.lancs.ac.uk/id/eprint/155343/3/2021wohlphd.pdf>]

¹⁰ Ofsted (2022) Research Review Series: Computing [<https://www.gov.uk/government/publications/research-review-series-computing/research-review-series-computing>]

¹¹ The Royal Society (2017), *After the reboot: computing education in UK schools*. [<https://royalsociety.org/-/media/policy/projects/computing-education/computing-education-report.pdf>]

This independent research has probed provision and experiences at schools where leaders have chosen to purchase Purple Mash. However, it is important to note that whilst Purple Mash offers a full Computing Scheme of Work, it is a much broader product offering a comprehensive range of features appropriate for primary school aged children. These include resources and tools for all subjects in the primary curriculum with curriculum mapping showing how the resources meet the needs of teachers and pupils.

Therefore, not all schools using Purple Mash bought it with the intention of using it for Computing, and interpretation of reported statistics should bear this in mind.

The Purple Mash Computing Scheme of Work

One of the key features of Purple Mash is its distinctive Computing Scheme of Work. The Purple Mash Computing Scheme of Work addresses each of the three strands of the National Curriculum Computing curriculum¹² – Computer Science, Information Technology and Digital Literacy. The Scheme of work takes a spiral approach¹³ to learning and provides over 50 highly integrated units which are intended to introduce, build and deepen knowledge for all children. Teachers are provided with fully planned and resourced units of work which utilise information technology as part of every discrete computing lesson. For example, incorporating art and design or sound into programs that children are designing and coding, or using the practice of algorithmic thinking to plan out an animation, a story or a presentation - demonstrating logical chunks of information that flow together as a whole.

Teachers are provided with step-by-step lesson plans, presentations and tutorial videos, along with fully resourced and referenced supporting materials. As Mrs C, Deputy Headteacher explained, this is vital for schools where the majority of staff are non-specialist teachers who are teaching computing – offering a simple solution,

“It’s very structured. You can just go through it step by step”.

The comprehensive support that the Purple Mash Scheme of Work provides has been well received by both specialist teachers and non-specialist teachers. For example,

*“I’ve been teaching computing from reception to year six now at the school for 17 years. I was already teaching coding so it wasn’t so new when the 2014 changes came into force... but what I did start to do was help my other colleagues across our 25 other trust schools who don’t teach computing across the whole school. I was helping them to support their colleagues who were complete computing, coding novices... **it’s absolutely brilliant.**”* Samantha Shallcross, Head of Computing, Bromley High Junior School

Of the schools surveyed, **93% used the Computing Scheme of Work.** Of those schools, 59% were using the Purple Mash Scheme of Work as their complete computing solution, and the

¹² DfE (2013) National Curriculum Computing Programmes of Study. [<https://www.gov.uk/government/publications/national-curriculum-in-england-computing-programmes-of-study>]

¹³ Bruner, J., (1960) *The Process of Education*. Cambridge, MA.

remaining 41% were supplementing the Purple Mash Scheme of Work online activities with other offline activities or physical provision (e.g. with the use of floor robots).

All of those who spoke about using the Purple Mash Computing Scheme of Work talked about the advantages of both its structure and its flexibility. For example,

*"We've used the model of what Purple Mash offers because it has open ended and sandbox type activities, but it also has **a very structured, scaffolded route through the skills, knowledge and understanding that pupils need to have. It feels like bowling with the bumpers out** - it gives you the video, then it gives you the instructions, then it gives you the activity, then it gives you that again, but for a tiny **incremental step forward** and where teachers are less confident, that's brilliant and really helpful."* Anthony Lees, Computing Lead at The Cornerstone Academy Trust.

The Purple Mash Computing Scheme of Work is used by different schools and different teachers in different ways. For example, Stephanie Barber, the Computing Lead for Snaresbrook Preparatory School explained that,

*"All the children in our school get one hour of computing a week discrete with me. That's where they do all of their computing curriculum and the computing skills. I've based it on **the Purple Mash Scheme of Work** which I found gave a **really good broad overview of all the computing skills, but most importantly, didn't just revolve around coding**. I found a lot of schools - when the new curriculum came in in 2014 - a lot of schools thought it's all about coding and then that's all the children did. But **there's a really important place for all the other skills like the information technology skills, and a much better emphasis on e-safety and digital literacy as well.**"*

Over 41% of schools who participated in this research study use the Purple Mash Computing Scheme of Work as part of a hybrid computing curriculum solution. Oliver Booth at Richmond School – part of The Harmony Trust explained that the Purple Mash Computing Scheme of Work

*"...runs alongside units that we've already had in place because we had previously bought hardware and the school quite rightly didn't want to lose that previous investment. Computing has historically been a subject which people don't necessarily enjoy teaching because they're not confident in teaching it. So I think **the step-by-step lesson plans mean that you can literally pick it up and go**. That's the beauty of it for me **because it ensures consistency across the school.**"*

Thematic analysis¹⁴ of interview data also showed a range of ways that the Purple Mash Computing Scheme of Work supported both short term computing curriculum provision as well as providing a scaffold for longer term curriculum development. For example,

*"We've added in a Sphero unit and we are exploring Makey Makey and then the Micro:bits as well. There's just no comparison between before and now. **Purple Mash has given us the confidence to branch out with these other technologies**".* Clare Mathema, Computing Leader at Sherborne House School

¹⁴ Braun, V., & Clarke, V., (2006) Using thematic analysis in psychology. *Qualitative research in psychology* 3(2) 77-101

The **role of Purple Mash in building confidence in both teachers and children to explore increasingly wider ranges of computing and technologies is significant**. In 2022, Ofsted undertook a research review which highlighted the importance of high-quality computing education incorporating a breadth of knowledge, information technology and digital literacy. Furthermore, that high-quality computing education combined declarative knowledge (knowing ‘that’) with procedural knowledge (‘knowing how’) which work together to **underpin skillful use of technologies**.

Most subject leaders spoke about how the **leadership of computing had evolved** over time in their school and what they perceived as **the vital role of the Purple Mash Computing Scheme of Work in this process**. For example, Tiffany Galloway, Computing Coordinator, Inmans Primary School explained that,

*“When I first took over this role, I used the Scheme of Work word for word like a script... now it depends on how many weeks there are in a half term and things like that so I adapt them, but I tend to use **the structure and the progression within the lessons and across the unit.**”*

The **41% of schools who had chosen to complement the Purple Mash Scheme of Work with physical resources** such as BeeBots, Lego and Sphero, did so in order to support tactile learning experiences for children and **to encourage the transferability of skills and understanding**.

The approach of combining the Purple Mash Computing Scheme of Work with complementary physical resources was **recognised by accountability models as supporting the overarching intentions of the Computing Curriculum**. As Helen Worrall, Trust Computing Leader at The Harmony Trust, explained;

“[Lead Inspector] feedback was so good regarding the curriculum which we had... he said, I'm really pleased to see that you're using a lot of practical things as well.”

Schools who had been recently inspected each spoke about **the positive feedback** that they had received about their computing curriculum. All of the school leaders interviewed spoke about their **consequent confidence in the quality and clarity of the Purple Mash Computing Scheme of Work** in addressing the aims and requirements of the National Curriculum for Computing. For example, Clare Mathema, Computing Leader at Sherborne House School reflected that,

*“it's not all about inspections, but when the inspectors came, they did comment on how high the skills were in computing. **Purple Mash has had a massive impact... I'm absolutely convinced that without it, the skills would not be where they are now, and especially for those teachers who aren't so confident.**”*

At this school, inspectors noted for example that,

*“**Pupils display excellent information and computing technology skills... Pupils displayed agile control and animation skills... Pupils were seen to write, animate and***

present their own stories using technology with confidence to strengthen the final pieces.”¹⁵

As Helen Worrall, Trust Computing Leader at The Harmony Trust summarised,
*“The **Purple Mash curriculum is excellent**. The trust saw the implementation of Purple Mash and they saw that it was easy to use and deliver [so] **people are not scared of it anymore... Purple Mash is perfect in terms of computing.**”*

The **impact of the Purple Mash approach to the Computing Curriculum had an unexpected effect upon children across the primary age range**. When asked how much computing they experienced at school, an overwhelming majority of children stated that they had computing lessons 2-3 times per week, rather than the anticipated once. This finding directly contrasted with research by The Royal Society who found in 2017 that the typical time given to computing in the curriculum was insufficient to teach the national curriculum subject content¹⁶. There were several possibilities to probe for this line of inquiry, not least of which being that the dataset for this research study is at least 6 years newer than that of the Royal Society report, during which time many variables have significantly changed. Consequently, the finding was interrogated further to identify whether this stemmed from other factors (e.g. timetabling, school cross-curricular approach, perception about tasks, clarity about the definition of computing, or misconception). What became apparent through interviews and focus groups was that computing was largely taught discretely, but that **due to the design of Purple Mash functionality, children were then consolidating those skills through learning activities in other subjects and also often through home access** (both as assigned homework tasks, and independent home access for pleasure – see later section on Home Learning). This finding was significant as it suggests that the design of **Purple Mash is enabling discrete teaching as well as cross-curricular approaches**, and furthermore, that **Purple Mash encourages independent consolidation of learning, whether or not it is timetabled or directly assigned by teachers**. In turn, this finding is notable as this directly addresses some of the concerns raised in the 2022 Ofsted Computing research review (e.g. balancing sufficient computing curriculum time with the workload demands placed upon teachers¹⁷).

In 2022, Ofsted published a research review about computing¹⁸, which sought to summarise factors that can affect the quality of education in computing, consider curriculum progression, pedagogy and assessment, and the impact of school leaders’ decisions on provision for computing. Following the publication of this research review, the education

¹⁵ ISI Report (2021) <https://www.sherbornehouse.co.uk/images/uploads/general/Sherborne-House-RCI-EQI-Report-FINAL-2021-07-07.pdf>

¹⁶ The Royal Society (2017), *After the reboot: computing education in UK schools*. [<https://royalsociety.org/-/media/policy/projects/computing-education/computing-education-report.pdf>]

¹⁷ Kemp, P., and Berry, M., (2019) The Roehampton annual computing education report pre-release snapshot from 2018. [<https://www.bcs.org/about-us/bcs-academy-of-computing/the-roehampton-annual-computing-education-report/>]

¹⁸ Ofsted (2022) *Research review series: computing*. [<https://www.gov.uk/government/publications/research-review-series-computing/research-review-series-computing>]

team at 2Simple published a series of information detailing the ways in which Purple Mash reflected those research findings¹⁹.

This independent research review has triangulated the reports by both Ofsted and 2Simple with data from school leaders, teachers and learners in order to illustrate what these research findings look like in practice.

In their 2022 report, Ofsted reported that high-quality computing education should be, ‘...rich in computer science knowledge, **enabling children to make sense of the entire computing curriculum**’ and that ‘**children learn important programming knowledge to enable them to become skillful programmers.**’²⁰.

This was illustrated by 2Simple as follows;

“Each year group of the Purple Mash Computing Scheme of Work contains computer science themed units. There is a coding unit in each year that uses 2Code block coding to develop skills and knowledge of the design, code, refinement process of programming and a variety of other computer science units. These range from the beginning of algorithmic thinking in year 1 with the Lego Builders unit, to introducing the Logo language in the form of 2Go (Maze Explorers) and then 2Logo in year 4. Children develop their computer science knowledge and skills through game creation (years 5 and 6) and learning about binary in year 6; where children can join up the software and hardware functionality of machines to see the inter-relationship between the physical processing and the technological outcomes. The programming units are carefully structured to support children in completing a mental model for good programming that they can apply to future challenges.”

Data analysis from surveys of staff and children, interviews with teachers and leaders, focus groups with children and observations of classroom practice surfaced a number of findings.

Where children attend schools who use Purple Mash, there is **an awareness of coding from a very early age which appears to be directly attributable to activities within Purple Mash** itself. For example, in a survey of early years and key stage one children, administered by their normal classroom teachers (n=4,636), **69% of children in nursery and reception knew what coding was and reported having completed some coding activities**. This is consistent with Bers et al (2019), who reported a number of other studies which demonstrated that very young children are able to engage successfully with the core concepts of computing, including coding²¹.

The gradual, **play-based introduction to coding** that is made available to children through Purple Mash was noted elsewhere in the dataset to **impact children’s perceptions on how achievable coding activities are**. For example, when asked about age-appropriate coding

¹⁹ 2Simple (2022) *Purple Mash and Ofsted’s High Quality Computing Curriculum*. [https://www.2simple.com/blog/search/ofsted/]

²⁰ Ofsted (2022) *Research review series: computing*. [https://www.gov.uk/government/publications/research-review-series-computing/research-review-series-computing]

²¹ Bers, M., González-González, C., and Armas-Torres, M., (2019), ‘Coding as a playground: promoting positive learning experiences in childhood classrooms’ *Computers and Education* 138. pp.130-145.

activities that they had undertaken through 2Code in Purple Mash, 85% of children surveyed (n=5,837) said that they thought coding was either easy or very easy. A notable detail within this finding was that as children moved through key stage two (years 3-6), fewer children reported finding coding easy – suggesting that **the level of challenge provided to children was perceived by those children to increase with age.**

This finding was borne out by teachers who described how children responded to learning coding within computing lessons. As one computing specialist teacher reported,

“Where we [originally] used Purple Mash as an entry into computing, actually we now see it as developing and extending it.”

The Purple Mash approach to Coding is based upon a number of pedagogical principles specific to computing²². This has been explained by the education team as follows,

- 1) The PRIMM approach, which is incorporated into the Purple Mash lesson structures, helps children to read and predict what code will do when executed so that their own programming efforts can be well structured and purposeful.
- 2) Many units of the Purple Mash Computing Scheme of Work relate to logical thought development and logical processing of information not just through coding units; where logical structuring and design is explicit in algorithm and program design, but throughout the units within the scheme.
- 3) Algorithms are explicitly taught from year 1, where the concept is introduced in the Lego Builders unit and further developed through coding. Children are introduced to a variety of tools to use to help them think algorithmically and use this to plan their coding work from simple labelled pictures at the earliest stages to flowcharts using 2Chart in key stage 2. Children's algorithmic thinking ability will become more sophisticated in line with their programming knowledge and ability to use the full design process cycle to meet the requirements of a coding task.
- 4) Abstraction is introduced, especially in coding, from the very start and explicitly referred to as the term 'abstraction' from year 5. However, children will have been using abstraction from year 1 and therefore introducing the vocabulary once they have concrete experience of doing this, fits with, and develops, their computational thinking vocabulary without making the concept appear more complex than it is.

The role of 2Code activities within Purple Mash **and the support structures in place for teachers to stretch children's coding skills were a notable theme through the data analysis** of interviews with teachers, computing specialists and school leaders. Furthermore, many spoke about the ways in which children's **coding skills learned through 2Code were then transferrable across other contexts.**

This appeared to be embedded in the design intentions of the Purple Mash Computing Scheme of Work, where teaching support offered by 2Simple,

“develops children's learning from simple algorithms and block-based programming, all the way to text-based coding - introducing, reinforcing and utilising accepted practices of computer science coding structures thereby teaching the optimum way

²² 2Simple (2022) Purple Mash and Ofsted's High Quality Computing Curriculum <https://www.2simple.com/blog/search/ofsted/>

to code and developing good habits for future coding rather than simply putting code blocks together until the code runs.”

This approach – progressing block-based approaches to text-based coding is significant because in their 2022 research review, Ofsted reported that,

“it is common for block-based languages such as Scratch to be used in primary schools... block-based programming languages can be useful in teaching programming, as they reduce the need to memorise syntax and are easier to use. However, these languages can encourage pupils to develop certain programming habits that are not always helpful. For example, small-scale research from 2011²³ highlighted 2 habits that ‘are at odds with the accepted practice of computer science’. The first is that these languages encourage a bottom-up approach to programming, which focuses on the blocks of the language and not wider algorithm design. The second is that they may lead to a fine-grained approach to programming that does not use accepted programming constructs; for example, pupils avoiding ‘the use of the most important structures: conditional execution and bounded loops’. This is problematic for pupils in the early stages of learning to program, as they may carry these habits across to other programming languages.”

Research by Grover and Basu (2017)²⁴ further highlighted that,

“although block-based languages may help novices to overcome the difficulties with syntax that they can face when learning to program, they do not necessarily help pupils with the semantic and conceptual difficulties.”

Ofsted’s recommendation has therefore been that,

“if schools use block-based languages, they consider how to design the curriculum to mitigate these potential pitfalls.”

The design of the Purple Mash Computing Scheme of Work has been to take children’s learning from simple algorithms and block-based programming, all the way to text-based coding. This approach was exemplified by the Computing Lead of a Multi-Academy Trust as follows,

“We use Purple Mash because the planning is there, the tools are there and it's simple enough to follow so the children can all access the learning.
We use discrete lessons to teach our coding. For example, they've had four lessons on coding where they've gone through a lot of the functions or objects, buttons, actions, all of those things. We'll do an input on some of the vocabulary and then the children will then have a go at practicing that themselves. Then we introduce the idea of coding using the PowerPoints where they talk about coding for a goal, so we talk initially about [how] you're trying to give instructions for something to happen. Then

²³ Meerbaum-Salant, O., Armoni, M., and Ben-Ari, M., ‘Habits of programming in Scratch’, ITiCSE ‘11: Proceedings of the 16th Annual Joint Conference on Innovation and Technology in Computer Science Education, 2011. pp.171-172

²⁴ Grover, S., and Basu, S., (2017), ‘Measuring student learning in introductory block-based programming: examining misconceptions of loops, variables, and Boolean logic’, in ‘Proceedings of the 2017 ACM SIGCSE Technical Symposium on Computer Science Education’.

we go and do that to achieve that goal and they are starting to learn and understand that you have to give those correct instructions otherwise it's not going to work. They learn that really early on from when they're in year one using the Bee[bot]s and **they learn that if they want their Bee[bot]s to go from one place to another they have to program that accurately because it will only do what it has been asked to do.** We model to the children physically, a set of instructions of going from one side of the room to the other and a child has to kind of navigate that other child through in a set number of instructions. So they can't suddenly just add in another one. And we kind of talk a little bit about that so they have that physical coding first... We use the BeeBots [offline] and then because the way that Purple Mash is set up looks very similar, they can quickly transfer that understanding onto the screen. Then that transfers into doing that electronically. For example, [in 2Go] with the flowers and the bees that you would have seen on the screen in the classroom [observation] today. **The good thing about the Purple Mash layout is that there is the ability to have an easier version to begin with.** So, in the example where they have to move the bee to the flower, you can have very simple just arrow instructions or you can then level that up to having several block based instructions together. Then they can have the next level so **it can build on and on.** Or, **if I need to simplify it for a child, we can and then we can make it more complex.** For example, in 2Code, the Chimp progresses up to the free coding in Gorilla so it gives them what they need but not too many things. We can slowly start to increase that difficulty. **That means that they're very good at explaining what they were doing and why they were doing it and how they were doing it.** Another positive about Purple Mash is there is quite a lot of creativity, but it's quite simple. So for example, children can code in a sound effect or a timer and be really creative and they just love that and they then very quickly understand the concept of this computer will do exactly what they've asked. And it's **really good for our more able children** to have those extra tools that they can dip into... **particularly within year 6 [when] they've been able to experiment** with more advanced features so that's been really positive. If I asked them now to go and program a different activity using the tools that they've already been taught, I'd be confident that they could go and do that. **They could then go and apply that knowledge to recreate it in a different environment** because of the way they could innovate and change that code. They were **really quick to secure those skills.** It's important to get those basic bits done so they understand how the blocks work, how they can join actions together, how they can learn, how to remove instructions or have instructions underneath each other. Once that basic understanding is secure, then we can build on and on." Josh Rigby, The Inspire Learning Partnership

"We were looking at 2Code and we start to talk about how **we go from graphical modelling** as the first steps where you're basically pressing the button or you've got like a graphical representation of what something does going into that hybrid model of what's predominantly block based code and then **that transitioned into full text coding.** People are often very unaware of that; they just purely use like the block based editor. But actually, you've got that really nice transition where you can go **from block based to text based and actually you are really preparing kids very well for that transition into key stage three.**" Martin Bailey, Lanchester Endowed Primary School.

The ease in transferability of skills between 2Code in Purple Mash and other future contexts was highlighted by a number of computing leaders as they considered children's readiness for accessing secondary computing curriculum.

"We did use Scratch before but obviously 2Code is very similar in terms of layout and functionality, so the transition from Scratch to 2Code instead was relatively seamless." Oliver Booth, Computing Lead, The Harmony Trust

"In year 6 at first, they're like, oh, we should be using Scratch because we're year six. Then I start showing them something on 2Code and we do more with the turtle and being able to use repeat and doing Logo and things like that. And so they realized that actually, even though they've been using it since year one, it gets trickier and it gets harder and it continues to push them." Stephanie Barber, Computing Lead, Snaresbrook Preparatory School

*"Over 2 years on the computing curriculum, we've seen that key stage two **coding is actually challenging children much more on Purple Mash than in Scratch Junior.**"* Computing Lead

*"For coding - we were using Scratch too heavily here and so branching out and using different types of coding has been fabulous for them. They've been able to explore more opportunities because they've got that foundation to begin with. For a lot of our coding units, the first thing everyone said was will you use Scratch? and it's like, yeah, but what are you going to get out of it that they haven't already got out of it and **how are you going to push that forward?** So we found that it would be **better for the children to learn the basics rather than pushing them on too far** within Scratch and then not understanding what they're doing - you are basically saying you're going to follow this code and write it but that's pointless. So **they absolutely love the games in the 2DIY3D in Purple Mash**, they love being able to create their own games and things like that. So that element of it has given them a better link to **see why coding is important** because actually they need to understand where that code's going, so **some of them say I want to be a game coder now.** Well, how do you do that? Some of them didn't have any idea of all of the coding that's behind that. And I said you need to **start thinking about how the scripts are built** and just doing random things within scratch wasn't necessarily giving them that. **They need to understand the purpose of why that coding is there**, not just a set of instructions that we're going to make you do today because that's what you've got to do. What's the purpose of it and where is it going? Then they can start thinking towards their future and not just saying I want to be a gamer or I want to create games but actually trying to do that.*

*The **more languages you have, the better you are really**, so we felt that they needed to experience different devices, different sites, different programs and different apps. And they've got different home experiences as well. So you know, it's hard if you stick to one thing and then they come in and go well because it puts them at a disadvantage straight away. You don't want them to be on the back foot from the start because it's not good for them."* Nicola Folwell, Deputy Headteacher, Glebelands Primary Academy

Of the schools who use Purple Mash to provide the Computing curriculum, **98%** reported that Purple Mash is either **as easy, or easier to use**, than other suites of tools. Furthermore, **77%** said that Purple Mash gives children directly **transferable skills to be able to use other suites of tools**.

