Building an ecological model to support uses of integrated technologies:

A case study school in Wolverhampton LA

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1. BACKGROUND TO THE PROJECT

Wolverhampton Local Authority (LA) has taken a pro-active stance in a number of areas of e-strategy development. Schools (nursery, primary, secondary and special) have all been able to benefit from a range of different cross-authority approaches, involving cross-authority procurement, implementation and follow-on support, covering developments in the areas of:

- Broadband provision.
- Learning platform provision.
- Mobile technology access.
- Interactive whiteboard support.

The LA is continuing its ongoing support for schools in developing implementation of an e-strategy. This support involves a continued evaluation of past practices, an evaluation of integration of current practices, and an evaluation of emerging technologies. The most recent evaluation of e-strategy implementation in the LA focused on implementation of learning platform uses in schools (Passey, 2010). The LA is now exploring certain other specific aspects of implementation, in order to provide schools with effective advice and support across the coming school year (2010 to 2011) and beyond.

The LA recognises that the implementation of a learning platform now provides schools with a central core technology that enables both inward and outward-facing functionality. The LA wishes to support schools in moving forward with their implementation of learning platforms (described in Armstrong, Hawkins and Whyley, 2010), so that they are used as effectively and efficiently as possible. At the same time, it wishes to support schools in understanding how they can integrate fully the uses of other technologies, alongside and with learning platforms, so that management, teaching and learning processes are enhanced to best effect. Further, it wishes to enable schools to begin to explore uses of emerging technologies, so that these might be considered for wider rollout across schools.

2. THIS REPORT

Wolverhampton LA has commissioned an academically-based and fully independent evaluation and research study, to support developments of e-strategy across schools. In this report, a single aspect of development is considered: how lessons learned from a school case study in Wolverhampton LA can help to build pictures of an ecosystem that enables schools to consider effective and developing approaches to technological ecologies (integrating desktop and mobile facilities, software applications and online resources, interactive whiteboard and home facilities), implementation ecologies, and learning ecologies (such as that considered within Corbett and Rossman, 1989). More recently, Luckin (2010) has offered a model of learning ecologies that integrates informal and learning settings, as well as the roles of rich technology environments.

Open discussions with the three key teachers during two visits, observation of pupils involved in a classroom session using Smart-table and other integrated facilities, responses from the head teacher, and a review of materials produced by teachers involved have all provided evidence for this report. From this school case study, advantages of an integrated approach to the use of technologies are explored. Part of this element is focally concerned with an exploration of how SMART software and SMART technologies (including a SMART Table) have been used in an integrated approach to teaching and learning.

3. THE SCHOOL

The case study school is a large primary school. It has a 2.5 form entry, and has over 600 pupils on roll, including 75 part-time nursery pupils. There are 3 teachers and a classroom assistant attached to each year group. From Year 1, pupils are set by ability - in four groups for English and mathematics, while there are three groups for science and other subjects. Target groups who are working at a 'minimum ability borderline' level are identified each year, and given specific support to help them attain the level above the borderline. Pupils with special educational needs are supported by dedicated teachers. Discrete subject teaching is provided in music, ICT, modern foreign languages (French and Spanish), art and design technology.

Ofsted have judged the school to be 'outstanding'. Parents generally engage

positively with the school, and a range of workshops focusing on different topics are available to them. Attendance by parents at workshops focusing on mathematics is found to be particularly high. The school provides a wide curriculum, with a large range of extra-curricular and extension activities (there are some 30 extra-curricular clubs in total). Pupils can take up opportunities to be involved in musical activities (SINGUP, in a 60-piece orchestra, and in musical productions – particularly those in Year 6), and in a wide range of sporting activities (including football, swimming, hockey, tennis, athletics, and cross-country).

The school holds a wide range of quality marks. These include the Art Mark, and the ICT Mark.

4. THE PROJECT AND MEMBERS OF STAFF INVOLVED

The school's ICT Mark was one of the criteria used by the LA to select this school for the project with SMART. It was thought that a school at ICT Mark level would have a range of necessary building blocks in place to enable an innovation project of this type to be effectively implemented. The project, specified by LA consultants, was taken on board by the school with full support of the head teacher. To date it has largely involved three key members of teaching staff (an assistant head teacher, a Year 5 teacher, and a member of the senior management team). However, it is should be noted that even after a short period of time (a matter of only some two months), other members of staff have become interested in the project and have begun to identify what the integrated technologies might offer to teaching and learning. As a consequence, the project's wider roll-out is being considered after two months of pilot use. It should also be noted that involving three members of staff in the project development has appeared to offer important benefits. The project has gained from high levels of commitment by the key staff, and a high level of interaction and reflection has been generated by the discussion across the three members of staff.

5. THE PROJECT AND THE TECHNOLOGIES

The project is concerned with exploring how different integrated digital technologies can be used effectively by teachers and learners to develop a 'digital classroom'. Integration of digital resources and technologies has been a focal concern of this project, and LA consultants have specifically selected technologies that would enable high levels of integration for teachers and learners working both within and across formal and informal settings. Indeed, as the project has developed, the relationship of settings or contexts, leading to a consideration of learning ecologies to a much greater extent, has increasingly become an aspect of interest and focus for the key teachers involved.

The aim of the project was to integrate technologies in ways that would allow seamless working in practice. This aim was to encompass also an extension of experiences beyond the classroom, bringing the use of the learning platform and integral software (SMART Notebook particularly) together, and to integrate uses of the software with use of a SMART Table. The software is used as a 'digital wrapper' to record and retain work in electronic form, so that it can easily be accessed in school and in homes, and this application is already used widely across the school (almost all staff can use SMART Notebook). Activities within the project have also involved lesson capture and feedback (in audio and in video, using the in-built SMART recorder to capture screen videos and resources on screens as they are being used), the use of SMART Sync, the use of SMART Notebook files by pupils at home (using SMART Fizzbooks), and the use of SMART Fizzbooks with SMART Notebook Student Edition (which features a portfolio facility). For this project, SMART Notebook Express has been available in beta-format (which delivers a web-based version of SMART Notebook to support online access).

For the project so far, small pupils groups have been involved (largely in Years R, 1, 2 and 5). Typically, these groups have worked in classrooms that have had an interactive whiteboard linked through a laptop machine to the learning platform (LP+), eight laptops with wireless network connectivity, and a SMART

Table. Pupils working on the laptops save their work to a separate area on the learning platform – a drop-box. Teachers see all of their work, while pupils see their own work only. The drop-box does not easily, however, allow overwriting and saving of non-MS Office files (as this software was designed to work with MS Office files such as MS Word or MS PowerPoint and allows these to be overwritten, but not SMART Notebook files yet, which is clearly a currently important limitation). Teachers set up class notes on the learning platform in document libraries. Again, saving and overwriting is not easy; time to load and upload also needs to be as low as possible, so that lesson pace can be maintained.

6. APPLICATIONS SUPPORTING TEACHING AND LEARNING

It is clear that the project offers a number of key technological applications that support specific and important aspects of teaching and learning. The key teachers have explored uses of these applications, and have already identified some key uses and outcomes that enhance opportunities for them as teachers as well as for their pupils as learners.

SMART Sync is felt by the key teachers to be a crucially important application. It has been used by teachers with groups of up to 18 pupils. The key teachers report that pupils 'loved it' – particularly being able to see other children's work. This appears to have provided an incentive for some pupils, and has helped their English performance. They like to see 'their' work, and like reading their work out aloud for others. It appears that they could well be perceiving a piece of work that others have produced, and that is being commented on by the teacher, as an exemplar on which to model their own work, to improve it using ideas that have been produced by others. This facility (SMART Sync used with laptops and an interactive whiteboard) clearly offers pupils an environment where sharing of work is possible, and may well allow a greater collaboration and discussion about what they are doing. It is likely that if they are modelling their work on the practice of others, that this is perceived by them as being more personal (as it is their work or that of their peers and friends, with which they may have a higher emotional engagement).