When this finding was probed further through interviews and focus groups, many teachers spoke about the clear individualised support that Purple Mash can offer to children across a wide range of prior attainment.

*“For learners where they may need that more scaffolded, here's the short video, here's the task, here's the very closed procedure that you do that moves your understanding forward in this increment. We have a differentiated provision where the teacher puts children down these different tracks. If **part of our goal is for getting children to a greater depth, understanding where they have mastery of the subject and therefore can apply what they know in a new context**, then we might be using, say, a **Purple Mash coding activity to get that conceptual understanding and embed it**, and then a parallel coding task so that they try it out in a new context that looks different.”* Anthony Lees, The Cornerstone Academy Trust

*“I teach literally from nursery all the way to year six. **Sometimes computing can be just this little thing on its own if you just ran it in isolation** and I don't feel that gives it its true value because the skills I'm teaching the children are generic. For instance, last term before Easter, year five were doing databases, which is one of the units in the year five [Purple Scheme of Work Curriculum] and the children were also learning about the Alpine region. So that's a very geography based topic. So I said right, we shall make our databases on various mountains within the Alps. So the first couple of lessons, that's what we did. I got the children to find the Matterhorn, Mont Blanc, etc. We discuss what's important information and then we use the Purple Mash tools to build the database, import the pictures of the mountain, etcetera. **Because it then relates to what they're doing with the actual class teacher.***

*I know most of the units because I've done them before, so I've got that experience, I know what worked last year and the year before, so it probably worked this year. We can **adapt it easily for different children**. I set the **2Do for the large majority of the class** where the database will basically be blank will be nothing in it, whereas the lower ability children will need that scaffolding. I direct children to the 2Do and hit the preview button which opens up a new version of it which we use as my model. **I'll save that and then I'll assign that as the 2Do for the lower ability children**. I don't actually tell anybody I'm doing this because I don't want them to be aware that they're not doing the same thing, but **it's like me taking my work off the board and physically putting it in front of them and saying you carry on**. I find that's the best way to get that differentiation. For the more confident children, I just got those children to just create a more in depth database.”* Steve Hewlett, Computing Specialist, Ashbury Meadow Primary School

Reinforcing this point, children in focus groups and observations spoke of the structured way in which Purple Mash helped them to learn coding. For example, Aretha in Year 4 explained that,

*“If we're trying to do some coding, there's normally a button and it show you like check somewhere or in the video to you telling you what to do. The teachers don't need to be running around trying to help everyone and **I really enjoy being independent in my learning and being able to move myself forward.**”*

Isaac in Year 5 added to this that,

*“What's really good with Purple Mash is that when it's too hard, it usually has instructions where it just says what to do. So you can just listen to the instructions again. I think the videos are really helpful **and I really like how basically if you have people and they can't read the instructions** and then if you press the speaker, it lets you hear it and so **they're setting it up to work for everybody... you feel like you can learn by doing your own thing as well, so you feel more included in the learning.**”*

With Kourosh in Year 6 then adding that,

*“Actually, what helped me a lot was that **there was a help button** and I'd always, if I needed help, I'd press on that and **it will give you like a really clear understanding of what's happening.** Like they give you like a base and then you just build it, build on with it, with your own ideas. There's like loads of tools and menus which you can look at to see and then help you, and also **instruction in like writing, which I find really helpful if I forget something from the video.**”*

Cognitive Load

Recent research has highlighted the importance of addressing cognitive load within learning experiences across the curriculum. Many have argued that this is particularly important for computing given the complexity of subject knowledge²⁵.

The scaffolded approach that the Purple Mash Computing Scheme of Work provides in achieving this was widely appreciated by all the teachers and leaders interviewed and observed. This is perhaps unsurprising given that, as reported by Robins et al., (2019), computing lessons can place great demands on pupils' working memory²⁶. It is therefore important that teachers are supported in managing the demand placed upon children when learning about aspects of computing, and that **planned activities are appropriately targeted to respond to children's prior knowledge and attainment** (discussed further under 'Assessment').

The Purple Mash education team reported that most of the tools used within the Purple Mash Computing Scheme of Work were **specifically designed to provide an appropriate cognitive load for primary aged learners.** Furthermore, that children are guided to use increasingly complex tools as they progress through the scheme or use the same tool in more complex ways. In this way, they do not have to repeatedly learn the procedural knowledge for simple functions but can focus on new procedural knowledge linked strongly to the declarative knowledge of the unit. The aim is to equip children with concrete skills and understanding of both aspects of knowledge so that they can easily apply them to future technological tools they will encounter.

²⁵ Robins, A., Margulieux, L., and Morrison, B., (2019) 'Cognitive sciences for computing education', in 'The Cambridge handbook of computing education research', Cambridge University Press. pp.231-275

²⁶ Ibid

The importance of familiarity as part of learning design has been widely documented and forms a core part of balancing cognitive load for children. This was a key feature in teacher feedback when asked to talk about **the role of Purple Mash in supporting children's progress** and attainment in computing. For example,

"it's something that they're familiar with, so they're more willing to do it. And if they're starting from that position of being willing, then that's going to show in what they're achieving, so I think there is a clear link." Nicola Folwell, Deputy Headteacher, Glebelands Primary Academy

One of the common themes across narrative analysis²⁷ from teachers and children was that the user-friendly interface and consistency across Purple Mash applications created a confidence and familiarity that had a direct on managing cognitive load.

*"Kids like consistency. **We like to go into something knowing what to do.** So even if it is a completely new bit of Purple Mash, even if we're using whatever it may be for the first time. If you've used 2Paint then actually 2Animate is very comfortable to you whether you are on an iPad or a laptop or whatever. **It's a safe space in the Purple Mash ecosystem** so it makes the children and the teachers feel more comfortable, more confident to then develop say, mathematical skills, because they are not thinking about How do I log on? How do I access the work? How do I save it? How do I do all that? **It's about familiarity.** You know, **it's about only developing a few new skills with all the different applications and tools, rather than having to learn something brand new each time.**"* Martin Bailey, Lanchester Endowed Primary School

From a pedagogical perspective, managing that cognitive load – the demands being placed on children at any given moment in their learning – is important, and certainly a more **efficient pedagogical approach to learning**²⁸. Other related themes which emerged from the narrative analysis included **the structure within Purple Mash which minimised operational cognitive demands**. For example,

*"It's the equivalent of being organised for your lessons rather than getting the kids right, you give those books out, you give out the worksheets. **It's the online equivalent of you've already got the books in the middle of the table.** Come in, start the lesson and the worksheets are already stuck in the books. They are starting their work, and **they know exactly what to do and where to begin.** It means that there is **no wasted time.** That's important because that's where you get like lower level behaviour issues come in – where the kids haven't found what they are meant to be doing, and as a teacher you can't get around to all 30 kids so before you know it, this kid's pushing that one and that one is poking that one in the back. So, that consistency, **that reliable interface is a game changer.** It makes **Purple Mash stand out above and beyond any of the other apps, any other platforms** – because **it's reliable, and it's predictable.** It keeps the **kids focused on learning** what they are there to learn." Martin Bailey, Lanchester Endowed Primary School*

²⁷ Parcell, E., and Baker, B., (2017) *Narrative Analysis* [<https://methods.sagepub.com/reference/the-sage-encyclopedia-of-communication-research-methods/i9374.xml>]

²⁸ Shibli, D., and West, R., (2018) Cognitive Load Theory and its application in the classroom. *Impact: The Science of Learning* (2) [https://my.chartered.college/impact_article/cognitive-load-theory-and-its-application-in-the-classroom/]

*“I think the speed of access within Purple Mash is important - because as you set the task[as a] 2Do, it's there. **They click on the 2Do and they're in the right place.** So we're **not wasting half the lesson** for them trying to find the right software or trying to find the right website. Instead, **you can get on with the lesson very, very quickly.**”*

Clare Dibble, Year 6 Teacher / Computing Lead, Oakdale Junior School

Within Purple Mash, cognitive load is balanced in two key ways. The first relates to the overarching design of the platform itself – the features, functionality, consistency and navigation. The second relates to the scaffolded approach that has been embedded into the pedagogical design of tools, activities, resources and the schemes of work. For example,

*“It's got things like the hints and the ‘how to’ videos that **gives them that safety net.** I try to **encourage them to be independent learners.** I try to encourage them to use the hints and I say, to me, it's OK if you don't get 5 monkey stars like... **If you've used the hint you've actually learned to do something yourself,** and I find girls find that really good. They use it. I've got girls who have been really, really quiet and they wouldn't ever put their hand up for help in class and they've gone through and you can see they've used all the hints, but then they've achieved it in seven minutes because **they've gone in and they've looked at how to do it and then they've learned how to do it.** That sort of safety net and safe space to have a go. And because they're familiar with it and **they've used Purple Mash for a long time, they know that they're going to be ok...** And that really helps... because they're a little bit **more willing to have a go.**”* Stephanie Barber, Computing Lead, Snaresbrook Preparatory School

*“Many of our children are working lower than age related expectations [on entry to the school], we also have a high proportion of international new arrivals which means it can take longer for our children to acquire the vocabulary we need... What happens is **you might take a unit of coding, but we'd spread it over double the amount of time.** We can give them quite a lot of feedback and a real sort of assessment of where the children are at... **wonderfully responsive...**”* Helen Worrall, Trust Computing Leader, The Harmony Trust

Assessment

Research concerned with the assessment of children’s learning in computing consistently highlights the importance of precision. For example, Ofsted (2022)²⁹ highlight that high-quality computing education uses formative assessment to focus on specific knowledge and skills and warn against assessment of generic competencies. Furthermore, that teachers should be careful not to make assumptions about children’s prior knowledge – particularly within digital literacy – and that formative assessment should be used to identify baseline understanding and misconceptions early in any unit of work.

²⁹ Ofsted (2022) Research Review Series: Computing [<https://www.gov.uk/government/publications/research-review-series-computing/research-review-series-computing>]

The Purple Mash education team reported that Purple Mash provides a number of different resources to support teachers in making assessments that fit in with their whole school model. For example,

- Each unit has examples of emerging, expected and exceeding statements that describe what a child's work would demonstrate in their learning for that unit.
- Assessment is integrated into the Purple Mash system via setting 2Dos with curriculum area tags so that teachers can then mark the work and assess each piece - building a deeper picture of children's outcomes and progress over time.
- Provision of 'I can' statements for children in a range of formats to suit school preference; (e.g. use of Purple Mash Data tab, Excel assessment format, paper-based).
- Each unit having a concept map and quiz which can be used for formative and summative assessment.
- Formative assessment being embedded into lessons plans to help children and teachers check children's prior knowledge and understanding.

In Phase 2 of this research study, teachers and leaders were asked about their approach to assessment. This data surfaced trends about (a) monitoring and reporting, and (b) formative and summative assessment. These trends were then probed through qualitative interview and observation analysis.

In terms of tracking summative assessments, **69% of schools used features within Purple Mash itself to track and monitor summative assessment in computing.**

- 38% of respondents reported that they use the Purple Mash Computing Scheme of Work Assessment tool.
- 31% used the learning objectives and judgements within Purple Mash to keep assessment records.
- 25% reported that they tracked attainment and progress outside of Purple Mash (usually using a local authority or multi-academy trust provided spreadsheet).
- 6% did not actively capture summative assessment data for computing.

Many teachers spoke about the **range of features within Purple Mash that integrate together to support teacher assessment, report writing, and leadership monitoring.** For example, 15% of those surveyed (n=1,201) used the 'I can' statements in Purple Mash as a way of children ascertaining their own progress. One such school was Snaresbrook Primary School,

*"I use the folder systems to try and store specific types of work, but also the new statements. **The 'I can' statements and progression documents that 2Simple provide are really helpful for monitoring. And the dashboard for computing as well - it's really good for somebody who likes numbers and data. The data dashboard – it's the fact that when you set a 2Do you can then go to it and select the [Learning] objectives. That's really helpful in that I can then go to those objectives and look for the pieces of work that match those objectives. It'll give you the red, orange and green. So when I look at a class, I can go to a specific objective and remind myself how well they did with it if I can't remember the piece of work that I had done with them. Then also if you click on a specific child, you can see their pieces of work so when it comes to report writing, I can see the comments that I made on those***

*pieces of work. So it's just seamless. I've used other assessment systems [for whole school assessment] where you have the red, orange and green but then you have to upload pieces of work. The fact that **in Purple Mash it is all integrated**, and with my bigger classes, that's really, really handy. I will go to their data dashboards and have a look at what I gave them and the comments that I made on those assessment pieces of work.... And then it said **these are the units in Purple Mash which are relevant to that objective**, which is really helpful especially for people who aren't specialists teaching computing, even for me, sometimes I get one of the objectives and I'm just thinking, OK, which of my tasks are the ones that actually satisfy that objective. So that's handy. Then next to that is **the 'I can' statements that break that objective down**. Just having that at your fingertips every week in class, or particularly with the pupils, **it's just brilliant for report writing** because it breaks it down and **gives us language that we can use.**" Stephanie Barber, Computing Lead, Snarebrook Preparatory School*

*"Although the expectation is to deep mark at least one piece of work per half term for each foundation subject, it is more challenging to do this with computing. Purple Mash gives the ideal means to do this **as teachers can check every child's work each week when the 2Do is handed in** – reviewing whether or not the child has achieved their learning objective from that lesson, and then the **teacher can comment** on it. Then **children have the opportunity to correct/edit their work** at the next session or at home. We have a progression document that is based on the Purple Mash progression, but in a format that follows the school policy school format. We take a lot of the [Purple Mash] 'I can' statements and the learning objectives and then teachers are using it in order to **help them assess children and mark the children's work. We can share what children have done on the [Purple Mash] display board and we can talk about it** - What can we do? What can we do better? How can we help so and so?" Clare Dibble, Year 6 Teacher / Computing Lead, Oakdale Junior School*

A number of subject leaders spoke about different approaches to monitoring computing, capturing evidence, moderating and storing work exemplars. **53% of those surveyed about monitoring computing used features within Purple Mash to support or carry out their monitoring.** One of whom, Anthony Lees at The Cornerstone Academy Trust, had extensive experience of working with many other schools as a result of TCAT being one of the EdTech Demonstrator Hubs as well as an English Hub. As he explained,

*"When we're talking to computing leads about monitoring... **Don't reinvent the wheel.** For a lot of those schools, Purple Mash is what they're using for everything else so use that. Get teachers and pupils to do what they're already in good practice of doing because there's no friction to you, you're not asking them to reinvent the wheel just for your subject. Do what they normally do... **The document management in Purple Mash and the class display board tool - get teachers to use that for evidence of final work outcomes and for celebrations.** But also on the subject leadership front, if you're looking at the **progression of programming across key stage two, make a class display board and get your teachers to each add an example of their different ability groups across there** because then you don't have*

to go hunting for it and **they're not giving it to you in a way that they're not used to collecting work all the time.**"

These findings showed the **important role that Purple Mash features were playing in supporting the capturing, monitoring and reporting of summative assessment data for children's learning in computing.**

The other narrative analysis trend in relation to assessment in this study centred around formative assessment.

*"The feedback engagement on there as well is really good where **you can comment to the children, they can comment back.** That **formative assessment** in that you can see exactly where they've gone wrong and you can review what they've done - **you can see their progress as well and reset tasks**, which is great. And if they've just rushed through, you can completely tell immediately and with that feedback that teachers can give - there's **an option to do verbal feedback** on there and they have the PDF editor **so they can actually write directly on those sheets** and that's really helped. That was kind of a barrier that we had where they almost had to print them or write them somewhere else and then upload them somewhere else. And now we've got that PDF editor, **they can do that straightaway**, which has been great. I'd say that **opportunity for feedback and assessment is really strong** and you can easily and quickly see that and the fact that you've got that in like a whole class format as well. So **you can pick up on misconceptions** within your class. That's really great." Naomi Wonders, Assistant Director of Studies, One School Global*

One of the assessment features that both teachers and children spoke about enthusiastically was the way in which **Purple Mash has been designed to encourage student metacognition.** These features draw upon research about **the vital role that metacognition plays in raising standards for all children.** The Education Endowment Foundation (EEF) reported that **children being taught metacognitive strategies can increase progress in learning by up to 8 months**³⁰.

Both adults and children spoke about how Purple Mash encouraged children to provide self-assessment and feedback about their learning to their teacher when completing or handing in work.

*"Purple Mash has that facility for the children to hand in their work. **They can annotate that to let you know how they feel that they've done** and then we can have a look through." Natalie Loat, Sherborne House School*

*"**I do like the feedback.** They get into conversation with their teacher.... You know, you'd write a comment or they'd write a comment when they submitted it. So **having that dialogue.**" Helen Worrall, Trust Computing Leader, The Harmony Trust*

*"When you do it you would send it through to your teacher, and then they'll give you feedback on it, like, **how to do it better next time, by typing something in or by***

³⁰ Education Endowment Foundation (2021) Metacognition and self-regulated learning. [https://educationendowmentfoundation.org.uk/education-evidence/guidance-reports/metacognition]

saying something or recording it, or **by doing a picture** they tell you that feedback. So you know what we're doing next time.” Evan, Year 5, Birchwood Primary School

*“It's been really useful. The **children compare their work against examples** and it's like, well, I've achieved that because mine looks the same. Or, when I put this data in, this happens and that's what happened on the screen. From a teacher assessment perspective, the **feedback features** the stars or the smiley faces, or the game review or the rating system **are incredibly valuable**. We mark their work once they've handed it in but equally as we're teaching, **we will go round talking to children**. So what are you doing? What [have] you found out? What did you do next? Then when we view their work, **well this is what we should be seeing**, but this child has done it in more depth or this child has been a bit slower.”* Mark Blissett, Key Stage Two teacher, Sherborne House School

*“The way Purple Mash stores work is really helpful because **I can go back and find specific pieces and then good examples of work**, so even at the beginning of a lesson, I can say to children this is what I want it to look like.”* Stephanie Barber, Computing Lead, Snaresbrook Preparatory School

Research about assessment in computing often focuses on assessing programming knowledge and computational thinking³¹, but it is important to recognise that high quality formative assessment is vital in ensuring that future learning is pitched appropriately for each individual child.

*“I think it's very well set up. We'd have a look through their files afterwards and see who been able to do what. I think what is good is... You **think I'm going to have to do something different here [with this child]**. So the ability to do that and then the continuity of building up from that is good”.* Helen Worrall, Teacher and Computing Lead, Northmoor Academy

*“If we've used it to do **things like pre-assessment, we might set them a quiz** and it will then send you through the score and you can look back and see how they get on with it before you move them on”.* Natalie Loat, Sherborne House School

In addition, many teachers and children spoke about the role of self and peer assessment in their learning and how features and design of Purple Mash encourages this. For example, as Kourosh (year 5) explained,

*“We just had different year groups coming up to play our games. So that's really fun. We had **posters and reviews printed for our games** and **other people have come as test users** to help us with that review.”*

With Evi (year 6) also explaining that,

*“We really enjoyed using Display boards, so seeing our work there – we've just finished the games unit before half term and **we went there to evaluate and play each other's games** through them. **We use that and see each other's work and go around to give each other helpful feedback.**”*

³¹ Kallia, M., (2017) 'Assessment in computer science courses: a literature review'. The Royal Society.

In some cases, **children spoke about the opportunities for peer assessment extending to beyond classroom activities** – and the role that **Purple Mash is playing in encouraging peer collaboration in independent learning time** (e.g. home / free time). For example,

*“I loved it when we made our own games using 2DIY3D. We still make them for each other to do **just for fun** and it’s a lot of fun to try what our friends made and then **give them ideas on how to improve their games.**”* Year 6 child, Sherborne House School

Many schools opt to use the ‘2Do’ feature where a teacher is able to assign specific group or individualised tasks to children. Children then click on these assigned tasks and complete them before they ‘hand in’ their work for assessment.

Since the 2Do feature was launched in 2019, there have been approximately **7 million activities assigned**, drawing on **150,005 different tasks**. On average, **schools set 410 Purple Mash 2Do’s each year** (range 16<11,796), with an average teacher setting **1-2 unique 2Do’s per class per week**.

As Steve Hewlett, Ashbury Meadow Primary School explained,

*“For us, **everything goes through the 2Dos**. It’s the easiest way to set the work. They’re off... **all the children, no matter whether in year one or year six**. That’s where it’s going to be. That part of the Purple Mash is actually one of its strengths. It’s an easy way of setting the work in front of the children... I like the marking ability where I can just go into the folder and **actually it’ll generate a report which will tell me who has not yet saved or handed in** so I can get a quick overview very quick. I don’t have to scroll through and find they haven’t saved because it will just tell me. And once they’ve done that, and it’s all handed in, you just click on the one at the top, you hit mark, you look at it, you review it, you leave your comments, you hit next and just move on to the next one. It’s a **real simple workflow**, which is a good thing. The objectives you know you tag at the beginning before you create the 2Do, and then obviously **you put your working towards, expected, emerging, whichever terminology you want**. And it does generate on the data tab, I can use that to give me my average score. So that in the way of recording and keeping hold of the data is good. And then **that’s my evidence.**”*

*“I like the way I can set up tasks and send them to the children on the 2Do button. I can then check the children’s work off-site and **feedback to the children** on finished work. The children complete the task and then **normally choose to stay on Purple Mash**, quite often using either the art programs or learning games.”* Helen George, Mark First School

*“**We use the marking facility [in Purple Mash]** and generally for the lessons we do a Red Star if they have not achieved the objective, yellow if they have partly achieved the objective, and green if they have met the objective. We use that in each lesson. It is helpful to open a child’s portfolio and see the coloured star because that can **help reinforce teachers’ judgement**. You can give **voice feedback** to the children which can be **very effective in taking their learning forward** and allowing them to see their next steps. Even if the teachers just leave a star of a colour without having to write a*

text comment or leave a voice note, you know where that child was in the lesson or whatever they have achieved. You don't necessarily need to write anything more if you're writing reports at the end of the year and you think, oh, how did they do for that lesson, you can just pull it up and just run down the stars and have a quick look. I think it's really helpful.

In key stage one, we just use formative assessment, we don't do any kind of formal summative assessments so it's just nice to have that as it informs the next stages. You can also see at a glance which pupils need support and then you can start to add the voice notes and things in support in that way.” Jen McCulloch, Computing Teacher, New Brighton Primary School

There were some striking correlations between those who use the Purple Mash Computing Scheme of Work and forms of assessment. Of those surveyed, 93% of schools using Purple Mash use the Computing curriculum within it. Of those schools, 59% were using the Purple Mash Computing Scheme of Work as their complete computing solution (with 41% supplementing, e.g. use of physical robots). **Of the schools using PM as their entire computing solution, 91% had embedded assessment within every lesson.** This was in comparison to 48% for schools using a combination of Purple Mash and other computing solutions. This suggests that **those choosing to use the full Purple Mash Computing Scheme of Work were embedding more formative assessment within their computing lessons than those who were using a range of computing curriculum solutions.**

This finding was probed further through analysis of additional datasets from surveys and interviews. Data revealed that **where schools were using a combination of solutions for their computing curriculum, assessment was (a) less frequent, and (b) more likely to be summative rather than formative.** For example, 29% of schools undertook assessment at the end of each unit of work, 15% at the end of each school year and 8% were not assessing computing at all. These figures were compared with data about how schools were tracking and reporting on computing outcomes in order to triangulate the findings. This analysis showed that where schools were not using the Purple Mash Computing Scheme of Work as their full computing solution, 67% were tracking computing on a school, trust or local authority document, with a further 23% using specialist software (e.g. MIS) provided by a similar body. This suggested that many schools were utilising a curriculum and monitoring solution provided by a localised body (e.g. a MAT or LA) – findings which interview and school visit data showed to be partly the case. However, these schools also reported less formative assessment within the teaching and learning of computing.

Conversely, of the schools using Purple Mash as their complete computing solution, survey analysis showed that **63% had embedded formative assessment routinely into computing teaching and learning.** Interview data showed that the utilisation of the Purple Mash Computing Scheme of Work had played a central role in this – with the scaffolded resources, planning materials and support resources equipping teachers to embed formative assessment in computing lessons.

These findings suggest that **using Purple Mash as a complete computing solution may be increasing the quantity and regularity of formative assessment - which is known to have a direct relationship with increasing student attainment** (e.g. Hattie, 2017³², EEF, 2021³³).

As explained by Nicola Folwell, Deputy Headteacher at Glebelands Primary Academy,
“In terms of assessment, it's giving us so much. It's there and you know it's all on the computer and it's not like you can't find it.”

*“We're a computing hub and an EdTech demonstrator school so I've been working with a tremendous number of schools on their EdTech offer and their computing offer, and I kind of have their perspective on this as well. When I run computing hub courses and we're talking about provision for computing they tell me that they do that very much through Purple Mash. **We like packages where a teacher can set a bespoke diet of content for that learner.** Not just generic key stage two or year one content but **tasks that the teacher has chosen for that specific learner.** Purple Mash fits into that very much. We've used the single sign on facility so that even from early years, once the kids are on their device, it just logs on in the browser. They can **focus straightaway on their learning.**”* Anthony Lees, The Cornerstone Academy Trust

Progression for Higher Prior Attaining Children

One of the many strengths cited by teachers and leaders using Purple Mash centred around the clear and logical structure of the Computing Scheme of Work, alongside the flexible way in which learning activities could be individualised for specific groups of children.

One of the lines of inquiry that this research probed was the extent to which this individualisation and greater depth stretch applied for the more and most able children and those with higher prior attainment. A very significant majority of participants reported that they felt the needs of these children were being met through Purple Mash provision, with 29% of teachers reporting that they felt that **children using Purple Mash were more likely to exceed National Curriculum Age Related Expectations** (n=379). For example,

- *“It is **well pitched** and allows opportunities to **develop more able pupils.** The **planning is suitable also for teachers of all levels** of computing ability.”
Samantha Jauncey, Our Lady Queen of Peace School*
- *“Purple Mash allows me to set **progressive challenges** for the classes every lesson.”* Samantha Shallcross, Head of Computing, Bromley High Junior School
- *“Purple Mash has really supported **children who have a keen interest in computing.**”* Kelly Nelson, Computing Lead, Hillside Primary School
- *“That's another good thing about it - **the more able were able to just go on to higher levels in 2Code,** so the ones that found it more difficult we could spend more time with them on the earlier levels and then the [more capable coders] of the class would just - up they go until they were doing much more complicated code coding.”* Clare Mathema, Computing Lead, Sherborne House School

³² Hattie, J., (2018) Hattie Ranking: 252 Influences And Effect Sizes Related To Student Achievement [https://visible-learning.org/hattie-ranking-influences-effect-sizes-learning-achievement/]

³³ Education Endowment Foundation (2021) Teacher feedback to improve pupil learning [https://educationendowmentfoundation.org.uk/education-evidence/guidance-reports/feedback]

- *“We love Purple Mash as a school. We have digital leaders that are **stretched with learning** on the monthly challenges which means they are **learning and having fun at the same time.**” Clair Harris, IT Lead, Castleview Primary School*

Children were also overwhelmingly positive about their experiences using 2Code. Survey data found 2Code to be one of the children’s favourite features on Purple Mash and focus group narratives expanded upon this.

*“There was a turtle and I customised what it was, and then you would say move left five times and then it would make a lines behind it and it could make some really cool designs with it. Oh yeah. I liked it. You didn't have to stay on the grid, and you could move around, make circles, stuff like that. **It allows you to be creative in what you're doing.** With the coding, you have different sections from easy to hard, and I'm pretty sure at the very bottom it's hard. So some people just go straight down to the bottom because they want to find the best looking game or coding design thing and then they have to scroll back up because it it's much easier the further you are at the top. **I like that it's different activities for different stages of confidence.**” Harry, Year 5, Donhead Preparatory School*

*“In 2Code it gives instructions at the start to tell you and **it helps you with what you can do** and if you like, accidentally press the next button then there's something you can go back and reread if you're stuck again.” Olly, Year 5, Donhead Preparatory School*

*“I enjoyed like doing the coding because you like you start to do the coding and then once you've like done all the steps you get to see what you've done and it's really cool to see like the figures like move and stuff and **you feel like you've done something really good**”. Dominic, Year 5, Donhead Preparatory School*

*“I really liked the minotaurs maze because it **gets you to understand about code** and how you move different objects and also **it gets you to really think on different possibilities** and things you could or have to do in like real if you're doing proper coding [in a job].” Isaac, Year 5, Donhead Preparatory School*

“It’s important for different jobs. If you wanna do coding, you can always do coding, but not only if you want to do one job. For example, sometimes coding can help with maths. If you want to do a really hard task”. Kourosh, Year 5, Donhead Preparatory School

Specific examples were given by a number of computing leaders during the school visits and interviews. For example, a key stage two teacher spoke about the way in which Purple Mash applications acted as a launchpad for highly specialist skill development.

*“We were using 2Design and Make in our lessons and **it really sparked the imagination of some of the more able children.** They had that **confidence from 2Design and Make about what is possible** and they wanted to take that further. They designed a model using 2Design and Make, then 3D printed it, then wanted to add specific features so refined and improved it. Then began to explore more specialist CAD software to develop specific detail. It was amazing. They ended up*

with these really detailed 3D printed models that stemmed from those 2Design and Make lessons.” Mark Blissett, Sherborne House School

This example was not an isolated one, with a number of children in focus groups talking about similar experiences. For example,

*“In computing, I made a 3D lorry from a template – the teacher showed us how to do some of it but **Purple Mash is easy to work out how to do extra bits yourself if you want to challenge yourself.**” Year 5 child*

Furthermore, the importance of this approach – where children are stretched, or stretch themselves, and then take on leadership of learning roles with other children – was specifically referenced in a recent inspection of the same school;

*“**Learners exhibit mastery**; in a year 4 ICT lesson, an ‘expert’ assisted others with use of the animation programme.” Inspection Report³⁴ 2021*

The way in which Purple Mash is adaptable for individual children and their next steps **creates a valued way of working** across schools. This adaptability has benefits for teacher’s planning, delivering, resourcing, assessing, providing feedback, monitoring and reporting. But it also surfaced some unexpected consequences. For example,

*“I had this boy in year 6 and he was very mathematically minded and he has benefited from using the same technologies as the children around him [but in a different way] because they’ve got something to talk about. **It was really good for his self-esteem and he really needed it.**” Nicola Folwell, Deputy Head, Glebelands Primary Academy*

The wide range of activities within Purple Mash were another regularly occurring theme across school visits and interview data. For example,

*“There’s more activities than you could possibly ever cover. **There’s always something extra that I can set them.** When we were doing variables in year five and six, I would have say, three tasks, one that we were going to work on together so they could get the idea too that they could work on their own. Then I would set an extra one if they had finished and push them on to the next stage or to something that was a bit more tricky. So I think **the amount of activities there are on the system is really good...** In something like year one, in 2Create a story, I can have a child who just draws a picture and dictates the sentence, to a child who’s then added the movement and added then the sound, and then a child who’s told a full story. You know, **there’s that progression** that it’s not a do one thing and then your activity is over - there’s always more that they can add because there are a lot of tools within one program. There’s just so much on there, there’s always something more you can give them. I know that it is safe and that’s **really good for the more able** because they come back and they teach everybody else. **Purple Mash allows us to have that independent learning.**” Stephanie Barber, Computing Lead, Snaresbrook Preparatory School*

³⁴ ISI Report (2021) Inspection Report: Sherborne House School

<https://www.sherbornehouse.co.uk/images/uploads/general/Sherborne-House-RCI-EQI-Report-FINAL-2021-07-07.pdf>

Appropriateness of Purple Mash for Upper Key Stage Two

Analysis of the Phase 2 Staff Survey in this research found that a small number of school-based Computing Leaders raised a concern about the appropriateness of Purple Mash for upper key stage two children. These comments referred to concerns about progression for more confident upper key stage two children, progression for children taught by non-specialist computing teachers, and transferability of skills for children moving from year 6 into secondary schools where programmes such as Microsoft Excel or Google Sheets are more commonly used.

This line of inquiry was pursued by interrogating survey datasets further, and by specifically raising these ideas with a wide range of school leaders and teachers – both specialist and non-specialist, as well as with key stage two children through focus groups and interviews.

Analysis of this data surfaced a number of notable findings.

Finding 1: Concerns raised about the appropriateness of Purple Mash for upper key stage two children were predominantly by those with specialist computing backgrounds. Initially, this appeared to support a hypothesis that their expert knowledge may be highlighting particular issues facing higher attaining and/or upper key stage two children. However, probing of this hypothesis through targeted interview questioning revealed that this was a more complex issue.

Where a school benefitted from a computing lead who had a specific specialist computing background (e.g. computing qualifications), scepticism about the appropriateness of Purple Mash for higher attaining upper key stage two children was greater. However, when probing attainment and progression outcomes across the whole school, the picture was more complex. This is because schools where that specialist teacher taught *all* of the computing curriculum (i.e. to all year groups) benefitted from a forensic knowledge of subject-specific pedagogy. For these children, that specialist computing teacher typically used Purple Mash as part of a blended approach to the curriculum – combining with other software and hardware. It was often the case that such specialists were particularly drawn to complimentary software or hardware or providers with whom they had a close relationship or personal interest (e.g. they had used particular programmes or devices in their personal or prior professional life, or they may be working closely with a particular supplier as part of a wider professional role or interest).

However, for schools where the computing lead did not have a specialist computing background, or for schools where the computing lead had a specialist background but **computing was taught by a range of teachers including non-specialists**, the picture was different. In these schools, those using Purple Mash as their entire computing curriculum solution, tended to report **greater consistency in progression and attainment across the school** through their interview responses.

This suggests that **where the computing curriculum is taught by non-specialist teachers, even when the computing lead has a specialist computing background – using Purple Mash**

strongly correlates with children's progress and attainment being more consistent across the school.

This finding aligned with the insights shared by those who had worked widely with schools as part of the DfE EdTech demonstrator programme. For example,

*"I love this move to Cloud first that we've all made. It is better; it is more reliable. It is more cost effective. And **it's a better deal for learners**. But some schools have misinterpreted, I think, how that should be put in place. It is better when you **go with providers like Purple Mash where you know you're getting this upgraded, constantly monitored, looked after protected service** rather than let's go and find all the freeware solutions because they're free, it's false economy. It doesn't do schools favours because in those models, subject leaders come to me and they're burnt out and ruined because they're trying to be the training provider for every teacher in the school or the organisation using this free system that actually probably will fall over. And then teachers won't plan to use it again. And it doesn't build the capacity of the organisation because you're not developing practitioners who have experience of use of the tool and will evangelise it in years to come. When I go to my teachers, I want them when I walk around and say, 'tell me about what you are doing with Purple Mash this year', **I want them to evangelise and say 'we use this every year or last year I found this and I'm definitely going to use it again because it's robust and stable and all of those things'**. And I tend not to see that in organisations where they've tried to invent the wheel from scratch using things that are all cobbled together from the internet. Focus on the right things and focus on the learners, not the false economy of using free applications or bits of all sorts." Anthony Lees, The Cornerstone Academy Trust (EdTech Demonstrator)*

Finding 2: Whilst some teachers reported that they felt the interface of Purple Mash was perceived as too young for upper key stage two children, **the children themselves did not share this view**. 99% of key stage two children (n=1,201) said that they liked or really liked using Purple Mash. Specifically, 99% of year 5 children and 96% of year 6 children. There was no significant difference between the opinions of boys or girls, even in upper key stage two.

*"Purple Mash is simply a great tool that can be **used across all ages**." Nicola Folwell, Deputy Headteacher, Glebelands Primary Academy*

Finding 3: Whilst some teachers reported that they felt that the activities within Purple Mash were not challenging enough for upper key stage two children, **data probing children's perceptions of their learning did not support this hypothesis**.

- a) Across all key stage two children, 97% (n=1,201) said that they found the activities within Purple Mash easy to complete. The data across each year group in key stage two was consistent, with one notable exception in that for year 6 children, this figure fell to 93%. This suggests that **year 6 children find the activities that they are being asked to undertake more challenging**.
- b) A further insight from this dataset was that the finding above (2a) appeared to be specifically the case for boys in upper key stage two – a group of children often associated with particularly strong skills in computing. 94% of boys in upper key

stage two reported that they found Purple Mash computing activities easy compared to 98% of girls in the same year groups.

- c) Finally, when key stage two children were asked specifically about coding, 85% of children said that they felt that learning coding was easy when learning through Purple Mash (83% in lower key stage two and 87% in upper key stage two). This was consistent for boys and girls in all year groups. However, there was a subtle but noticeable difference in Year 6, where the proportion of children finding learning coding easy fell by 6% (from a key stage two average of 33%, to 27%). This suggests that **the level of challenge in the year 6 computing curriculum specific to coding is recognised by these children.**

A number of these findings were probed further through narrative analysis³⁵ of interviews with school leaders. As one multi-academy trust senior leader summarised,

*“There can be **a real misconception that Purple Mash is an Early Years tool** because historically it looked very cute and cuddly, and I mean that in the nicest possible way. It looked very welcoming. It looked very primary school appropriate... The **user interface has changed many times** and now it looks pretty good to me because I think it's warm and friendly and welcoming and I think **it's fun as a pupil, but it's also business enough for a teacher**... Certainly the perception of some of our teachers years ago was that it was for key stage one and [they] missed out on some of the functionality.”* Anthony Lees, The Cornerstone Academy Trust

Finding 4: As widely surfaced by teachers and leaders (both specialist and non-specialist), one of the greatest benefits of Purple Mash is the breadth of applications, tools, content, resources and support within it. However, this was equally seen as an operational challenge with **most research participants saying that they recognised they were not aware of everything available to them through their subscription.** This was a specific issue in relation to the appropriateness of Purple Mash for higher attaining and upper key stage two children and can be summarised as follows,

*“There is a definitely a perception of Purple Mash being quite early years and **a misconception in relation to the importance that people place on Microsoft Word, PowerPoint, Excel.** So it's trying to show them that actually when you go into something like the Spreadsheet element of Purple Mash that yes, it can be as simple and support that year one or two child who can use it. But **actually if you unlock all the features, it can be just as advanced as what Excel or Numbers is.***

*“But people don't have that perception - **those are barriers that the teacher creates.** People say ‘oh but we need to teach kids how to use Word.’ But no, **we need to teach kids how to word process not how to use Microsoft Word specifically** - you know, **transfer the focus of the learning.***

*Recent updates to 2Publish - that general sort of digital literacy platform has had **quite a big refresh and it does look more professional and advanced maybe than what it what it previously did.***

*Things like within 2Code, it's showing people hang on actually **this is actually more advanced than you know.** One of the big things with the new Ofsted framework is*

³⁵ Parcell, E., and Baker, B., (2017) *Narrative Analysis* [<https://methods.sagepub.com/reference/the-sage-encyclopedia-of-communication-research-methods/i9374.xml>]

that you understand that journey all the way from early years and actually now we see beyond year six expectations.” Martin Bailey, Lanchester Endowed Primary School

*“I really like the new 2Publish - it was fantastic to be able to give them **the freedom to add their own text boxes and images and all the rest of it**, but also be able to lock those things down for when you want them to not be fiddling with all of that. It's got so much! I think **it's going to be better than using Google Docs** because I think Google Docs is trying to copy Microsoft Word but doesn't have a lot of the functionality that Microsoft Word has. I'm actually probably going to be using 2Publish more than I now use Google Docs because **it's upped its game** and it's got **much more functionality than other programs that are similar.**”* Stephanie Barber, Computing Lead, Snaresbrook Preparatory School

Finding 5: Purple Mash was seen by a significant majority of teachers and leaders as providing a **safe space to learn skills whilst simultaneously developing progression towards common workplace tools.**

*“**Purple Mash helps children scaffold towards, for want of a better expression, adult tools** - Google Sheets or Excel or whichever because it's set up like a mini version. For example, the spreadsheet, although it although it looks slightly different to Google Sheets it's the same, it's got the cells, **it's got the same tools**. So those tools, when they meet them higher up **those skills are transferable**. E-mail is the same - you're still typing, attaching a picture, sending. Those **skills are transferable with nice consistency.**”* Clare Mathema, Sherborne House School

*“A lot of our work is done through Chromebooks, we do still have our Windows laptops, which is also important to us because sometimes we don't just want them to have exposure to Google Chrome, we do want them to be able to use Microsoft and use Office because when they go to secondary school they'll have access to all those things as well. So we do try and give them a breadth of things and I think **Purple Mash is very good at a lovely kind of mixed economy of all sorts of different devices and experiences and approaches**, which is, you know, brilliant for the children.”* Josh Rigby, The Inspire Learning Partnership

Many schools talked about introducing upper key stage two children to Microsoft Teams or Google Workplace as part of their transition work – preparing children for secondary school systems.

“For [Microsoft] Teams what I've done is embedded a link for Purple Mash. So the children had direct access to it, and then the other way round, adding those meeting links into the [Purple Mash] blog so that it would just be a click here to join the meeting. They are able to adapt to different platforms, just like that really.

*“**They were able to adapt between the two, but because they've got really solid skills knowing how Purple Mash works**, it meant that they could just sort of push on with any Teams stuff. The assignments are very much like Purple Mash 2Dos, so we've been setting those and then they return those to the teacher and then obviously they can be marked. It's great being able to just flick through like a workbook and it's really, really good. It made it easier for us as teachers.*

*Purple Mash is great because it **strips it back to the essentials** and **helps the children to understand how the program works** and it gives them all those elements within it as well. Typing skills have been better because they've been practicing their typing and for their times tables checks in year four, they've been using the practice ones [in Purple Mash].” Nicola Folwell, Deputy Headteacher, Glebelands Primary Academy*

Developing children’s awareness of being set specific work, with teachers then able to mark and return that work, was a commonly cited example of where Purple Mash enables success for the very youngest children, building up skills as they move towards secondary school and workplace tools such as those provided by Microsoft and Google.

*“Using the 2Dos, where teachers can set what is effectively a [Teams] assignment - we do all of that right from early in the school. **Purple Mash does it really well.**” Anthony Lees, The Cornerstone Academy Trust*

*“[Teams is] not as instinctive and it's not as easy as Purple Mash. So we set homework on Purple Mash and the kids find it much easier, but it might be that you set a [Teams] assignment for something like reading comprehension. [Children need to] move seamlessly between different systems and different suites of tools and **Purple Mash is playing a role in giving children the entry level skills and building them up** so that they can actually do that.” Helen Worrall, Trust Computing Lead, Northmoor Academy*

*“You can now **attach any document, any type of file to a task and it stores it in in their Purple Mash folder, I think that's really key.** The fact that you can add a link... So your whole task could be set. You can have a video to watch and then a document [to] work on all in one area ... [it] gives it a much more sort of almost Google Classroom type feel. I think it's been really valuable.” Samantha Shallcross, Head of Computing, Bromley High Junior School*

Many teachers spoke about specific features of Purple Mash that introduced new skills in a safe space. The introduction of email was particularly popular;

*“The **e-mail is brilliant because it's so self-contained** and with e-safety in mind, they're not at any risk of any of that happening within Purple Mash. But they learn how to use it. They practice building up those skills. I find that **there's always something within Purple Mash that will mirror an application** that they would find online or... on any other form of computer. **Then they learn how to use it in that really sort of self-contained safe space**, which I think is really great for them, and it does mirror very well what those programs and applications can do.” Natalie Loat, Year 3 teacher, Sherborne House School*

Purple Mash has designed the email feature for children as a completely internal email system. This means that children cannot receive email from outside of Purple Mash, and teachers are provided with a range of settings for safeguarding purposes.