SMART recorder is being used to support some lesson activities, and the facility to go back to previous work and review and look at adv ice is recognised as a key benefit. Associated with this, the ability to easily revise items that have been recorded for the following year, and the ability for items to be easily seen by parents at home are also recognised as offering advantages that go beyond the opportunities afforded by facilities that have been accessible to date. A feature that has been noted by the key teachers is that pupils are happy to go back to previously recorded screens – this may in part be due to the fact that the screens are largely uncluttered, and that pupils are therefore able to identify key points readily (compare this, for example, to the facility of uncluttered screens to support pupils who are on the autistic spectrum). One consequence of teachers using SMART recorder is that they now wear microphones – this practice in itself clearly offers a range of key challenges, and implies a different set of working approaches.

SMART Notebook has been used in a wide range of ways:
- As a recording tool (to maintain a record of what has been done or is being done).
- As a reporting tool (to record items for others to see).
- As a presentational tool (to present material to others, inside and outside the school).
- As a synthesis tool (to draw together different elements perhaps in different media formats).
- As an annotation tool (to point out some key aspects and to highlight these with additional notes).
- As a sequencing tool (to allow different items to placed in order or re-ordered for different audiences).
- As an editing tool (to alter or amend items when their use has been trialled with specific groups).
- As a creative tool (to allow forms of multimedia to be used to create different forms of resource).
- As a 'digital wrapper' tool (to enable items to be accessed and used on different technologies).
- As a multimedia authoring tool (to allow resources to be created by teachers).

'Chat' is an in-built facility of this software. The key teachers see the potential of other technological facilities also in supporting aspects of collaboration. They would like to explore some uses of group work around a laptop, where a pupil can send a question to a teacher, where only the teacher sees it, and as a consequence, the pupil can gain a more independent response. Providing a chat facility of this form could potentially support 'quiet pupils' within a class, engaging them within textual discussion (as they would be reluctant to engage in direct verbal discussion).

On the SMART Table, a teacher can:
- Set up activities that can be used by specific groups of pupils.
- Use hot spaces (where pupils need to drag certain things into a pre-defined area).
- Use a hot spot (with a labelling activity, for example).
- Provide different media (including images and videos, and suggest ways in which aspects or features of these can be discussed).
- Use paint facilities (to copy shapes, or to draw lines of symmetry on shapes, for example).
- Provide multiple choice questions (involving sound or video as well as text, where each player is given a range of answers that they need to drag to specific areas to answer questions, for example).

At the end of the first month of the project, the key teachers had already considered how the SMART Table might offer enhancements for teaching and learning – its potential to support discussion was recognised as being potentially important. The facility to synchronise items on the SMART Table to laptops was also felt to offer potential advantages. The key teachers also see the potential of linking activities on the SMART Table to the interactive whiteboard through SMART Sync - which is technically possible if Wi-Fi is activated on the SMART Table.

Having tried out the SMART Table in class, it was felt that dialogic discussion was encouraged through the use of the SMART Table. This being the case, it is certainly possible that this facility can help those who are quiet in classrooms. A drawback of the facilities that was identified was the long time

that it took to open a file. This highlighted problem raises a need for schools to consider connectivity, capacity and speed when wider technological systems are introduced - in this case the speed and low connectivity was due to the current school Wi-Fi system and was not itself an issue with the SMART Table. By taking part in the project, the school recognised that whilst its existing Wi-Fi network was adequate for teacher use, it was not adequate for the increased connectivity required to support multiple learner access. As a direct result of involvement in this project, the school is now in the process of upgrading the number and speed of wireless access points.