*“We do emailing in year two and it's that **safe environment to learn how to email.** Now that's been updated so **it looks more like an email system would in real life** and it's amazing. But you know that they're not going to be able to suddenly start*

emailing other people - as a teacher you can lock that down and have control over what they're doing - that is essential. It's really good". Stephanie Barber, Computing Lead, Snaresbrook Preparatory School

One of the features of the Purple Mash email provision is that it is embedded within highly engaging projects. For example, children can email Little Red Riding Hood or Pirates and receive an instant reply. During one of the school visits, a year 3 group were observed working through a simulation unit of work – the Dark Side of Elpmis. **Children in the class were absolutely captivated** by the plotline and at each stage of the simulation were keen to follow the actions which included writing to the spaceship rescue team by email. Upon receiving the instant email replies, **the children leapt out of their chairs with excitement** and were highly motivated to respond immediately. **Even the most reluctant writers were resolutely focused on typing their messages** back. Children were working collaboratively to answer questions from the simulated emails, and the nature of the tasks self-differentiated such that **the very wide range of needs in the class being observed were all appropriately attended to**. As the classroom teacher described;

*"It's really exciting seeing the flow of activities and to go around the children and guide them when they're so excited. **The design of these units is really clever, you know, really clever.** So, in the last couple of weeks what I quite liked about the different units, particularly in year 3, is that they tend to **begin by giving them a better, wider context for what they're doing.** So, there's quite a lot of links to real life scenarios. So last week they were thinking about times when a simulation might be really useful and times when perhaps it wouldn't be - so what are the kind of advantages and disadvantages and they consider different contexts for that. For example, they were talking about... perhaps doctors might use a simulation to practice what an operation might look like, or a pilot, and we looked at all those different things. **It was quite nice the way that it links in with their own experiences and they draw on real life** and then, , sort of consider along the way the pros and cons. Obviously with today [the lesson being observed] it was to move on to the **evaluation aspect** of that. So, for them to then have a go at creating their own simulation and why might they want to do that? Really helpful, and the range of different skills that they were using all in one lesson - the e-mail, the video playing, the reading, the moving things around drag and drop ... there's so many different things going on."* Natalie Loat, Year 3 teacher

This storytelling approach to learning about computing skills has been argued by researchers such as Curzon³⁶ as a highly effective way for children to learn when in conjunction with explicit explanation of new knowledge.

*"**For teaching e-mail it it's just perfect.** It is really, really popular because just the excitement of Barnaby bear or, you know, little Red Riding Hood replying. That they **e-mail someone and they get an immediate reply.** It's just fantastic and then the email asking them to do something else. **It's so engaging - that is the genius.** It just couldn't be better and it's **really quite comprehensive.**"* Clare Mathema, Computing Lead

³⁶ Curzon, P., McOwan, P., Donohue, J., Wright, S., and Marsh, M., (2018) 'Teaching of concepts', in 'Computer science education: perspectives on teaching and learning in school'.

These stories certainly captured the imagination of the children in many focus groups, including a group of Year 2 children at Broadclyst Primary School,

*“We go into Purple Mash and we had Little Red Riding Hood as a 2Do. So we were learning and **retelling a story in Purple Mash** about Little Red Riding Hood and we were writing and drawing the story. **I loved it.** We used some type of pens on the side and **we drew the pictures with it with them and we used our keyboards on our surfaces [tablets] to write our own version.** It’s just really easy to do things on **Purple Mash** and just click and use it. **I can use my brain to think about my learning rather than where to find stuff and what to click next.**”*

Of the schools who use Purple Mash, **77%** reported that Purple Mash gives children **transferrable skills to later use any other suites of tools**, and **61%** said that Purple Mash makes children **more confident in choosing and using different tools**. With this in mind, it is significant to note that **98%** felt that Purple Mash is either **as easy, or easier to use**, than other suites of tools. This suggests that **Purple Mash provides an accessible, easy to use starting point for skill development which successfully prepares children to be able to choose and use a wide range of other tools throughout their lives.**

*“Higher up the school, especially having their own folders and things, that **sets them up in their learning for when they go on to use Google or Microsoft Word** and those sort of folders. The way the Purple Mash programs are set up, it definitely does feed into that progression. For example, like the 2Graph we use a lot and then when they have to do it on something like Google, **they’re much more familiar with the ideas behind it** and it’s the same as using the processing tools and the emails [in Purple Mash], especially when they then get further up the school, they can then realise that **actually oh yeah, I remember doing this.**” Fleur Bennett, Computing Lead, Harold Wood Primary School*

In order for children to be ready to use tools more commonly found in adult and workplace environments, they need to develop a range of digital literacy skills. These skills are often demonstrated through an individual’s typing skills and ability to produce text, images, audio and designs using technology, as well as their use of grammar and composition within the artefact that they create. As The National Centre for Computing Education summarise in their definition of digital literacy, these are;

“the skills and knowledge required to be an effective, safe and discerning user of a range of computer systems”³⁷.

Notably, one of the key elements seen across responses from surveys, interviews, focus groups and observations in this research was the central role of Purple Mash in developing children’s digital literacy both discretely and across the curriculum. This was seen by teachers as important in addressing Muller and Goldenberg (2021)’s assertion that,

³⁷ Teach Computing (2021) Digital Literacy within the Computing Curriculum [[https://raspberrypi-education.s3-eu-west-1.amazonaws.com/NCCE+Reports/Digital+Literacy+Within+the+Comuting+Curriculum+\(Final\).pdf](https://raspberrypi-education.s3-eu-west-1.amazonaws.com/NCCE+Reports/Digital+Literacy+Within+the+Comuting+Curriculum+(Final).pdf)]

“despite often being regular users of technology, children may lack basic digital literacy skills.³⁸”

It is therefore of vital importance that digital literacy is planned, taught, assessed and monitored with this in mind. As Ofsted (2022) set out, specifically when considering online safety,³⁹

*“The curriculum [should] carefully **sequence knowledge related to e-safety** to ensure that subject content is appropriate for pupils at each stage of their education... It is not enough to set out in the school’s policy what pupils should know and remember. This should be **rooted in the design of the curriculum.**”*

As one computing lead summarised,

*“Online safety is a scary subject really. But **Purple Mash spins it in a more positive way** so it helps **build up their confidence** with using devices and technologies.”* Fleur Bennett, Computing Lead, Harold Wood Primary School

*“For **Internet safety**, I use **Purple Mash across the whole school**. The pupils find it a really safe space... I know that because I’m the one teaching it all the way through and I know that **progression is happening across all the topics.**”* Stephanie Barber, Computing Lead, Snaresbrook Preparatory School

The Purple Mash approach to Digital Literacy is based upon a number of pedagogical principles⁴⁰. For example, that,

*“Digital literacy is taught in discreet units but also **integrated throughout all units** where children share work, collaborate and discuss features. The **scheme is progressive to suit the age of the children being taught** and the issues that are most relevant to their age of development. All topics are revisited, recapped and built upon at the appropriate level.”*

It is important that aspects of Digital Literacy are taught discretely in order that the skills and understanding become strong enough to be transferrable across learning contexts.

For example, many schools spoke about the impact that 2Type had made upon the speed and quality of typing skills for their children and the transferrable way in which children had applied those skills across the curriculum.

*“One of the key things that we use Purple Mash for every [computing] lesson is the touch typing. Because I set through the tasks, **I set a term in advance touch typing tasks to every child in every year group, so from the year 1 upwards and in a progressive nature.** I’ve got a document and I know at what point in the year what kind of activities they should be working on and they progressed through that so they*

³⁸ Muller, L., and Goldenberg, G., (2021) Education in times of crisis: effective approaches to distance learning. *Chartered College of Teaching*. [https://chartered.college/wp-content/uploads/2021/11/MullerGoldenberg_FULL_NOV21.pdf]

³⁹ Ofsted (2022) *Research review series: computing*. [<https://www.gov.uk/government/publications/research-review-series-computing/research-review-series-computing>]

⁴⁰ 2Simple (2022) Purple Mash and Ofsted’s High Quality Computing Curriculum [<https://www.2simple.com/blog/search/ofsted/>]

are constantly changing. They're not always doing the same touch typing task, and **they're getting that variety** sometimes their left hand, sometimes their right hand, sometimes it's the end of each window, that sort of thing. And **I've noticed a huge increase in their typing speed**, and every term now from year 4-6, I do a little touch typing assessment with them so they can track their progress. Now that **there is that clear progression in the way they're working** from just using single letter keys, home row keys, upstairs downstairs to then moving on to three letter words, keywords, phrases, and finally, there's paragraph writing. **It has made a big difference, a big impact, and it's part of their routine.** So every lesson, the first 10 minutes of the lesson while everyone's getting logged on and getting sorted and I'm giving out merits or whatever from last lesson they're doing touch typing. But it's just part of what we do in the lesson. **There's lots of programs out there, but it needs to be about progression.** Quite often when you start up the program, you'll find you end up starting back from the beginning again. Had I given the girls the option to just go to 2Type and do a touch typing task, they'd always go to the same game or they would go to something they know they can do. Whereas I'm setting it through the 2Do so they see the task that I want them to see.

At the beginning of the term, I do all of them and it takes me just half an hour to set them all up and then **I know that in the background throughout the [term] they're [2Dos] just automatically changing, hiding and showing as and when they need to.**" Samantha Shallcross, Head of Computing, Bromley High Junior School

In focus groups, children spoke with energy about how much they enjoyed Purple Mash touch typing. As Edward in Year 5 explained,

*"In year two and three, we were using Purple Mash with touch typing and I think most of us really **got typing a lot faster.** It did it **in a fun way** and also it had loads of **different options** that you didn't just have to do in one order. You could do them in any order. So **if you're more advanced, you could do more.**"*

This was further explained by Kourosch in Year 6 who said that,

*"I think **I love the touch typing** cause like before, like a few years ago I had to look at the keyboard. I had to go very slowly, but now I can just look at this screen and just keep doing it and I think it just helps me a lot. For example, it helps me a lot because **you can use the skill that you're learning in Purple Mash in other subjects and in other areas and in other tasks.**"*

Similarly as George in Year 5 explained,

*"Once you know how to touch type at a good speed it **makes your other online work much quicker and easier.** You can then focus on the content more and so it helps you to be a more efficient learner. When we are adults, we will use typing more than handwriting so we need to learn it at school so we are ready for that".*

Children's ability to find, evaluate and communicate information through a range of digital formats was evident throughout the dataset. For example, and as illustrated throughout this report, children spoke about using Mashcams, creating images, soundclips and video, and using annotations and 3D modelling to create interactive artefacts. The key thread across the dataset was that these features were readily available and familiar to both children and teachers, ensuring that digital literacy was meaningfully embedded within other curriculum areas.

Another key finding in relation to the embedded nature of developing digital literacy with children was the way in which tools and features were used for clear purpose. This included through structured work as part of the Purple Mash Computing Scheme of Work as well as in application across the broader curriculum and to support inclusion through the design of learning itself.

Inclusion

The inclusive nature of Purple Mash was evident in both classroom observations as well as through teacher and leadership interviews with a wide range of features both observed and discussed.

*“It has been an effective tool in ensuring **all children can access the computer curriculum linked to their individual needs.**” Mrs W, Teacher*

*“I’ve got a lot of children in my new class who need a high level of support. **Complex dyslexia, or year 6 children who are not yet able to spell CVC words.** So we use lots of different ways. One child has told me already that when she does her homework and it’s writing, she **uses the dictate tool in Purple Mash** for her work which is no different to a child using dictate tool in Microsoft Word Online really. It just looked more familiar in Purple Mash!” Clare Dibble, Year 6 Teacher / Computing Lead, Oakdale Junior School*

*“It definitely **supports SEN and lower ability** children because it allows us to add support in there such as voice notes - **they can access work that wasn’t possible before.**” Jen McCulloch, Computing Teacher, New Brighton Primary School*

*“Most of the schools within our trust that **worked with a lot of children with EAL** have something called **communication imprint...** We use **Purple Mash a lot inside activities** - turning the activities into pictures **so children could access them through visual scaffolding.**” Helen Worrall, The Harmony Trust*

*“All of our children, **whether they’re SEND or EHCP, they’ve all been able to access 2Code and be successful...** For example, I’ve got a boy in my class who has got an EHCP and is quite high needs, but it’s been simple enough for him to engage him even in the year 6 coding lessons, so that’s been really positive for him.” Josh Rigby, The Inspire Learning Partnership*

*“Obviously **in terms of the assistive side of it, it’s brilliant** for children that aren’t able to record their handwriting in the same way as others...it’s been fantastic.” Nicola Folwell, Deputy Headteacher, Glebelands Primary Academy*

The range of assistive features within Purple Mash were described as being used to overcome a number of barriers to children’s learning. For example,

*“We sit in one of the highest deprivation areas in the country and a lot of our children have **English as an additional language (EAL).** That was one of our biggest barriers to learning. So it was really useful when the update for **Purple Mash introduced being able to create and upload your own resources.** And also when you could link a*

*YouTube video. So we took the decision that **we would screen record our voice and give voice notes**, that's very helpful, particularly for those children being able to then being able to hear you, giving them the feedback - it's way more beneficial than an attached comment, which they either can't read or can't understand.” Oliver Booth, Richmond School, The Harmony Trust*

Templates were commonly cited as a powerful tool for providing individualised access points for tasks across the curriculum whilst maintaining children’s dignity.

*“For some of the children that perhaps might struggle if they were presented with a blank document, **we use the templates and there's a lot of scaffold within that, a lot of the tools are really, really clear and easily accessible for them.** It’s quite visual so **they can navigate their way around more independently** perhaps than if it was outside of Purple Mash. It provides the right scaffolds for those children”. Natalie Loat, Sherborne House School*

Another common feature of inclusive practice was the way in which Purple Mash activities have been designed. For example,

*“My lower prior attaining children have found it easy because it is so straightforward and **it is that step-by-step approach where they have small instructions.** They can see what it should look like under each stage. I think we were designing a house and they could see that this is how we adjust the shape and then you can fill in your own pattern or you can select a pre-existing pattern and the learning steps are broken down more. Having spoken to them, they don't see themselves as below for computing. **They see themselves as an equal**, which is nice and I think where they're shown an example, but they have the **freedom to adapt** it in whichever way they like to **then they're still successful** because they're seeing what they envision on the screen and **they've got that chance to talk to their partner** next time. OK, this is what mine was like. How did you do that? And a lot of it is them solving their own problems because they're using their peers rather than coming straight to me as the teacher. In the upper school there's more reliance on the child rather than the teacher, so we kind of show the steps, ask questions that they have initially and then a lot of them will problem solve themselves. **If Purple Mash wasn't so easy to follow, we would have more children who would be stuck and then disengaged.** But because it's easy to use, they are really keen - it's their favourite lesson. I think it's because **it links in so closely with our wider teaching and learning strategies – metacognition and learning to learn.**” Mark Blissett, Sherborne House School*

*“I think the fact that the [coding] activities that they do from the fish, the bubbles, the magician... they start off really simple and they can work it through step by step, and that **really helps support our lower ability children.** But then the fact that at the end they can then go on to make their own, that **supports our higher achievers.** So they're all starting off at the same level, but the outcome is often very different. And obviously **because I set that in the task, I can see that and I can mark against it.** And the fact that the objectives are there now that's really easy for me to just do a quick colour **grade as to what they've actually achieved** without the children feeling that they haven't achieved. So I think that's really important and then I know because they hand it in as a task. I also get them to RAG themselves, so they use the stars to*

decide whether they are red, orange or green, you know, bottom middle, top and it's what they feel they've achieved in computing." Samantha Shallcross, Head of Computing, Bromley High Junior School

*"I think the [Purple Mash Computing Scheme of Work] is run easy enough that if they miss a week, they're not miles behind. **They can catch up** enough because the steps are straightforward. So we've had some children that are particularly low over the last couple of years who have still **managed to be successful because steps are so easy** to follow that they said, OK, well, I was at this point last week, I just need to do this step and then I'm back where everyone else is."* Mark Blissett, Key Stage Two teacher, Sherborne House School

Gender

In 2017, the Royal Society reported that gender balance was the most significant diversity issue facing computing. In 2018, a survey by Computing at School (CAS)⁴¹ found that more than 25% of girls considered computing to be boring and that nearly 20% were not interested in learning about it. These findings are consistent with research by the Wellcome Trust in 2020⁴² which found that 71% of boys find computing interesting to learn about compared with 47% of girls. The same report also notes that in year 7, computing was commonly the least enjoyed subject for girls. It is of little surprise that the latest exam data - from 2021 - shows that there are disproportionately fewer girls undertaking computer science qualifications⁴³.

The different ways in which girls and boys respond to Purple Mash were probed as part of the survey data analysis, interviews and observations in this research study.

The most notable findings were that there was generally very little statistical difference between the responses of boys and girls for the majority of survey questions asked.

The exceptions to this were:

- 1) **More girls use Purple Mash at home than boys** (90% of girls in key stage two compared to 74% of boys, n=1,201). This may be due to a number of factors. For example, diligence in undertaking homework, being inspired to continue or extend work introduced at school independently, or home attitudes and priorities regarding online learning / screen time (by either parent or child). It is perhaps relevant that when asked about their home uses of Purple Mash, there was a strong declining correlation between age and usage. For example, 91% of year 3 children used Purple Mash at home, reducing to 89% in year 4, 85% in year 5 and 75% in year 6. This trend appeared across all school types which perhaps suggests that home usage of Purple Mash is aligned with other priorities (e.g. greater focus elsewhere in the curriculum).
- 2) There was a **small difference between boys and girls when they were asked how much they felt that Purple Mash helped with their learning**. 93% of boys and 95%

⁴¹ Computing at School (2022) National Reports and Policy Documents [https://www.computingatschool.org.uk/teaching-resources/2012/september/national-reports-and-policy-documents]

⁴² Wellcome Trust (2020) *Science Education Tracker*. [https://wellcome.org/sites/default/files/science-education-tracker-2019.pdf]

⁴³ FFT Education Datalab (2021) Results <https://results.ffteducationdatalab.org.uk/>

of girls reported that they felt that Purple Mash impacted their learning positively (n=1,201). This was consistent across year groups.

The overwhelming finding in relation to gender and Purple Mash was that Purple Mash supports and encourages both boys and girls in their learning across the curriculum.

*“First year of purple mash and the children are really engaged and **especially the girls are into computing now.**”* Edwin van Boggelen, Computing Lead, St Michael’s Academy

These findings were probed during interviews with teachers and insights were surfaced which may bring further clarity to this matter. For example,

*“I would say when I first arrived in teaching, it was quite a boy heavy subject, you'd find that quite a lot of boys did enjoy it... and I have started to see more girls enjoying it... I think it's a case of **engaging the girls...** I think Purple Mash has helped. They've enjoyed doing the coding games and all the different activities that we do through Purple Mash. They like it, and so I think it is the right platform. I suppose it is making them that little bit more confident in what they're doing and how they use the programs and the software that's available. And I think through that, if they're able to code, then they feel it's something that they can do. They are quite engaging games. **The Purple Mash team actually think about what the children would like**”.*
Niall Sandwith, Year 6 Teacher / ICT coordinator, Birkwood Primary School

In terms of engaging girls with computing, a number of features of Purple Mash were cited by teachers and computing leaders in a wide range of schools. One of the most commonly featured examples in the interviews was the use of 2Code. For example,

*“the girls really enjoy using it...it's really important, to get girls engaged in computing... **I think 2Code has played a massive part in encouraging the girls into coding** because it's simple. They can do it. It follows the same sort of format with each activity that they do and even the top level doesn't get too complicated even by the time we start getting into the variables... I start off with them with year one you know doing bubbles and bubble coding and obviously that is something that they can relate to. But we always talk about the fact that it didn't have to be a bubble. What else could it be that we could be - popping and hiding or clicking on so that they see that just by making one game, they could actually turn it into something else completely different. It could be about farm animals, or it could be the fish... it's the same concept every time. We're looking at those coding games of starting with an event and then following it by an action. And it doesn't matter what we're doing, whether we're racing snails or driving cars or anything like that, it's the same thing. It starts with an event and then there's an action that follows and once they get that concept, they start to realise how I can create what I want and say. Then we move on to actually making their own flower, fairy backgrounds and the space theme and stuff, and then they make their own backgrounds and they're allowed to add no more than 4 characters on the screen. They have to code those four characters before they can add another character. So by Christmas, we are doing a nativity scene where they are coding the angels and the baby but they're making their own, and I think that's what gets them excited - the fact that they are basically making their own*

computer games.” Samantha Shallcross, Head of Computing, Bromley High Junior School

It is important to note that the publication of the dataset used by the Ofsted research review and the Royal Society are now at least 6 years old. The **children whose decisions were reflected in that data would have been influenced by policy and social matter present around a decade ago**. During the intervening period, a great deal has changed, with a **significant strategic emphasis on engaging more children with computing**. Based on the findings outlined above, **Purple Mash is playing a significant role in influencing the perception of children in the primary age range and has been doing so since its launch in 2014**. Children who were in key stage two at that point will have just finished their A levels at the time of writing this report and as such, it is relevant to highlight two significant findings from the latest (2022) exam data. The first is that computer science is now the **fastest growing degree subject with a 7% year-on-year increase**⁴⁴. The second notable correlation is that whilst the ratio of men to women applying for computing degrees is still 4:1, there has been a **20% increase in the number of women** year-on-year.

The contribution of Purple Mash in closing the gender gap, and of inspiring more children to pursue further studies in computing should therefore not be underestimated.

Impact of the pandemic

The Coronavirus-19 pandemic affected the lives of children, school staff and families in a wide range of different ways⁴⁵. Many of those who contributed to this research study highlighted this and spoke about the ways that Purple Mash had been used alongside other suites of tools both during and since the pandemic remote schooling periods.

During the pandemic there were a number of lockdowns where most children were not able to physically attend their usual school⁴⁶. During these periods, teaching and learning took place through different forms of remote schooling. Each school was required to decide what forms of schooling would be provided for their children, and how that would work operationally.

Server analysis from this period reflects the central role that Purple Mash played in providing educational continuity for children.

*“Without Purple Mash we couldn't really have got through lockdown providing the **quality of curriculum** that we did.”* Fleur Bennett, EY Teacher and Computing Lead, Harold Wood Primary School

⁴⁴ British Computer Society (2022) Computer Science now the fastest growing degree subject new data reveals [https://www.bcs.org/articles-opinion-and-research/computer-science-now-the-fastest-growing-degree-subject-new-data-reveals/]

⁴⁵ Education Select Committee (2022) The impact of COVID-19 on education and children's services [https://committees.parliament.uk/work/202/the-impact-of-covid19-on-education-and-childrens-services/]

⁴⁶ Office for National Statistics (2021) Remote schooling through the coronavirus (COVID-19) pandemic, England: April 2020 to June 2021 [https://www.ons.gov.uk/peoplepopulationandcommunity/educationandchildcare/articles/remoteschoolingthroughthecoronaviruscovid19pandemicengland/april2020tojune2021]

As Nicola Folwell, Deputy Head, Glebelands Primary Academy explained,

“Purple Mash was our provider by choice for the children to access their home learning. We used the blogs on a daily basis to set activities. **The teachers absolutely loved it.** They thought it was brilliant because they could create their timetables and the **children had all their information there.** They could use the 2Dos to set the activities and they could adapt them. The voice recording was one of the best things because you can sit there and record your instructions [verbally] and [children] don't have to read them. So that was **brilliant for a lot of our children.** They were uploading their work. They were saving it. They were sending in pictures. And then utilizing every single aspect of it. The children were given live teaching and synchronous and asynchronous education throughout really and every day they had contact with their teachers. So it was really good for them because socially, not just learning wise, but socially they were **interacting with their peers on a daily basis.** And **we really want to keep that going.** When we came back to the school with all of our catch up funding, we've actually been able to buy quite a lot of technology. We've got a school of around 400 children - we're two form entry – and **every child in key stage two has a tablet and Purple Mash is on the home screen of that tablet.** And the teachers - **some of them actually do their planning through Purple Mash now.** So they're not doubling up on their planning”.

“Purple Mash was our platform of choice for lockdown learning for years one to six and now we use it as a **communication tool** for children and parents about their homework. **Each year group has a blog which details the home learning** for the following week. Every year group might set it differently with a times table game or upload maths sheets and in key stage two the spelling games are set weekly. **Serial Mash is used every week as well for home learning.**

I see lots of random things saved in their children's files that they've done on Saturdays and Sundays. They're absolutely nothing to do with home learning but they love using it. **Quite a few children do that when they've been really engaged by something [at school] and they go and play with it at home** because they know where to find it and that they'd enjoyed doing it, and they can have another go.”

Clare Dibble, Year 6 Teacher / Computing Lead, Oakdale Junior School

Many teachers spoke about the way that using Purple Mash during lockdown periods upskilled teachers. For example,

“It gave us the facility during lockdowns to communicate with children in a really simple way. Purple Mash, worked perfectly for us.

It's been a really interesting journey because people have become really comfortable with Purple Mash and **that's really helped our computing curriculum delivery.**

People aren't scared now about picking up a unit of work because **we know what to expect and how to deliver it.** Everybody's using Purple Mash and it's been really good.” Helen Worrall, Computing Lead, The Harmony Trust

Furthermore,

“it was really useful when the update for Purple Mash meant that you [could] create and upload your own resources – that was good, and also you could link the

YouTube video so we took the decision that we would screen record our computers.”
Oliver Booth, Richmond School, The Harmony Trust

Purple Mash across the Curriculum

Whilst the first part of this report has been focused on the uses of Purple Mash as part of the Computing Curriculum, the product itself has a much wider reach with nearly 50 learning tools and thousands of resources to support teaching and learning.

For many schools this has been a low risk, high impact way of engaging children with technology as an everyday part of their learning experiences. As Samantha Shallcross, Head of Computing, Bromley High Junior School summarised,

*“My initial reason for introducing Purple Mash was actually to **encourage staff to use technology in their classroom more**. Just by using things like the templates that they have in in Purple Mash and the history resources and that sort of thing.”*

Teachers at schools who were using Purple Mash across the curriculum in these kinds of ways were resoundingly positive about their experiences and the benefits that this had on teaching and learning. For example,

- *“We love using it, the children really enjoy it and **it’s so adaptable**.”* Kim Woodley, St Mary’s CE Primary School
- *“It can be **used widely across the curriculum** and the **children really enjoy the lessons**.”* Amy Doody, Holy Name Catholic Primary School
- *“It is a useful tool, a **very intuitive interface**.”* Ameena Riaz, Computer Science Teacher
- *“The resources that are available on Purple Mash are **age appropriate and user friendly**. We have all those resources out there and available. They **can be edited in teacher mode** if needs be or they can just be supplied to the children.”* Niall Sandwith, Birkwood Primary School
- *“As a school, we all love PM and so do the children.”* Charlene Kerry, Computing Lead, St Andrews’ Infant School

*“People often see it as the resource for teaching computing. That’s why a lot of schools invest in Purple Mash, and **then you discover the range and the depth** and we’re looking at the wider curriculum and whether it be a history topic or geography topic that you know where in the past teachers might have used Microsoft Word or Publisher and you’ve tried to make a newspaper or whatever but now in Purple Mash there are **these amazing templates** so that children can focus on the skills you want them to focus on. **The best thing about Purple Mash is how much is on Purple Mash**. The worst thing about Purple Mash is how much is on Purple Mash. **From the PowerPoints to the planning, the knowledge organisers, the usability** and that side of things are definitely for myself and I would be echoing messages from pretty much every school I visit.”* Martin Bailey, Computing Advisor

*“All of the **tasks and tools in it are very pupil focused**. They seem spot on for primary children and our **learners across different ages**. All of them love to go on Purple*

Mash, they enjoy it and that's the engagement factor which is important." Anthony Lees, Broadclyst Primary School

*"When I first take my Receptions from Mini Mash into Purple Mash, I teach them how to use 2Dos and **they think that's incredible**. It's like this new area because they've been used to Mini Mash and then **when it first comes up with their new grown up interface, they're like ohh!!** The children are always spotting things. So when Purple Mash first brought out that you could change the backgrounds, my year threes were like 'wow we can now make our backgrounds different to yours', and you know, all **that sort of personalisation**. They love that they learn about - in year one - they learn about the avatars and keeping themselves safe. And it's really, really good to be able to teach those sorts of things."* Stephanie Barber, Computing Lead, Snaresbrook Preparatory School

Most schools who took part in this research study used Purple Mash for a wide range of purposes across the curriculum and as part of teaching and learning. However, it was notable that **each school had their own unique blend of uses** and there was not a pre-defined type of usage with a school or multi-academy trust subscription.

Schools who took part in this research study were asked about where they used Purple Mash across their curriculum. This surfaced the following trends across schools that:

- 93% of school used Purple Mash for computing
- 54% for maths
- 53% for English (including 20% of schools who use the Serial Mash reading resources)
- 40% for science

- 36% for art
- 30% for music
- 30% for geography
- 28% for history
- 20% for religious education,
- 16% for PSHE (not including online safety which was addressed through computing)
- 7% for languages
- 29% use Mini Mash (early years specific features)

When asked through teacher-led surveys, independently completed surveys, interviews and focus groups, children were unanimously positive about their learning on Purple Mash.

"It makes me feel really happy and I just feel like I really want to get started with it."

Year 3 girl

"It makes me feel happy as well because I can do like the activities that I want to do."

Year 4 boy

As there have been debates about the extent to which children growing up today may be over-exposed to screens, this line of inquiry was interrogated in order to ascertain whether the appeal of Purple Mash hinged around bringing 'screen time' into the classroom, or whether it was an integral appeal within the product itself. Anthony Lees, from The

Cornerstone Academy Trust has extensive experience of working across many different classrooms and schools and summarised his view;

*“Within the profession, sometimes the concern about overuse or reliance on technology and sometimes from parents and stakeholders, there can often be a concern about that. **But the right technology helps to create children that are confident speakers and that are eloquent about their learning, that are reflective of their learning and have that ownership. They have that metacognitive awareness about their own learning that this kind of tool – Purple Mash – helps to foster.**”*

This finding mirrors international research which has now established that children who use purposeful, accessible, engaging technologies regularly,

*“... **are more discerning about their learning** and emphasis shifts from novelty of using devices to **practices which develop greater metacognition.**”* (Twining & Maher, 2017⁴⁷)

Maths

Over 54% of schools using Purple Mash use it regularly to support children’s learning in maths. Regularly cited tools used by children included 2Count, 2Graph, 2Survey, 2Calculate, 2Question, 2Investigate, 2Quiz and 2Design and Make. Children spoke with great excitement about playing their favourite maths games – usually 2Race, Bond Bubbles, Fractonio’s Pizzeria and Sequence Snake. As Freddie in Year 2 at Broadclyst Primary School explained,

“When you log on, there’s like a big screen and there’s different bits you can use, and if you’re learning about maths, you press on a maths one and once you’ve pressed the maths one it’ll come up with lots of different maths activities and depending on what you’re learning about you press on that one.”

Engagement and usage rates for these maths games was **consistent with wider pedagogical research about the engaging role of instant feedback and the importance of reward cycles in maintaining motivation**⁴⁸. As Oliver Booth, at The Harmony Trust illustrated,

“In maths, where it was more quiz related, we saw the highest level of engagement.”

To illustrate this further, a particularly popular feature has been the **times tables practice**. Since the launch of this feature in 2019 to support children in their preparation for the Year 4 times tables checks⁴⁹, more than 41,000 multiplication tests have been assigned in Purple Mash. As Philip, a Year 4 child at Broadclyst Primary School explained,

*“There’s this big one at the end of the year that we do and there’s basically the same one in Purple Mash where there’s 25 questions and you get 6 seconds to answer it and **we use that to improve our times tables.**”*

Children who took part in the focus groups in this research study consistently spoke about their **enjoyment and engagement with the Purple Mash version** and were **able to clearly**

⁴⁷ Twining, P., and Maher, D., (2017) Bring your own device. *Educational Research*, 59(1) pp. 73–88 [http://oro.open.ac.uk/47546/]

⁴⁸ Wise, R., (2004) ‘Dopamine, Learning and Motivation’ *Nature Reviews Neuroscience* 5. pp.483-494

⁴⁹ DfE (2022). Multiplication Tables Check [https://www.gov.uk/government/collections/multiplication-tables-check]

articulate the impact that these had on progress in their learning. As Matilda, a Year 5 child at Birchwood Primary School explained,

*“For my times tables I found my nines and eights and twelves really tricky. At the start of the Year 5 I tried different methods. But **using Purple Mash, I finally worked it out.** As well, I like that you have your scores and you can see that you are improving as you've been doing it more and you are getting from low scores to higher and higher scores. **You feel like pleased and proud with yourself** when you're doing that sort of thing and improving all the time.”*

A number of curriculum leaders spoke about using maths games for targeted intervention – both stretching more confident children as well as precise support and practise for underachieving children. As Clare Dibble, Year 6 Teacher at Oakdale Junior School described,

*“It is brilliant because it means that **you can set individual things for children who are struggling with their** maths and set them a maths game that is at their level quite easily. **Yet it doesn't look any different to anybody else's work so that helps with a kind of equity.**”*

Teachers widely recognised the role of Purple Mash maths games in increasing children's engagement and enjoyment with the subject, and described incorporating these games in a range of ways in lesson planning. For example, Mrs C, Deputy Headteacher explained the **role of the maths games in formative assessment;**

*“We've used the quizzes that come along with each of the math topics which are excellent. It gives you a score at the end of it so then you can set a 're-do', and if a child's not grasped it, it sets it again. **I use it for pre learning to prepare them for something we're about to do, or consolidation, or checking their understanding at the end of a topic.**”*

Yet the use of Purple Mash to support mathematical learning was not just about the use of games or quizzes. Many teachers, in particular those currently teaching in key stage two, spoke about tools such as **2Calculate – used to teach spreadsheet and mathematical formula (algebra) skills.** As Tiffany Galloway, Computing Coordinator at Inmans Primary School explained,

*“[2Calculate] is really good because we can highlight cells, rows and columns so **we can get through all the vocabulary.** It's got the excellent toolbox which we use a lot with all the different tools and then I show them that instead of using that tool, here's the formula for that and it has the basic interface and then **it's got the advanced mode,** which is really good for when we start to write formula and further up the school. So I find that really really useful. I don't tend to use the formula wizard - I tend to think whatever's on the national curriculum and go from there. I assess them at the end of every lesson and then I can see whether they're moving up into the greater depth and maybe could move on or whether they need that extra bit of support.”*

The way in which 2Calculate can be used to open up more advanced mathematical features was highlighted by a number of teachers as being particularly useful for their more and most able children. For example,

*“My really good mathematicians love the spreadsheet one [2Calculate]. They were in awe. It's just really well thought out. So they're learning the skills of like locking and unlocking cells, but **whoever's designed it understands infants**. They set up a little zoo with the cages and then they have to lock and unlock the cages so they're learning the skills of spreadsheets. **Spreadsheets can be quite dull, can't they? But not when it's a zoo and the animals need to be locked in!** They really, really enjoyed that.” Clare Mathema, Sherborne House School*

More broadly, use of Purple Mash to support learning in maths surfaced similar trends to those seen across other areas of the curriculum. However, due to the core subject nature of maths there were some additional findings. For example, the way in which the **additional features in Purple Mash were providing tangible cost savings to schools;**

*“Over the years, **because the Purple Mash offer has grown, there's been tools that have become part of the offer**. So when he [child in focus group] was talking about racing against other children and getting scores and times, I can think of [other product name] that we've had in place for maths that we no longer subscribe to because that whole product was a separate offer but **now just comes under the Purple Mash so no longer need that additional subscription**. [It's important] to give the teachers [across our trust] an understanding of quite how broad the offer is and quite how many different things you can cover with that one product.” Anthony Lees, The Cornerstone Academy Trust.*

English

A notable trend appeared when teachers were asked about their uses of Purple Mash to support learning in English relating to the use of Serial Mash. Serial Mash is a reading platform where engaging and bespoke stories, accompanied by associated support and extension resources (linked to the National Curriculum) are published each half term for children across the primary age range. Additional functionality allows the children to record their reading on and away from the platform using an online reading journal.

However, teachers and leaders tended to be either great advocates of the impact that Serial Mash had upon their learners, or were unaware of its existence. For example,

*“Serial Mash has been fantastic **for improving reading**.” Vanessa Willis, Kingston St Mary CofE Primary School*

Furthermore, **Serial Mash was often spoken about as providing motivation for particularly reluctant readers**. For example,

*“children like reading online... children don't struggle in the ways that we possibly think they will, and **reluctant readers are much more willing to participate**.” Mrs C, Deputy Headteacher*

*“If you want to get a reluctant reader to read, they'll often read on a screen or attempt to read on a screen. I've got a child who's in the bottom group for reading but who was interested in fossils. We don't really cover fossils in key stage one, it's further up the school, but because they're interested, you know, why not introduce that? It opens up doors. Well **there is so much in Purple Mash about fossils**. We made a book of some of the work that we printed off, and it's linked to our*

geography as well. So we did the quizzes on the British Isles. And something that was actually from the next phase, where they were labelling a map, and there's some quite challenging stuff on there. And they like it. **The use of Purple Mash becomes a launchpad for much broader learning in terms of both content and subjects and topics and it all makes a difference to progress as well as metacognition.** There's a lot of things all woven together there." Mrs C, Deputy Headteacher

The rationale behind this successful impact on learning outcomes was explained by Anthony Lees at The Cornerstone Academy Trust – notable for being both an EdTech Demonstrator⁵⁰ as well as a DfE English Hub⁵¹;

*"I think the breadth for us is key. If I give you an example, something like Serial Mash - where you've got the book set that can be read online, **there's a lot of thought gone on to the creation of that very clearly with a lot of professionals who understand how reading comprehension as well as decoding works, and how to help build that skill set for learners.** So as you know, part of the challenge for a teacher is **finding texts that are exactly the right level for all our learners.** That and also the range of different lengths, the range of maturity of content versus difficulty of decoding. It is a really hard balance, isn't it? And **with the Serial Mash series of texts, there is so much range in there.** And the maturity as well as the content is well matched to the difficulty of reading it, which is often not the case with books you pick off the shelf. They might be great authors and you know the kids will love them, but often there's a mismatch between those two things. That's really time consuming for a teacher to find. And it's that kind of tool that I think is great - that there is so much content in there.*

*It's also the range of ways that the material can then be used. So we've used it with children in a group reading setting where they're all following the text on their device, or where occasionally it's on a touch screen tablet or something, or it may be that totally inverse to that children are reading a text as an individual and it's part of their ongoing reading log and it marries into accelerated reader. Or the teacher might be using one of those texts on the board to teach the class as an example of something they're doing. **There's a lot of flexibility in the way that those resources can be used.***

*But because it's serialized, you've got that chunk of reading, then you've got **a range of activities that tick a lot of different boxes for what you can do** and then the next step and it's incrementally forward moving.*

*Previously, life was pretty analogue as a teacher - there weren't an awful lot of quality digital resources out there. So as a teacher, you get very good at finding texts, copying pages, writing questions and printing that on a Monday morning, sticking it in the front of books and actually teachers do none of that now, do they? They can do it all at home with a cup of tea. To be able to have that scaffolded solution for a teacher as well is probably **one of the reasons that I guess Purple Mash is so popular and so successful because it is about the outcomes for the learners.**"*

⁵⁰ DfE (2022) EdTech Demonstrator Schools [<https://www.gov.uk/government/publications/edtech-demonstrator-schools-and-colleges-successful-applicants/about-the-programme>]

⁵¹ TCAT (2022) English Hub [<https://englishhub.education/>]

A particular trend across the data on Serial Mash was the impact that its use had on the learning of specific children. Naomi Wonders, Assistant Director of Primary across the One School Global group described this;

“Serial Mash has been a great resource in terms of guided reading and the children really love that. Children particularly like the Purple Mash team reading it because then it's not always the teachers voice [reading out loud].

I launched it back in September and it's worked really well. The children love it, they love having that choice of text on there as well and we'll guide them to make those decisions just to make sure that they are appropriate and we'll pre-read ourselves.

But they know that they've got a whole library of digital books on there, which is brilliant, particularly because our students love anything on a laptop.

I would say it particularly helped engage the boys. We had lots of boys that were quite disengaged with our previous reading material and we had been doing a lot of study into how to enthuse them. Serial Mash – both the reading and with the games that come with it and the activities for each chapter it really helps them delve into their reading. The fact that when they got to the end of the chapter they had things to do and other ways to tie that into their learning, that really helped encourage the boys, and the girls as well. Now, they're quite enthusiastic readers I find.

Serial Mash in particular has so much content across a range of abilities. There's something on there for everyone, which is what I really like - in terms of boys and girls and in terms of age as well, because we use it with years three to six in the primary.”

Alongside Serial Mash to support learning in reading, Purple Mash also offers children a wide range of support for developing writing. For example, 2Write, 2Handwrite, 2Publish, 2Create a Story and 2Type as well as Phonics and SPAG specific tools, games and resources.

Classroom teachers frequently spoke about the increase in children's enjoyment when using these tools – the Mashcams in particular seemed to be a success. As a group of year 2 children explained;

“We really like going on the Mashcam. So there's loads of different things you can do and you can pick something, and then you can take a picture of your face inside of them. Like An Astronaut or her princess. So you become an astronaut. And I was Cinderella. So I clicked on Cinderella's one and then I put my face where there was like a face that you could use and I clicked on where the circle was where you put your face in. And then it takes your picture so I turned into Cinderella. Then you can write something that you're saying in the speech bubbles. We were doing that as part of learning about Cinderella and part of learning about speech bubbles and part of learning about taking photos. We were learning about traditional tales too where we would put a twist on them. I really liked doing that”.

Teachers also often spoke about the ways in which learning resources and activities could be made more accessible for children.

“I often make templates so that children have a resource bank. I like the ability to change things and add image banks for the children to use in their work. It can really make a difference. As a teacher, you can personalise the resource to make it right for the children in front of you, in that class, at that time. The word banks and

similar tools give even **more flexibility** and the **ability to add speech** for key stage one children means **they don't need another member of staff** to help them to read their task. So if you don't have a Teaching Assistant in the classroom, at least the children can access their work. I have found that **this encourages independence.**" Jen McCulloch, Advisory Teacher

The ease with which children were experiencing individualised learning was surfaced throughout a number of the focus groups, and across both key stages one and two. For example, a group of key stage one children at Broadclyst Primary School spoke about how their teachers provided them with sequences of tasks using the 2Do feature. As Freddie explained,

*"I think it **helps you with your learning** because there might be some things on there for when you do the main learning then there may be a few more things so it helps you learn a bit more. **When you click on the 2Do it comes to another page with your own set of activities to work through.** Sometimes you can make your own quiz, sometimes you might need to write a letter. But **it depends on what you're learning about.**"*

Science / STEM

Children often spoke about the ways in which they used Purple Mash as part of wider topic work. It was **notable that girls were particularly engaged with the STEM activities** and were very **keen to extend their work further when using Purple Mash**. For example, Evie, a Year 2 child at Broadclyst Primary School explained that,

*"I think I **want to talk more about the planting a seed activity.** So we had a little booklet [on Purple Mash] where we could talk about how we plan to [plant the seed] and if you want to go back and add some more things [to the booklet], there's a back and forward **button if you want to do something else** [on another page] or if you **want to finish something off.** So it's like a little booklet where you can tell more things about how you grow plants and there's a little rectangle at the bottom which is a space for you to write in. I think we learned about drawing and labelling them and telling more things about them. **It was better than doing it with a piece of paper and a pencil** because it was fun and I love drawing and doing things on Purple Mash, so that's a really good thing."*

This view was shared by those across both key stages one and two and across a range of different schools. **Children in older year groups often talked about the ways in which they appreciated revisiting previous pieces of work** – particularly work from earlier in their current academic year as their learning progressed. For example,

*"It's easy to search for work that I have done before. I like to do that so **I can go back and remind myself of what I did.** Sometimes I can see that now **I know more than I did when I did the work so I like being able to add more things in and improve my learning.**" Year 5 child, Sherborne House School*

History

Purple Mash provides a range of applications, tools and resources to support the History curriculum. For example,

*“We were doing the great Fire of London, so **they were being Samuel Pepys and they were talking in their speech bubble** using the Mashcam. There is a lot on there across the curriculum.”* Clare Mathema, Sherborne House School

*“The way we teach our pedagogy is actually part of a self-directed learning pedagogy where **we encourage the children to make those decisions for learning themselves** and as part of that they have **allocated study sessions**. And so **Purple Mash is one of the things in the children's backpack** that they can access directed by their teacher to **support what they're doing** and studying. What I really like is that, for example, with Ancient Greeks, there's lots of different activities on there. Some can be art based, some can be geography, others can be writing tasks which really help the children to have that choice of exploration when they're looking at particular themes. So in a study session, they can then pick out, say, I'd really like to do this art task to enhance my learning.”* Naomi Wonders, Assistant Director of Primary, One School Global

Creative and Performing Arts

Whilst not a specific focus of this research, it was notable that when surveyed, more than 30% of schools were actively incorporating Purple Mash into their creative and performing arts curriculum. Teachers spoke about the ways in which it engaged children not previously interested in sound, composition or performance. For example,

*“In 2Sequence, first of all, we just let them explore the different sounds and there was one where they had the **twinkle, twinkle little star** and then you put the backing notes in and we showed them in our class assembly so **they had an audience for it.**”* Clare Mathema, Sherborne House School

*“They were completing an art activity using 2Paint a Picture on their Chromebooks and **they were actually drawing on the screen**, which is really good to see. And that's something that even I haven't thought of when we got Chromebooks in terms of how useful they could be. But having that **touch screen and type accessibility** for the younger children is fab. Up in year six with me, I would be setting a research project or go and create a slide show or a leaflet, so **the resource is totally age appropriate across the school.**”* Niall Sandwith, Year 6 Teacher / ICT coordinator, Birkwood Primary School

In focus groups, children referred to the ways in which their art skills complemented their learning in Computing. For example, Caleb in Year 5 explained that,

*“In actual art lessons I found different ways to express the painting. We used 2Paint for it and we could use **lots of different styles - things like abstract pointillism**. We already knew how it looked like and how we were supposed to do it and so we found it a bit easier knowing what we were supposed to do. It was really fun doing that. I think it's just because you can do whatever you want on 2Paint and you can use your own ideas and put it on the computer **and you can see your finished artwork and you feel amazed that you've done that** and you've, like, used all these different tools and stuff. It **gives me a real sense of achievement** as well as trying out new things.”*

Early Years

Purple Mash provides a range of applications, tools and resources to support children's learning in the Early Years, including Mini Mash; a specifically designed version of Purple Mash for Early Learners.

*"I'm in Reception and we use Mini Mash everyday, whether it's one of the 2Paint activities or one of the puzzles, it's always on in the three classrooms and for the children to have access to it. **Mini Mash is set perfectly for them and it's very early years friendly** and they can navigate it really well themselves."* Fleur Bennett, Early Years Teacher, Harold Wood Primary School

*"**Mini Mash is perfect for my nursery and reception classes.**"* Stephanie Barber, Computing Lead, Snaresbrook Preparatory School

*"It is **brilliant for early years** because we could access it on the iPads and the children were able to have those really straightforward logins and then there were just **so many things in there that linked really nicely with the early years curriculum**. Lots of their **Understanding of the World was really well supported**. We could do, you know, show me your understanding of seasonal change or whatever. And they could design their own pictures and it was also handy because when they were doing their typing **it wasn't set up to correct to sort of automatically correct their spellings, which was really useful because actually what I was looking for was them using their phonic knowledge and I didn't want it to auto correct** what they typed. So whereas if they did it on a, you know a doc or something, it might self-correct it for them.*

*We did have still a set time for a computing lesson where it would be particular skills, **but then we'd have the iPad out for them throughout continuous provision that they could go back and have a go**. There are **so many different tools** that we could tap into through throughout the early years within Purple Mash and it worked really well.*

*On one of the first days **we were doing something around 'People who help us' and there was a whole load in Mini Mash about the roles that those people play** and they could log on and you know find out more about that sort of thing.*

*With Reception, we used a lot of the 2Dos which were very interactive for them. There'd be things that they could select and **they'd get like instant feedback** or response from that application or sounds that go on when they are clicking and dragging things - they're not required to use a mouse or whatever. It's **really friendly for them in terms of where their physical development is at**. And I think the **instant feedback that they get from a lot of those applications is really useful for them** and it would kind of **celebrate their successes along the way**." Natalie Loat, Sherborne House School.*

Transferrable Learning Skills

During interviews, observations and focus groups, many teachers and children spoke about skills that children had learned as part of their computing work which were then used as a launchpad for other forms of learning. For example, the use of 2Connect and the wide range

of ways in which children then used it as a mind mapping tool as part of their learning across the wider curriculum,

*“We’ve just introduced them to 2Connect and they can then do their **mind mapping and make the different connections** with the node. We have then used it as part of their Learning Journeys across the curriculum.”* Mark Blissett, Key stage two teacher, Sherborne House School

*“We’ve just started 2Connect. You can use it like a whiteboard when you are thinking. **You come up with one idea and that makes you come up with another idea.**”* Year 5 child

Other features such as 2Quiz were used to encourage metacognitive approaches to learning. For example, in an observation of year 2 children, the **2Quiz tool was used imaginatively by the teacher to pre-assess children’s weekly spellings**. Children then created their own 2Quiz using their newly set (individualised) spellings as an innovative approach to the traditional Look-Cover-Write-Check technique. **Children then used the features of 2Quiz to challenge themselves** (e.g. opting for the answers to be through selecting letter tiles, or random letters, or using the full keyboard), **working through the carefully scaffolded options available**. Finally, children challenged friends who were working on the same spellings to complete each other’s quizzes. This 20 minute session was **observed to engage every single child in the classroom** with actively learning their individual spelling lists with one child summarising that,

*“I know **really this lesson is about learning spellings** and we are doing that. But we love it because **actually we are also having a lot of fun.**”*

Home Use and Parental Engagement

One of the overarching trends of this research study has been the surfacing of ways in which **Purple Mash contributes to much wider strategic pedagogical benefits to children’s learning**. In other words, **Purple Mash is directly making an impact on school improvement priorities** which are not directly connected to Computing.

One of the many findings of this study was that 47% of school leaders and teachers said that **Purple Mash increases fluidity of children’s learning between home and school**. Initial hypotheses included that this was an expected consequence of Purple Mash being used during lockdown periods, or that Purple Mash was being used for homework purposes. Combining datasets across multiple surveys showed that **85% of key stage two children reported using Purple Mash at home** during the January-July 2022 data collection timeframe (Year 3 = 91%, Year 4&5 = 89%, Year 6 = 75%), and **79% of early years and key stage one used Purple Mash at home** in this same period (n=4,636). However, further probing revealed a much more subtle thread to this line of inquiry.

When asked about their uses of Purple Mash at home, **only 51% of key stage two children reported that their home uses were defined by their teacher and only 49% in key stage one**, with the remainder explaining that they chose when and how to use Purple Mash for themselves when they accessed it at home (n=5,837). This suggested that **a significant amount of children were opting to use Purple Mash for pleasure in their home environments**. Probed further, 100% of children who were using Purple Mash at home were

using the Purple Mash games, 74% were drawing, creating or writing things, 51% were making or responding to quizzes and 46% were coding (including games). The impact of these uses were seen in a wide range of examples. For example, some children spoke about how **they made games in 2DIY3D at home for their friends to play and consequently gave each other feedback for improvements**. Other children spoke about how they had learned something at school and then been **inspired to continue to practice or extend that skill at home** voluntarily. The common thread appeared to be **the role of Purple Mash as a launchpad** – introducing ideas, skills and engaging online spaces which **children could then independently access both for official schooling work as well as for enjoyable leisure purposes**.

Probing further, children were asked about their experiences when using Purple Mash, and what happened if they got stuck on something in one of the tools or games at home. 80% of children reported that if they tried the activity again, Purple Mash showed them alternative ways of making progress if they experienced difficulties, and 78% reported that they talked to their friends or teachers during schooltime about how to solve particular problems in their home uses of Purple Mash (40% teachers, 38% friends). This suggests a longitudinal approach to children's informal home uses of Purple Mash, whereby **they are independently engaged and motivated to pursue particular activities at home – seeking peer or teacher support as and when they feel it would help them**. This kind of organic **Vygotskian⁵² approach to social learning appears to be embedded within the design of Purple Mash itself**, given that there was no evidence in any of the interview or survey data to suggest that this particular learning strategy was explicitly being adopted by any of the schools participating in this research study.

As Samantha Shallcross, Head of Computing at Bromley High Junior School explained about Purple Mash,

*“It's a **safe space for them to explore and try things out** and certainly for the little ones, we found their folders fuller and fuller. They were having a go and you know... **They discovered it themselves**, and that was a great joy.... **It says something very powerful about children exploring and learning through exploring**. And there's nothing [in Purple Mash] that will take them out into the world wide web, outside of that [safe space], and it's just really, really helpful to have.”*

With the majority of children keen to use Purple Mash at home, many teachers spoke about the ways in which Purple Mash also supported parental engagement. As Stephanie Barber, Computing Lead at Snaresbrook Preparatory School explained,

*“In terms of parental engagement over the last two years, obviously with Covid and having lockdown the parents had to get involved. **Purple Mash was absolutely essential to our online activities** over those sort of lockdown periods and **every single year group used it from nursery to year six**. But the fact that **children could independently use the software** - they were actually **often teaching the parents how to do things**. When I was home teaching and I was*

⁵² Vygotsky, L.S. (1978). *Mind in Society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

watching all the parents and they were trying to do things and the children were like no, that's not how you do it, let me show you...

*The parents liked the fact that every time they went on Purple Mash the children were doing something different and it wasn't always the exactly the same activity and **they weren't getting bored** with it, which I think happens with other things online."*

Parents who were asked about their child's uses of Purple Mash for homework spoke about their **appreciation for the child-oriented design** and the **impact that this has on children's willingness to complete homework** as well as **extend their own learning** further. For example,

*"My daughter, age 5, is able to **independently login** to Purple Mash, click on her 2Do tasks, and work through them. She can click on "play" to hear the questions and to hear the answer options and Purple Mash gives her immediate feedback. **She loves doing her homework because she feels independent and she knows straight away how well she is doing.**"* Year 1 Parent

Impact on Learning

In previous sections of this report, findings have been shared where teachers spoke about the direct impact that Purple Mash has had on children's learning. **Teachers and Leaders often spoke passionately about ways in which Purple Mash had improved gender equality, stretched the most able, supported children with specific gaps in their learning or with individual learning needs.** Teachers also spoke about more subtle approaches – where personalised 2Do's enabled a **sensitive approach to individualised learning pathways**, 2DIY3D lessons provided a **launchpad for Gifted and Talented interventions**, and where Serial Mash had **improved reading progression and attainment for whole cohorts of children.**

Specifically, within the computing curriculum, there was widespread consensus amongst computing leads (both specialist and non-specialist) that the Purple Mash Computing Scheme of Work had made a **significant impact on both progress and attainment across all age groups.** As Ofsted (2021)⁵³ set out,

"Children make progress in computing by knowing and remembering more about and, importantly, across each of these categories, and being able to apply this knowledge."

This approach, woven into the Purple Mash Computing Scheme of Work was seen as **integral to the pace, progress and attainment outcomes seen in children's learning.**

*"We use Purple Mash because the **progression is really good and it constantly refers back to things that they've done before** in the previous unit so I find that sort of seamless..."* Stephanie Barber, Computing Lead, Snaresbrook Preparatory School

⁵³ Ofsted (2021) Education Inspection Framework [<https://www.gov.uk/government/publications/education-inspection-framework>]

Of the teachers and leaders who were surveyed about the Purple Mash Computing Scheme of Work, 76% said that Purple Mash **increases children’s engagement and enjoyment of computing.**

When probed, part of the rationale for the impact of Purple Mash were the ways in which it had become part of the ecosystem of the school, group or multi-academy trust.

Professional Development and Support

In 2017, it was reported that subject knowledge was the most common issue facing teachers in teaching a computing curriculum⁵⁴. The shortage of teachers with specialist computing subject knowledge prevails, with Ofsted reporting in 2022 that the number of subject specialists in computing remains low, and that there is also a lack of a pipeline of new specialist teachers, suggesting that this situation is unlikely to change in the near future⁵⁵. Demographic data from this independent research study aligns with these findings, with the majority of the participants not being from a specialist computing background.

However, there is a **subtlety that is often overlooked in the research addressing specialists within the teaching of computing** and that is the difference between a teacher having subject knowledge (e.g. a degree in computer science), and a teacher having a combination of subject, pedagogical and subject-pedagogical knowledge – vital for *effective* learning in a particular subject⁵⁶. It is important for those researching professional development in relation to computing to make this distinction⁵⁷. This is because there is an ideological friction between the dominant pedagogical stance of those with a specialist computing background, and the pedagogical practices that pedagogical educational research shows to be most effective for children’s learning⁵⁸. In other words, whilst **someone may have significant expertise in coding themselves, they may not necessarily have expertise in teaching coding nor facilitating effective learning in coding.** For example as one Computing Lead explained,

“We have an IT team and they're pushing me to use Scratch Junior. And I've said no because I like Purple Mash because I can assess their level easily and move them up or down easily depending on if they need a bit of extra support or if they are ready to be stretched further. I know that each challenge has got algorithms and it's got debugging and it's got an opportunity for them to practice and consolidate those skills and then move on.”

⁵⁴ Sentence, S., and Csizmadia, A., (2017) ‘Computing in the curriculum: challenges and strategies from a teacher’s perspective’, in ‘Education and Information Technologies’, 22(2) pp.469-495

⁵⁵ Ofsted (2022) Research Review Series: Computing [<https://www.gov.uk/government/publications/research-review-series-computing/research-review-series-computing>]

⁵⁶ Shulman, L., (1986) ‘Those who understand: knowledge growth teaching’, in ‘Educational Researcher’, 15(2), pp.4-14

⁵⁷ Tondeur, J., van Braak, J., Ertmer, P., and Ottenbreit-Leftwich, A., (2016) Understanding the relationship between teachers’ pedagogical beliefs and technology use in education: a systematic review of qualitative evidence. *Educational Technology Research and Development*, pp.1-21. And Karaseva, A., Siibak, A., & Pruulmann-Vengerfeldt, P. (2015) Relationships between teachers’ pedagogical beliefs, subject cultures, and mediation practices of students’ use of digital technology. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, 9(1)

⁵⁸ Rich, P., Browning, S., Perkins, M., Shoop, T., Yoshikawa, E., and Belikov, O., (2019) ‘Coding in K-8: international trends in teaching elementary/primary computing’, in ‘TechTrends’, 63(3) pp.311-329

This point was reflected in the findings of this research study whereby **the learning of children in computing was more consistent across a school where all teachers were teaching from the same Scheme of Work, than a blended scheme designed by a computing lead with a specialist computing background and then taught by non-specialist staff**. This finding reflects national statistics and larger scale research. For example, the Office of National Statistics reported that in secondary schools, 46% of computing teachers held a computing qualification – yet **less than half the hours of computing teaching were taught by those specialist teachers**. This contrasts strongly with core subjects where most hours were taught by subject specialists⁵⁹.

The solution to these challenges is, as widely argued, high-quality professional development for all those involved in the teaching of computing. In both their computing research review and in the latest education inspection framework, Ofsted highlight **the importance of high-quality computing education being underpinned by sufficient subject-specific professional development**. Importantly, including both the development of subject knowledge as well as utilising the expertise of subject communities. This support should be targeted at all those teaching computing, with additional support for those leading the computing curriculum – whether or not they are subject specialists.

Purple Mash is designed to support both specialist and non-specialist staff in the teaching and learning of computing. Professional support and development is provided in a range of ways for all staff whose school has an active subscription. For example, Purple Mash's CPD offer provides a fully accredited CPD session online or on-site for all schools as well as additional optional courses, webinars, a staff led training platform, on-demand video-calls and live chat and highly responsive email support.

As the Purple Mash education team describe, there is also extensive guidance to develop teachers' technical knowledge,

*"The scheme itself is **designed to build teachers technical knowledge** by explaining teaching in **digestible practical steps** and **introducing tools** that can then be used for the further curriculum to **enhance digital literacy** in school, such as blogging, Display Boards and use of QR codes. **Clear steps help teachers to gain confidence** in what they are teaching and how to **unpick children's misunderstandings**. There are teacher videos to accompany lessons in more technical units (coding and spreadsheets), key terms explained in videos for coding knowledge, assessment 'toolkits' to support teachers building up a picture of what good progress looks like and how children demonstrate this through their work, and computing vocabulary glossaries.*

*But **Purple Mash isn't just a Computing Scheme of Work**. There are also a range of **Subject Leader's Toolkits** to support leaders on their journey to expertise and therefore be better able to support staff. There are currently six toolkits covering Computing, Maths, English, Science, Computing and PE. These are all available as free downloads outside of Purple Mash."*

⁵⁹ Office of National Statistics (2020) School workforce in England [<https://explore-education-statistics.service.gov.uk/find-statistics/school-workforce-in-england>]

Narrative analysis⁶⁰ of data from surveys and interviews surfaced a number of themes about the forms of professional development and support that were found to be most utilised and most impactful.

One of the themes that emerged from interviews with computing subject leaders was around the **extensive support community that Purple Mash provides** for them. Many spoke about the support with developing their curriculum intentions, implementation and impact work, and supporting their readiness for Ofsted deep dives⁶¹ which require that subject leaders do not have to be specialists, but that they must;

- know what they want the pupils to learn and why.
- show how the curriculum matches the scope and ambition of the national curriculum.
- demonstrate that there are clear end-points and that content is broken down into manageable chunks that lead up to them.
- show that the chunks are logically sequenced and prepare pupils for future learning⁶².

All of the subject leaders interviewed felt that the Purple Mash Computing Scheme of Work and the supporting subject leadership materials provided them with the support and guidance that they felt was necessary to achieve this. Triangulating with document analysis from inspection reports about the schools who were being interviewed as part of this study having also been recently inspected supported this finding. This confidence was summarised by Fleur Bennett, Computing Lead at Harold Wood Primary School as;

*“I do **really like the subject leader part** because you can do the audit and different things like that. It’s **really helpful** because sometimes there’s so much on offer for subject leaders and it’s **nice somewhere just to have it in one place** that you can trust. **Purple Mash is something that you can trust.**”*

100% of the schools that engaged with this research study were highly complimentary about 2Simple as a company and Purple Mash as a product. This was true even of those who chose to respond anonymously to the publicly available survey, and those who transparently spoke about their doubts about specific aspects of the inquiry (e.g. the appropriateness of Purple Mash for upper key stage two). The high esteem for the 2Simple / Purple Mash brand is also reflected in other independent datasets⁶³, and subject leaders were typically passionate about their belief in what Purple Mash offers as Niall Sandwith, ICT coordinator at Birkwood Primary School summarised,

⁶⁰ Parcell, E., and Baker, B., (2017) *Narrative Analysis* [<https://methods.sagepub.com/reference/the-sage-encyclopedia-of-communication-research-methods/i9374.xml>]

⁶¹ Ofsted (2021) Curriculum <https://educationinspection.blog.gov.uk/2021/12/08/curriculum-keeping-it-simple/>

⁶² O’Connell, S., (2022) Ofsted Deep Dives [<https://www.headteacher-update.com/best-practice-article/are-your-pupils-ready-for-ofsteds-deep-dives-primary-school-inspection-inspectors-improvement/246487>]

⁶³ EdTechImpact (2022) Purple Mash User Ratings [<https://edtechimpact.com/products/purple-mash>], SchoolZone (2022) Purple Mash Review [<http://www.schoolzone.co.uk/insight/purple-mash-summary-review>], Educational App Store (2022) Purple Mash [<https://www.educationalappstore.com/website/purple-mash>], Common Sense (2022): Common Sense Purple Mash Review [<https://www.commonsense.org/education/reviews/purple-mash#:~:text=Because%20activities%20can%20be%20tailor,site%20will%20keep%20them%20engrossed>]

*"I can't understand why schools wouldn't have it now. I can't fathom why as a subject lead, you wouldn't be pushing to get Purple Mash into your school. I don't know if it's just a sort of a teacher thing. I can't be the only person that did this, but I kind of boxed myself off into thinking as the subject leader I need to make all the decisions I need to make it all right. Whereas this year we've become much more outward looking and literally just sent an email to Purple Mash saying I've got these things that I need to do. Is there any chance that these documents are available and then it just that from there it turned into a video meeting. So I think I've had two or three video meetings with [name] and then I joined that teacher panel. So within even just this academic year I've had a lot of support from Purple Mash itself. I just hadn't looked for it before if I'm honest, I just kind of tried to shoulder everything and do it all myself, whereas it was the wrong outlook. **You've got education teams there that are wanting to basically help and that probably have the answers in five minutes**, where it could have taken me 20 hours of scouring around trying to work things out, and even just the simplest of click they show, it's like the data dashboard. I've never really used the data dashboard and then one little video clip of them showing me what it was and I was like, oh, that's really quite useful. So it's the slightest of import, but I've said it before to [names], **I can't put into words how helpful it's been this year**. It's saved me hours and hours and hours and headaches galore and I feel like **because of their input, computing as a subject here is in a very strong position**. There's **not many organisations that have such a genuinely supportive, genuinely proactive and positive team able to help in that way**. It is **something very special about 2Simple**".*

However, whilst Purple Mash is a market leader, with 2 million learners, across 8,188 schools, in more than 74 countries, not all subject leaders have chosen Purple Mash as their primary school computing solution. Anthony Lees, a senior leader who has been part of the Department for Education EdTech Demonstrator programme explained a potential rationale for why this may be the case;

*"I think teachers over the years get used to using a certain set of tools and they have their go to solutions, don't they? They know that when we go out and collect minibests what tool to use, and they know that when they're teaching temperature using line graphs that they have a go-to solution. **There is free stuff out there, there's so many resources out there for absolutely everything**. But we try to bring that back for teachers and help them understand that you can use that, but it's free. So first of all, there's no quality control. It might be gone next time you go to it. Also you have no idea what else is going to be advertised on any of those sites that you're exposing children to. There's just no quality control, there's no longevity. And actually it's not very personalised. **We subscribe to solutions because we support those companies and they support us**. It will still work and it will look like it did before and you won't get any nasty pop-ups. You won't get diverted to some weird site. You won't. It just behaves as you expect it to behave. And for me that's the key. **2Simple has developed a tool set that is absolutely fit for purpose, suits us and we know it will be there and can rely on it**. We would rather subscribe to something and know the tool is going to be there and relied on. And **that means that teachers will plan to use it rather than plan not to use it**. And I've seen so many settings where, you know, computing is a great example where teachers come on a call and they're burnt out*

*because I said, what's your curriculum provision? What solution are you using? And they say, well, I've invented this thing over the last two years that cobbles all these different free tools from the Internet and they are absolutely ruined because they've tried to create a curriculum model from scratch and it's impossible. It's just not a do-able task. And they are being the provider of training for their entire organisation and I have to nicely have the conversation that says this is a House of Cards because it depends 100% on your skill set and your knowledge and you being well and being at that school for this model to survive. And **when you have something in place like Purple Mash, there is an established training provision behind it, where there are tools that are reliable and have gone through many iterations to get to where they are and the stability level they're at.** So then all teachers will plan to use it. Because if it's fragile or flaky, or there's any chance that it might not work then teachers tell you they plan to use it, but they don't really use it. They tell you they put it on their planning and then they unofficially plan what they're really going to do. That's a problem because that doesn't give the children those opportunities. We're letting down children when we do that and actually, it's not the teacher's fault - it's a strategy decision. Actually, **the school should be investing in the right tools so that teachers do deliver them and children do get those experiences of using the right tool for the job.**"*

A number of leaders and specialists mirrored this view in their responses;

*"Even if you are an experienced teacher with computing, it's nice to have something to dip into as well, **to expand your ideas** and to find the sort of objectives that you want to teach against as well and get other sort of cross curriculum ideas."* Samantha Shallcross, Head of Computing, Bromley High Junior School

Many of the subject leaders spoke about the ways in which they had supported staff across their schools or trusts to develop specialist computing knowledge. One of the notable themes in this dataset related to the materials within Purple Mash that facilitated this process. For example,

*"**All the teachers who attended the training sessions found that it was simple to access and simple to use.** So we went through the PowerPoints that have been redeveloped this year and **they break it down step by step and showing what needs to happen.** What the teachers found really helpful are the notes at the bottom of the PowerPoint. So **it really gave them the details that they need** – so for any teachers who needed to really go back and follow that step by step that guidance was there. For some of our more experienced teachers, they could look at those slides and say, yeah, OK, I'm confident what I can do and then they could just teach from the PowerPoints themselves. I've had a couple of teachers come back and give me some feedback over the last few days that **they had really great time and that the children had a really positive time and they were really successful which was great.** So I'd say those resources that have been provided - the power points and also some of the other guidance like the pdf guidance has been really useful because it's broken it down into short steps. So it's not too much too quickly. **It's been manageable for them.**"* Josh Rigby, The Inspire Learning Partnership

The incremental way in which Purple Mash has designed both children’s learning as well as teacher development – applying equal pedagogical consideration to both – has been widely referred to and appreciated by both teachers and subject leaders. For example,

*“It ticks all the boxes. I think that’s **made me feel more confident as a subject lead having that support there and available**, which has in turn meant that we as a school are using more features. And I think through that we’re getting more out of it and **discovering more that Purple Mash actually offers all the time**. And I think that’s the same with other staff members. I think they’re seeing what’s on offer and therefore using it more regularly and more readily. You’ve got the resources there through Purple Mash to be able to do that, and **it’s not putting pressure on teachers**. You’ve got your teaching and learning videos that talk you through how to do things. We’ve now got the **pre-assessment and post-assessment tools** which we’re starting to use and roll those out. We’ve got the **curriculum planning**. So if they’re teaching Vikings type in Vikings [in the search box] and there’s a **range of resources** that they could potentially use.”* Niall Sandwith, Year 6 Teacher / ICT coordinator, Birkwood Primary School

*“It’s a really good package to have, to **give subject leaders that confidence** to say, right, here’s what you need. Teachers, you can have that, the resources are there, the vocabulary is there. The PowerPoint lessons are there. And I think **for a teacher, that’s quite reassuring to have that kind of support**.”* Josh Rigby, The Inspire Learning Partnership

Many of the teachers surveyed, interviewed and observed as part of this research study were non-specialist teachers or non-specialist computing leads (i.e. did not have a specific computing qualification). However, most had undertaken computing specific professional development and some were currently studying towards computing or technology related qualifications as part of their leadership roles.

Consequently, participants had been on a professional development journey since becoming qualified teachers – particularly as most of them had trained and qualified before the 2014 introduction of computing. Teaching staff were asked through a survey (n=420) about the role that Purple Mash had played in developing “The 3 Cs”⁶⁴ in relation to computing with the following results;

- 79% reported a direct increase in **Cognisance** (awareness) about teaching Computing
- 90% reported a direct increase in **Competence** (skills) when teaching Computing
- 80% reported a direct increase in **Confidence** when teaching Computing

Survey responses included the following,

- “It really has supported our teachers to have the **confidence and knowledge to teach all children**.” Senior Leader, St George’s CE Primary School
- “I was asked to deliver computing... and I have found **Purple Mash to be the most educational and helpful tool for me in my role...I couldn’t deliver computing lessons as effectively without it**.” Moira Devlin, Holy Family RC Primary School

⁶⁴ Aubrey-Smith, F., (2021) The three Cs: Developing teachers’ digital & edtech skills
[<https://www.headteacher-update.com/best-practice-article/the-three-cs-developing-teachers-digital-skills-edtech-technology-cpd-1/242153/>]

- *“Purple Mash is certainly **improving teacher confidence in teaching ICT and ensuring the content is covered.**”* Clair Budd, Deputy Headteacher, Beulah Junior School
- *“**It's invaluable for teacher confidence and progression of skills.**”* Ruth French, Computing Lead, Harwood Park Primary School
- *“**We all feel so much more confident delivering the curriculum to our primary aged children.**”* Lindsay Taylor, Computing Lead, St Margaret's Primary School
- *“**Purple Mash works great in our school, teachers who are not very confident with computers find it really helps them to deliver quality lessons.**”* Fernando Toscano, Computing Lead, Sunny View School
- *“**We enjoy using Purple Mash as a school and it gives confidence to teachers who do not feel comfortable teaching computing.**”* Charlotte Ruffell, Teacher, Churchfield CE Academy
- *“**Both children and adults enjoy using the platform. Teachers are developing their skills and have found the updated content extremely supportive and useful.**”* Nicola George, Computing Lead, Northgate Primary School

These headline findings were probed extensively within interviews with non-specialist teaching staff and triangulated with computing subject leaders and observations during school visits. Research concerned with teacher professional learning sets out that effective professional development shares a set of characteristics⁶⁵, where professional learning is;

- focused on current students and supporting progression in their learning
- reflexive and actively discussed with expert peers – often through coaching or mentoring
- personal to the needs, beliefs and previous experiences of the teacher, and
- based upon research evidence, and sustained over a period of time⁶⁶.

Purple Mash offer a range of direct training to schools as part of their product subscription. This is used in a range of ways to enable schools to offer their own bespoke sequence of training and support to all those using Purple Mash.

*“The CPD that was available was good. Since they had that training, **I've seen an uplift in teachers use and confidence.** I'm currently doing an NPQSL and they're talking heavily about professional development being less of a standalone one year event and more trying to drip feed and keep repeating things. So what I've done following the CPD is **revisit some of the things that were mentioned to let staff have a bit of a go with it while I'm there** and now, rather than looking at an annual one year CPD event, whether it could be broken down through the year to build that teaching confidence. You always talk about first aid in that regard. You get first aid training once a year and when it comes around, something's changed. How many compressions? So I've just got my head around it should be one breath and five, to all*

⁶⁵ Education Endowment Foundation (2021) Review identifying the characteristics of effective teacher development: a systematic review and meta-analysis. [<https://educationendowmentfoundation.org.uk/education-evidence/evidence-reviews/teacher-professional-development-characteristics>]

⁶⁶ Aubrey-Smith, F., (2021) Effective Professional Development. [<https://www.headteacher-update.com/best-practice-article/evidence-to-action-the-seven-es-of-effective-cpd-professional-development-learning-research-teaching-education/235279/>]

*of a sudden is now one and 15 and you only get that once a year. That's quite important. So I do feel like **regular CPD will make a big difference to staff confidence.***" Niall Sandwith, Year 6 Teacher / ICT coordinator, Birkwood Primary School

Initial thematic analysis⁶⁷ of interview data with teachers and school leadership colleagues surfaced a wide range of approaches to providing professional learning for staff. Some schools offered an annual INSET style session, with others offering twilight staff meetings or drop-in support sessions. Many provided a steady 'drip feed' of links to timely resources ahead of teachers planning for particular topics, special events, or units of work. There were two consistent findings across this dataset. The first of which was that schools were able to immediately access and use the professional development and support materials in the Teachers Area of the Purple Mash site without needing to reinterpret them or undertake 'train the trainer' preparation. **Leaders were particularly grateful for this as it removed additional subject leadership capacity demands from an already pressurised workforce.** The other trend was that **leaders valued the pedagogical design of the professional development and support materials** – not just for the content itself, but also for the way in which it could be **used to model broader pedagogical learning – particularly for early career or underperforming teachers.** For example,

*"To be able to have that scaffolded solution for a teacher is probably one of the reasons that Purple Mash is so popular and so successful. It is about the outcomes for the learners. So, we are a teaching school environment really with a lot of people very early in their career, lots of them. The great thing is that **Purple Mash itself really helps scaffold their understanding.** We try to pair a newish teacher with a teacher with a few years under their belt and we grow that second teacher into someone that is an experienced professional at the same time. Tools like this really help because **it gives them that very clear model** of: How do you know what are bite sized chunks of content? What moves learning and knowledge formation forward in an incremental way? How you know that spiral curriculum nature of a lot of the Purple Mash content as well that revisits things and builds on previous learning? For teachers that are in their initial years of becoming teachers, having that understanding that **this is the way learning is built and that this is how you must plan everything from now on – well, tools like Purple Mash model that.** It is designed that way, isn't it? It's part of what to me makes that so successful."*
Anthony Lees, The Cornerstone Academy Trust

*"[The Purple Mash Computing] Scheme of Work **increased their confidence.** The fact that you can follow the activity step by step and you can actually almost code along with the children. They're not long activities and it's not hard to go through it first yourself and have a go yourself or to understand the concepts. And the videos are all there in the background to explain to teachers what the concepts are if they're not sure. **It has had a big impact on being able to do that across the school.**"* Samantha Shallcross, Head of Computing, Bromley High Junior School

⁶⁷ Braun, V., & Clarke, V., (2006) Using thematic analysis in psychology. *Qualitative research in psychology* 3(2) 77-101

*“I feel pretty pleased that **the teachers have felt really positive about coding.** It's something that I think can put a lot of fear into some staff. They know English and maths very well. But if you say right, we're coding today then oh my gosh. But actually, once I've done that initial training session and they've got over that initial fear of actually what it is, it's actually very simple and actually it's fine. I think that **it has been really positive that the teachers have come away from this empowered to do this and feeling positive about it.** And that is **a huge positive for Purple Mash that the resources have enabled teachers to feel that way.**”* Josh Rigby, The Inspire Learning Partnership

A number of computing leaders spoke about the ways in which **teachers had been empowered by the structure, scaffolding and support that Purple Mash's 'Teachers Area' offers.** For example, speaking about a non-specialist teacher, Jen McCulloch, Computing Teacher, New Brighton Primary School described how,

*“Teachers used to ask me what they should use Purple Mash for in the classroom. With my support, and the support available in Purple Mash, those teachers are now up and running and able to make those choices themselves. **They know how to use lots of the different tools in Purple Mash and can devise their own opportunities for the children.**”*

*“Purple Mash definitely helped us as a school to address some fundamental problems teachers had around teaching Computing, particularly their **confidence and subject knowledge.**”* Stuart McLean, Teacher, Norman Street Primary School

*“The planning and resources have really **helped our teachers become confident in teaching computing.**”* Gemma Parsons, Computing Lead, Galley Hill Primary School & Nursery

Reflecting on the ways in which Purple Mash has been used over a group of schools, Rachel Beyer, Director of Studies, One School Global spoke about the impact of professional development on children's learning,

*“We could look at the statistics and we could see the user stats, and then when we did the training, **it literally skyrocketed.** We've kept that pattern going now - we tend to put training in every six months and it **boosts the impact of what children are learning in Purple Mash.**”*

Non-specialist teachers spoke in more detail about the specific aspects of Purple Mash that were helping them to build the 3 Cs (Cognisance, Competence, Confidence)⁶⁸ in their practice.

*“As a non-computing specialist, I think that **having that sort of scaffold and structure there is so useful.** I know that my units are there so **I can look ahead for the year and know what I'm teaching and when.** Having the overall unit plan so that you can have a read through of that and know this is where we're moving throughout the unit. Then it's all **broken down so clearly into week by week** so I know exactly*

⁶⁸ Aubrey-Smith, F., (2021) The three Cs: Developing teachers' digital & edtech skills
[<https://www.headteacher-update.com/best-practice-article/the-three-cs-developing-teachers-digital-skills-edtech-technology-cpd-1/242153/>]

*where I am and you can literally pick it up and go. I love it as a teacher, **knowing that that bank of resources is there**, that the planning's all there. **It runs really smoothly** because you can pick it up and think right, that's the activity I need to find, set it ahead of time and **it's done ready for the children** to log on and use and the slides that run alongside that are so helpful.” Natalie Loat, Sherborne House School*

When talking about the impact of professional learning, many school leaders spoke about bespoke approaches to raise whole school cognisance, competence and confidence. For example,

*“**A lot of them weren't comfortable with any of it to begin with**, which is understandable because this is a new world. **We wanted to have a whole school approach** so we had a couple of Viking days and used Purple Mash together – as a whole school. **We used the [Purple Mash] Display Board** so they can share their work. We've got quite a lot of children so there were about 35-40 pages worth on the display board of all the pictures of the learning they've done over a couple of days so that they could, you know, show everyone there. Instead of doing their blogs per year group, then it was one blog that the whole school did together so they could see what each other were adding and the whole school shared that blog. The teachers realised that getting over that onerous task of learning it to then realise that **there are benefits to doing it within Purple Mash**. Now, they have really taken it on and sort of adapted it so that it fits them and their class, and it works for them.” Nicola Folwell, Deputy Head, Glebelands Primary Academy*

The impact of the diverse range of approaches to professional development within each school was clear when probing survey, interview and observational datasets specific to individual schools or trusts. 60% of all schools who took part in this study were actively using the teaching resources in Purple Mash to support planning, assessment and professional learning.

There were **significant positive correlations between the schools which reported a pro-active strategy** of introducing staff to resources, tools and support materials, and the **positive experiences reported by children** attending those schools. Notably, schools where there had been a **targeted focus on building cognisance, competence and confidence** in teacher's practice correlated strongly with the presence of **metacognitive vocabulary** within children's responses. In other words, **schools using Purple Mash who planned strategically to support teacher professional learning also saw an increase in successful metacognition within children's learning**. This finding aligns with internationally published research regarding both teacher professional learning and about metacognition⁶⁹.

⁶⁹ e.g. Education Endowment Foundation (2021) Review identifying the characteristics of effective teacher development: a systematic review and meta-analysis. [<https://educationendowmentfoundation.org.uk/education-evidence/evidence-reviews/teacher-professional-development-characteristics>] and Education Endowment Foundation (2021) Metacognition and self-regulated learning. [<https://educationendowmentfoundation.org.uk/education-evidence/guidance-reports/metacognition>]

This finding was probed further with analysis of a combination of datasets collected through surveys and interview data (n=420). This analysis found that of the teachers who were actively using Purple Mash in their classroom practice,

- 74% use subject specific lesson content to **provide skill development**
- 73% use tools to **learn and practise** specific subject skills
- 72% use **topic content** for specific lessons or units of work
- 72% use **games for practising** specific subject skills.

Of these teachers, there were a range of benefits cited, including that,

- 75% said that Purple Mash **ensures effective use of children's learning time** – taking them to the right activity at the right time
- 74% said that Purple Mash **ensures effective use of teacher's time** by enabling teachers to sequence work and/or plan activities in advance.

Teachers were asked about the impact of children's Purple Mash uses on their planning of teaching and learning. These statistics should be interpreted with a degree of caution because they do not take account of the purpose of the task set by the teacher themselves. For example, 38% said Purple Mash **stretches the most capable** children further, but there is no available dataset from the same sample to determine whether teachers had intended to provide stretch for the more or most able (i.e. they may not have set individualised tasks / differentiated activities in the first place). These figures should therefore be viewed as generalisations across all uses of Purple Mash – both informally and formally, and both at home and at school.

- 65% said Purple Mash encourages children to **consolidate their learning**
- 52% said Purple Mash provides **insights into children's confidence** in a particular task
- 44% said Purple Mash **targets interventions** for those who need direct support
- 43% said Purple Mash **organises activity progression** supporting teachers in targeting intervention
- 42% said Purple Mash provides valuable **skill specific attainment data**
- 34% said Purple Mash ensures **retention of skills and knowledge**.

"We use Purple Mash every week. It really helps consolidate what the children have learnt." Amy Wilson, Teacher, Reed First School

The final aspect of non-specialist teacher engagement with Purple Mash related to teacher workload. The overwhelming finding in relation to this line of inquiry was that **Purple Mash was seen as a significant contributor to a reduction in teacher workload**. This finding is in line with user reviews published elsewhere which reported that 94% of teachers felt that Purple Mash improves teaching efficiency, and 89% felt that it reduces teacher workload⁷⁰. As Mark Blissett, Key Stage Two teacher at Sherborne House School explained,

"It's made my life so much easier because the planning and stuff is there. I can just take it and adapt bits to whatever you need. It's really useful just to have those different units all set out and you can map the journey with everything in front of you. You can see what skills are being covered and the progression of where they

⁷⁰ EdTechImpact (2022) Purple Mash User Reviews

*can go next - **getting that launch trajectory right**. It's really well organised, so it tells you where the resources are as well – it **saves us hours** and just makes it all so much easier.”*

Workload reductions and efficiencies for teachers were largely attributed in part to the pre-prepared resources (e.g. planning and assessment documents, and support materials), and in part to the ease with which work could be assigned to children and then assessed or discussed. For example,

*“Staff realised that it can have a **really positive impact on their workload**.” Rachel Beyer, Director of Studies, One School Global*

“For teachers to adapt it's easy because it's so straightforward. It's all there - you go on, you go to the teacher's area and all the planning is there and all the videos are there.” Clare Mathema, Computing Leader at Sherborne House School

*“That's what we wanted to do, put **no barriers between them and the work**. The fact that they could then go back and mark work like a booklet rather than having to go into each individual child is just brilliant because you can just flip through it, and that's far better than taking 30 different books to my house – being able to mark as you go, being able to send it back and say to them that's not quite right, please can you have another go and reset – you were actually able to give them advice and get them to have another go and see their improvements.” Nicola Folwell, Deputy Head, Glebelands Primary Academy*

*“I think they like that it's just easy to use that we can just do it. They were just **grateful to have something that didn't increase their workload** and we could just set stuff. I think teachers got on that quite quickly. You want to see that the kids are doing work. It was easy to see who's done what.” Helen Worrall, Computing Lead, The Harmony Trust*

*“What they do is they basically, **instead of writing themselves a weekly timetable, some of them are actually just using the blog to put all their work on**. So they're attaching the PDF, they're attaching the PowerPoints, they're attaching any resources that the children need to that so that they've got it all there. And therefore they're not doing it twice. So children will go to their Purple Mash blog and **all of their learning will be there**. They may have links to click and they may have the **resources so that they can independently work through them** and they will have any slides, and they might have links to websites that might have embedded videos. And they really like it because they know it's there and it's been very consistent since the beginning of lockdown. We learned a lot of lessons, and the **teachers really up-levelled all of those skills**, and then we worked out the whole blog system for more formalised teaching.” Nicola Folwell, Deputy Head, Glebelands Primary Academy*

*“I think **the PDF annotator has revolutionised Purple Mash**. One of the other pieces of software we use - [product name] was one of the tools that we couldn't do without because we couldn't annotate a PDF anywhere else. Now that's been added in [to*

*Purple Mash] then **we don't have to pay for both products.** We can just use Purple Mash". Jen McCulloch, Computing Teacher, New Brighton Primary School*

Support from 2Simple

As reported in a previous section of this report, all of those who engaged with this research study spoke very highly of the 2Simple colleagues that they had engaged with and the value that they placed on the high quality support received. This trend permeated the data regardless of how long schools had been using Purple Mash, the quantity or nature of their use of Purple Mash, or who the decision maker had been for the purchase or renewal of the product (e.g. where another leader or someone centrally based for a MAT or group had made those decisions on behalf of the school and the school had 'inherited' the decision). It is helpful to note the impact of this trust and support as this has had a direct impact on the quantity of teachers using the product and consequently on the impact on children's learning.

*"It's been a **really open partnership.** There's been other products that we've had in that time that have come and gone. We have retained Purple Mash for all of that time because of the **different qualities of what it offers and provides for us.** And because [the 2Simple team] has been so open and so giving and so warm and welcoming. There's been many times where we've looked at maybe one aspect of what one of the tools does and said it would be really lovely if it did this as well. And within a little while, [the team] goes away, get [colleagues] on it and we come back and suddenly it does that thing and that's lovely to have that relationship where you feel like **you're really adding to the quality of what's there** and having that feedback and that **professional dialogue.** There's longevity to it, and there's always been some part of it that is new and fresh." Anthony Lees, The Cornerstone Academy Trust*

*"The **help desk is so brilliant. They're so quick.** I emailed something yesterday and like within an hour they had replied. It's fantastic. **I've always found them really, really helpful. Really impressed.** Really, really good. And actually that's really important to have that quick reply because if you can't communicate with somebody and something's not going right, people don't use it." Clare Mathema, Computing Lead, Sherborne House School*

*"They're **very good at getting back to us straight away on things.** I'm constantly badgering the support team for something that I want to know, how to do, and **they're always happy for feedback and suggestions and answering questions.**" Stephanie Barber, Computing Lead, Snaresbrook Preparatory School*

*"It's two things... **It's always up to date,** so I think it was a year and a half ago, the 'Education for a Connected World'⁷¹ document came out and like **the day it came out, Purple Mash published guidance**⁷² - here's Purple Mash and how it connects to Education for a Connected World. **So it's always up to date.** And, they've **always got***

⁷¹ UK Council for Internet Safety (2020) Education for a connected world [https://www.gov.uk/government/publications/education-for-a-connected-world]

⁷² 2Simple (2020) Education for a connected world resource [https://www.2simple.com/free-stuff/education-connected-world-free-resource/]

*relevant activities like the Queen's Jubilee things and all these brilliant ideas like the Guinness World Record attempt for Internet safety day, all those sorts of things that are **always current**. And for teachers being able to have **all these progression documents and schemes of work and help guide** and things like that. **Again, always up to date. Always current.** You never go on there and find that something is the old version. It's always bang up to date and **I think that's really important as a class teacher that needs to be able to access things straight away.** My headteacher has recently allowed me 10 minutes per staff meeting to share things every week. I'm like, do you know you could do this? Did you know you could do this and slowly getting other teachers using Purple Mash more across the curriculum". Stephanie Barber, Computing Lead, Snaresbrook Preparatory School*

*"It's **quite fool proof** because anything you do on there, one of the amazing Purple Mash team can get it back for you. I accidentally deleted all of the blogs we have done because I take myself off of the list of who could see it, so I messaged Purple Mash and they were like 'ohh here it is', straight away so it's things like that. It's a fall back that teachers have because they're so worried they're going to break something on the Internet or the computer, that it's nice to show them that they can't break it. So that's helped their confidence a lot." Fleur Bennett, Computing Lead, Harold Wood Primary School*

*"I love the way that the **2Simple team listen to teacher feedback**. There's been a number of things throughout my years of using Purple Mash that I have suggested to the team and **it just happens**. It's just fantastic. I love the product. I just think really positive when I go into our schools and I talk about Purple Mash – people are really complimentary, they love it. I think the way it just keeps improving is great. You don't want to buy a software product where nothing happens for a few years. It's great that it's **always evolving and there's more research being added in there - these kind of reviews that are going out to the teachers to encapsulate what you can do and best practices** – it's lovely to see.*

*It's just everything there. The marking in the comments to the children, the way it lists the resources and you can easily print off passwords, which sounds absolutely ridiculous. But if the children can't log in then learning time is lost. In some other products they ask you to fill out letters by hand with the passwords on. In Purple Mash it's like just one simple PDF that you can print off. That in itself is brilliant. **The team behind Purple Mash know exactly what we need.** It's a **one stop shop for primaries** and it has got everything in there that you need. It's all of the topics that you generally teach in primary school. All the different tools that you need. There's a curriculum in place for computing. There are lots of different apps. There's so much in it. **For an annual subscription when you work out how much it costs per child, what else are you going to get for that money? Really, it's kind of it's a no brainer, really, and there's not really anything out there that's quite like it.**" Jen McCulloch, Computing Teacher, New Brighton Primary School.*

Conclusions

The aim of this study was to identify the extent to which **Purple Mash is meeting the needs of teachers and learners** in

- achieving the aims and requirements of the computing curriculum, and
- achieving 2Simple's overarching aim to provide excellent, accessible, and inspiring software to encourage children to love learning and prepare them for later life.

This aim has been addressed by investigating a number of lines of inquiry. Each line of inquiry invited teachers, school leaders and learners to share their perspectives and insights.

- 1) **Inspiring learning** for all children – specifically in relation to computing
- 2) Building children's skills, knowledge, understanding and application through delivery of a **high-quality computing curriculum**
- 3) Providing **progression for all children** in their learning
- 4) Preparing children for **secondary school** and their **later life**
- 5) Contributing to **raising standards** – in computing, and across the wider curriculum
- 6) Increasing **teacher skills and confidence** in developing children's knowledge about computing
- 7) Supporting **teacher professional development** and **workload**.

Utilising survey, interview, observation and focus group data from 6,328 teachers and children from across 1,003 schools, a range of findings have been set out in this report which provide persuasive evidence that Purple Mash **is** meeting the needs of teachers and learners.

Furthermore, that evidence surfaced and described through this report suggests that Purple Mash;

- provides a computing scheme which meets the needs of the primary curriculum from year 1-6 including the more and most able, children with SEND and those who face barriers due to language or literacy
- builds staff cognisance, competence and confidence in understanding, teaching and facilitating learning of the computing curriculum
- ensures consistency for children across all ages and stages in their learning of computing – evidence suggests that this may be even more so than for schools whose curriculum has been designed by a computing specialist and then partly or wholly delivered by non-specialist teaching staff
- engages children in computing directly through units and lessons but also indirectly through activities which children find intrinsically motivating and choose to do outside of class time
- builds confidence for both children and teachers in exploring, choosing and skilfully using additional technologies
- scaffolds children in developing robust skills and understanding which they are then able to apply confidently when using other technologies – including those traditionally associated with secondary education and the adult workplace
- engages children with coding from a very early age – building confidence and willingness ready for formal learning about coding

- ensures solid progress for all children, and encourages high attainment outcomes
- appropriately balances cognitive load demands as part of children’s learning
- encourages independent and self-initiated learning as well as collaboration in learning
- meaningfully supports teacher formative and summative assessment and leadership monitoring of standards and outcomes
- supports a reduction in teacher workload in relation to planning, resourcing, monitoring, marking and feedback, report writing, tracking and accountability
- encourages and facilitates children’s metacognition
- encourages self and peer assessment and for children to lead the learning of their peers
- increases the quantity and regularity of formative assessment
- scaffolds children to meet or exceed national curriculum age related expectations
- encourages creativity within learning
- acts as a launchpad for individualised stretch learning for children who have been identified as gifted and talented / more and most able
- builds self esteem for children with particular talents
- is perceived by children and adults as a safe space to learn, and a trusted partner in learning
- is perceived by teaching and leadership staff as a valued source of expertise – both about computing as well as about wider approaches to subject leadership and pedagogy
- provides a suitable level of challenge for all primary school year groups
- has a very wide range of tools, applications and resources, meaning that (a) most users are not yet aware of everything that is available to them, and that (b) most schools use Purple Mash in their own bespoke way across classes / year groups / subjects / school priorities
- has made a significant impact on children’s awareness, skills and confidence with digital literacy, computing and information technology
- provides highly engaging and stimulating learning experiences across the curriculum – with children observed displaying exceptionally high levels of motivation and interest in their learning
- is seen as a highly positive framed way of teaching digital literacy and online safety
- is seen as highly inclusive – enabling children with a wide range of specific additional needs to access learning meaningfully and successfully
- is perceived as making a significant contribution to engaging girls with computing – setting in place mindsets, confidence and interest which is likely to contribute to more girls completing computing qualifications and entering computing related careers
- was seen as a vital tool and provider-of-choice for facilitating a quality curriculum during Covid lockdown / remote schooling periods
- is widely perceived as being designed by those knowledgeable about how children learn, what engages children, and what best supports the staff teaching them
- has a design which understands and incorporates biological research on the importance of reward cycles in learning experiences

- was widely cited by children and teachers as positively impacting their learning journeys – described both qualitatively and quantitatively
- encourages equity and dignity in learning by providing a consistent accessible interface in partnership with tools that can provide highly individualised learning activities and experiences
- offers direct cost savings to schools by providing a very wide range of tools, resources and applications – reducing the need for schools to purchase multiple products
- directly engages reluctant readers – particularly boys – through Serial Mash, raising standards in reading
- directly impacts progress on children preparing for their national multiplication check
- supports children in consolidating previous learning and building upon their new learning incrementally
- saves teacher time through the efficient mechanisms for assigning and marking work
- is used for learning both in school and at home, with home learning not necessarily needing to be formal homework or directed by a teacher, but independently chosen for pleasure
- encourages social learning approaches beyond the classroom - with children then confidently reaching out to peers and teachers to support their independent and informal learning
- is valued by parents for the child-oriented design and the impact on children's willingness to do homework
- offers an extensive range of professional learning and support for both the teaching and learning of computing as well as the wider curriculum tools and resources and subject leadership
- is seen as a significant contributor in reducing teacher workload
- provides valued, high quality customer support to teachers and leaders, including prompt communications, very responsive resource authoring and customer oriented product development.

Recommendations

The data analysis process within this research study identified a small number of recommendations that would be beneficial for interested stakeholders to consider. These include,

In relation to the development of products and services

- 1) To include explicit explanation of pedagogical strategies embedded within teaching and learning materials – supporting broader teacher pedagogical development (in particular for early career teachers).
- 2) To identify, refine and improve mechanisms for increasing awareness amongst school staff of the wide range of tools, applications, resources and support materials available.
- 3) To continue to offer, and to expand where possible, the range of subject leadership specific support, including support for staff leading professional learning within schools/trusts.
- 4) To provide a series of recommendations for schools about effective adoption, training, support and development models at different stages of their Purple Mash journey – encouraging schools to share their own successes and current challenges with each other through peer networks.

In relation to policy development / sector research

- 1) To contribute towards sector research on effective teaching and learning of computing by sharing the findings from this report – specifically in relation to:
 - consistency across non-computing specialist teachers
 - the relationship between consistent curriculum provision (of the Purple Mash Scheme of Work) and improved formative assessment
 - the relationship of curriculum provision (of the Purple Mash Scheme of Work) and embedding teaching of metacognitive strategies.
- 2) To champion a focus on professional learning research specific to primary school computing, which recognises and values the process of learning computing in itself rather than focusing on its role in contributing towards secondary computing readiness and computing career trajectories.
- 3) There are some misconceptions between teacher’s perceptions of children’s learning, and children’s own perceptions of their learning (e.g. upper key stage two children). This could be addressed further by an in-depth study of teacher intentions and children’s lived experiences when using specific aspects of the Purple Mash Computing Scheme of Work.

References

2Simple (2020) Education for a connected world resource [<https://www.2simple.com/free-stuff/education-connected-world-free-resource/>]

2Simple (2021) Computing scheme of work [<https://www.2simple.com/free-stuff/computing-scheme/>]

2Simple (2022) *Purple Mash and Ofsted's High Quality Computing Curriculum*. [<https://www.2simple.com/blog/search/ofsted/>]

Aubrey-Smith, F., (2020) An exploration of the relationship between teachers' pedagogical stance and their use of ICT in classroom practice. [<http://oro.open.ac.uk/75001/>]

Aubrey-Smith, F., (2021) Effective Professional Development. [<https://www.headteacher-update.com/best-practice-article/evidence-to-action-the-seven-es-of-effective-cpd-professional-development-learning-research-teaching-education/235279/>]

Aubrey-Smith, F., (2021) The three Cs: Developing teachers' digital & edtech skills [<https://www.headteacher-update.com/best-practice-article/the-three-cs-developing-teachers-digital-skills-edtech-technology-cpd-1/242153/>]

Bers, M., González-González, C., and Armas-Torres, M., (2019), 'Coding as a playground: promoting positive learning experiences in childhood classrooms' *Computers and Education* 138. pp.130-145.

Braun, V., & Clarke, V., (2006) Using thematic analysis in psychology. *Qualitative research in psychology* 3(2) 77-101

British Computer Society (2022) Computer Science now the fastest growing degree subject new data reveals [<https://www.bcs.org/articles-opinion-and-research/computer-science-now-the-fastest-growing-degree-subject-new-data-reveals/>]

Bruner, J., (1960) *The Process of Education*. Cambridge, MA.

Common Sense (2022): Common Sense Purple Mash Review [<https://www.commonsense.org/education/reviews/purple-mash#:~:text=Because%20activities%20can%20be%20tailor,site%20will%20keep%20them%20engrossed>]

Computing At School (2022) National Reports and Policy Documents [<https://www.computingatschool.org.uk/teaching-resources/2012/september/national-reports-and-policy-documents>]

Curzon, P., McOwan, P., Donohue, J., Wright, S., and Marsh, M., (2018) 'Teaching of concepts', in 'Computer science education: perspectives on teaching and learning in school'.

DfE (2013) National Curriculum Computing Programmes of Study.
[<https://www.gov.uk/government/publications/national-curriculum-in-england-computing-programmes-of-study>]

DfE (2021) Early Years Foundation Stage Framework
[<https://www.gov.uk/government/publications/early-years-foundation-stage-framework--2>]

DfE (2022) EdTech Demonstrator Schools
[<https://www.gov.uk/government/publications/edtech-demonstrator-schools-and-colleges-successful-applicants/about-the-programme>]

DfE (2022) Multiplication Tables Check
[<https://www.gov.uk/government/collections/multiplication-tables-check>]

DfE (2022) Pupil Census data 2021/22. [<https://www.gov.uk/government/statistics/schools-pupils-and-their-characteristics-january-2022>]

DfE (2022) School workforce in England November 2021.
[<https://www.gov.uk/government/statistics/school-workforce-in-england-november-2021>]

EdTechImpact (2022) Purple Mash User Ratings
[<https://edtechimpact.com/products/purple-mash>]

Education Endowment Foundation (2021a) Metacognition and self-regulated learning.
[<https://educationendowmentfoundation.org.uk/education-evidence/guidance-reports/metacognition>]

Education Endowment Foundation (2021b) Review identifying the characteristics of effective teacher development: a systematic review and meta-analysis.
[<https://educationendowmentfoundation.org.uk/education-evidence/evidence-reviews/teacher-professional-development-characteristics>]

Education Endowment Foundation (2021c) Teacher feedback to improve pupil learning
[<https://educationendowmentfoundation.org.uk/education-evidence/guidance-reports/feedback>]

Education Select Committee (2022) The impact of COVID-19 on education and children's services
[<https://committees.parliament.uk/work/202/the-impact-of-covid19-on-education-and-childrens-services/>]

Educational App Store (2022) Purple Mash
[<https://www.educationalappstore.com/website/purple-mash>]

FFT Education Datalab (2021) Results [<https://results.ffteducationdatalab.org.uk/>]

Grover, S., and Basu, S., (2017), 'Measuring student learning in introductory block-based programming: examining misconceptions of loops, variables, and Boolean logic', in 'Proceedings of the 2017 ACM SIGCSE Technical Symposium on Computer Science Education'.

Hattie, J., (2018) Hattie Ranking: 252 Influences and Effect Sizes Related To Student Achievement [<https://visible-learning.org/hattie-ranking-influences-effect-sizes-learning-achievement/>]

ISI Report (2021) Inspection Report: Sherborne House School [<https://www.sherbornehouse.co.uk/images/uploads/general/Sherborne-House-RCI-EQI-Report-FINAL-2021-07-07.pdf>]

Kallia, M., (2017) 'Assessment in computer science courses: a literature review'. The Royal Society.

Karaseva, A., Siibak, A., & Pruulmann-Vengerfeldt, P. (2015) Relationships between teachers' pedagogical beliefs, subject cultures, and mediation practices of students' use of digital technology. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, 9(1)

Kemp, P., and Berry, M., (2019) The Roehampton annual computing education report pre-release snapshot from 2018. [<https://www.bcs.org/about-us/bcs-academy-of-computing/the-roehampton-annual-computing-education-report/>]

Manches, A., and Plowman, L., (2017) 'Computing education in children's early years: a call for debate' *British Journal of Educational Technology* 48(1) pp.191-201

Meerbaum-Salant, O., Armoni, M., and Ben-Ari, M., 'Habits of programming in Scratch', ITiCSE '11: Proceedings of the 16th Annual Joint Conference on Innovation and Technology in Computer Science Education, 2011. pp.171-172

Muller, L., and Goldenberg, G., (2021) Education in times of crisis: effective approaches to distance learning. *Chartered College of Teaching*. [https://chartered.college/wp-content/uploads/2021/11/MullerGoldenberg_FULL_NOV21.pdf]

O'Connell, S., (2022) Ofsted Deep Dives [<https://www.headteacher-update.com/best-practice-article/are-your-pupils-ready-for-ofsteds-deep-dives-primary-school-inspection-inspectors-improvement/246487>]

Office for National Statistics (2021) Remote schooling through the coronavirus (COVID-19) pandemic, England: April 2020 to June 2021 [<https://www.ons.gov.uk/peoplepopulationandcommunity/educationandchildcare/articles/remoteschoolingthroughthecoronaviruscovid19pandemicengland/april2020tojune2021>]

Office of National Statistics (2020) School workforce in England [<https://explore-education-statistics.service.gov.uk/find-statistics/school-workforce-in-england>]

Ofsted (2021) Curriculum [<https://educationinspection.blog.gov.uk/2021/12/08/curriculum-keeping-it-simple/>]

Ofsted (2021) Education Inspection Framework [<https://www.gov.uk/government/publications/education-inspection-framework>]

Ofsted (2022) Research Review Series: Computing [<https://www.gov.uk/government/publications/research-review-series-computing/research-review-series-computing>]

Parcell, E., and Baker, B., (2017) *Narrative Analysis* [<https://methods.sagepub.com/reference/the-sage-encyclopedia-of-communication-research-methods/i9374.xml>]

Prensky, M., (2001) *Digital Natives, Digital immigrants*. [<https://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf>]

Rich, P., Browning, S., Perkins, M., Shoop, T., Yoshikawa, E., and Belikov, O., 'Coding in K-8: international trends in teaching elementary/primary computing', *TechTrends* 63(3) pp.311-329.

Robins, A., Margulieux, L., and Morrison, B., (2019) 'Cognitive sciences for computing education', in 'The Cambridge handbook of computing education research', edited by SA Fincher and AV Robins, Cambridge University Press. pp.231-275

SchoolZone (2022) Purple Mash Review [<http://www.schoolzone.co.uk/insight/purple-mash-summary-review>]

Sentence, S., and Csizmadia, A., (2017) 'Computing in the curriculum: challenges and strategies from a teacher's perspective', in 'Education and Information Technologies', 22(2) pp.469-495

Shibli, D., and West, R., (2018) Cognitive Load Theory and its application in the classroom. *Impact: The Science of Learning* (2) [https://my.chartered.college/impact_article/cognitive-load-theory-and-its-application-in-the-classroom/]

Shulman, L., (1986) 'Those who understand: knowledge growth teaching', in 'Educational Researcher', 15(2), pp.4-14

TCAT (2022) English Hub [<https://englishhub.education/>]

Teach Computing (2021) Digital Literacy within the Computing Curriculum [[https://raspberrypi-education.s3-eu-west-1.amazonaws.com/NCCE+Reports/Digital+Literacy+Within+the+Comuting+Curriculum+\(Final\).pdf](https://raspberrypi-education.s3-eu-west-1.amazonaws.com/NCCE+Reports/Digital+Literacy+Within+the+Comuting+Curriculum+(Final).pdf)]

The Royal Society (2017), *After the reboot: computing education in UK schools*.
[<https://royalsociety.org/-/media/policy/projects/computing-education/computing-education-report.pdf>]

Tondeur, J., van Braak, J., Ertmer, P., and Ottenbreit-Leftwich, A., (2016) Understanding the relationship between teachers' pedagogical beliefs and technology use in education: a systematic review of qualitative evidence. *Educational Technology Research and Development*, pp.1-21.

Twining, P., and Maher, D., (2017) Bring your own device. *Educational Research*, 59(1) pp. 73–88 [<http://oro.open.ac.uk/47546/>]

UK Council for Internet Safety (2020) Education for a connected world
[<https://www.gov.uk/government/publications/education-for-a-connected-world>]

Vygotsky, L.S. (1978). *Mind in Society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Wellcome Trust (2020) *Science Education Tracker*.
[<https://wellcome.org/sites/default/files/science-education-tracker-2019.pdf>]

Wise, R., (2004) 'Dopamine, Learning and Motivation' *Nature Reviews Neuroscience* 5. pp.483-494

Wohl, B., (2021) The Impact of the English Computing Curriculum on Young People as Delivered at Key Stage 3. PhD Thesis. Lancaster University
[<https://eprints.lancs.ac.uk/id/eprint/155343/3/2021wohlphd.pdf>]

Acknowledgements

Whilst this research brings together contributions from 6,328 teachers and children from across 1,003 schools, it is appropriate to extend particular thanks to those who contributed significant amounts of their time.

With very grateful thanks to the following schools for their very warm welcome and very significant contributions to this research.

- Ashbury Meadow Primary School
- Beulah Junior School
- Birchwood Primary School
- Birkwood Primary School
- Blackfield Primary School
- Broadclyst Primary School
- Bromley High Junior School
- Castleview Primary School
- Churchfield CE Academy
- Corton Primary School
- Donhead Preparatory School
- Edge Grove School
- Francis Holland School
- Galley Hill Primary School & Nursery
- Glebelands Primary Academy
- Harold Wood Primary School
- Harwood Park Primary School
- Hillside Primary School
- Holy Family RC Primary School
- Holy Name Catholic Primary School
- Inmans Primary School
- Kingston St Mary CofE Primary School
- Lanchester Endowed Primary School
- Mark First School
- Normal Street Primary School
- Northgate Primary School
- Oakdale Junior School
- One School Global
- Our Lady Queen of Peace School
- New Brighton Primary School
- Northmoor Academy
- Reed First School
- Richmond School, The Harmony Trust
- Snaresbrook Preparatory School
- Sherborne House School
- St Andrew's Infant School

- St George's CE Primary School
- St Margaret's Primary School
- St Mary's CE Primary School
- St Michael's Academy
- Sunny View School
- The Cornerstone Academy Trust
- The Inspire Learning Partnership

Particular thanks are also extended to the following people who generously gave significant amounts of their valuable time and expert insights

- Mark Burrows
- James Williams
- Kat Salisbury
- Alban Squires
- Rebecca Summer

About the Author

Dr Fiona Aubrey-Smith is an award-winning leader with a passion for making learning meaningful for every child. As Director of One Life Learning, Fiona provides strategic education consultancy services to schools, professional learning providers and edtech companies. She is also an Associate Lecturer and Research Consultant at The Open University – teaching and supervising postgraduate research programmes as well as undergraduate education degree courses in education, pedagogy and research methods. Fiona sits on the board of a number of charitable trusts and is a regular contributor to books, panels, and events addressing Education, Pedagogy and Education Technology. Fiona was named by Education Business as one of the 50 most influential people in education in both 2021 and 2022 and has been recognised for her contribution to the teaching profession and across education with Fellowships awarded by both the Chartered College of Teaching and the Royal Society of Arts.

In case of enquiries please contact:
Fiona@OneLifeLearning.co.uk

Cite this report as

Aubrey-Smith, F., (2022) *Purple Mash: The Evidence and The Impact: An independent research review*. 2Simple. London.

© Copyright 2Simple 2022