7.   APPLICATIONS SUPPORTING FORMAL AND INFORMAL LEARNING

The key teachers recognised at an early stage the potential that the facilities might offer in terms of supporting activities that relate to different elements of formal lesson structures, and the ways that these might relate to learning within formal and informal settings. Taking this idea further, it would be possible for teachers to consider how specific activities designed to match specific elements of a lesson structure format could be undertaken across the formal-informal learning setting. So, for example:
- Information about lesson objectives could be gained in the school setting.
- An introduction to the lesson could be gained in the school setting.
- An activity could be started in the school setting, but continued in the home setting.
- An extension activity could be undertaken in the home setting.
- Plenary activities could be undertaken in the home initially, and then moved to the school setting.
- Responses to the activities could be gained from a teacher in the school setting.

8.   CLASSROOM ACTIVITIES AND OUTCOMES

In the early stages of the project
By the end of the first month of the project, teachers had used the SMART facilities available in a range of ways. The fact that pages can embed video, audio, and web links,

clearly offered teachers and learners a range of important possibilities in terms of supporting aspects of teaching and learning. For example, one teacher created a word 'dartboard'– pupils drag words according to certain criteria or priorities onto a dartboard. Another teacher, in a plenary session, asked pupils to identify three things to share with their partner, and to check these against the 'Marking Ladder' (a list of important learning outcomes identified by the teacher). During the project, teachers have been using the full version of SMART Notebook to create and handle resources. Some pupils have also used this version of the software, and have used it easily (as a part of the Webplay project, for example). The introduction of a parallel 'student version' for pupils to use is not being seen to offer advantage at this time, indeed, the fact that different features are accessible and used by teachers and pupils is being seen as a potential disadvantage.

An observation of a session involving different technologies (about a month into the project) highlighted some early and immediate benefits and outcomes arising. In the session, one teacher was using the interactive whiteboard at the front of the class, and was wearing a microphone in order to record some of the session. There were six tables in the room, with pupils grouped around them, and one of these was equipped with five laptops. A SMART Table was also in use with another group of pupils at the rear of the room. The SMART Notepad screen was being used to annotate what was being shown on the interactive whiteboard.

The topic being covered in the lesson was properties of shapes in mathematics - defining properties of shapes, and using features of shapes to identify a specific shape. The teacher initially covered properties of a square – this part of the lesson was not recorded. He then covered properties of a rhombus – but this time, he recorded this part of the lesson, so that the linked audio and presentation screens could be viewed afterwards by pupils. The teacher loaded the recording onto the learning platform so that it could be accessed by those with access to the learning platform either in the lesson or beyond the lesson. Throughout this activity, children were largely attentive.

Once this introduction had been completed, resources for pupils to use were distributed - electronically to those with laptops, and on paper to those on the other five tables. It is important to note that the SMART Notebook file created for use on the laptops was the file that was printed out as the paper exercise - this removed the need to create a separate worksheet in MS Word or some other medium. The SMART Notebook file is in this way the main teacher work creation tool, able to be accessed on the laptops, on the interactive whiteboard, and printed out easily in paper format. When the copies were distributed, four children were chosen to work on activities on the SMART Table.

Certainly pupils using laptops gained access to materials prior to those pupils on other tables, taking quite a long time to sort out the paper – so there was more initial disruption of thinking for groups using paper. Pupils on laptops were asked to use the chat facility initially, before engaging on the mathematics task. When the chat facility was turned off, the pupils on the laptops engaged with the mathematical task quite quickly. They didn't talk like the children using paper resources. When pupils did chat, those using laptops were chatting about the task, while those using paper resources were chatting off task. There were clearly interesting differences between the amounts of 'general chat' and engagement with the activity for those using laptops and those not.

The session also highlighted an interesting difference in the way that a teacher could handle examples of pupil work. Overall, pupils using the laptops worked faster – and they appeared willing to share their work with others (even though it was recognised that the laptops were running slowly during the session, perhaps because of an issue with the quality of wireless connectivity). The teacher took one example of work from a child using a laptop to share with others, and this was readily accepted by the pupil. Those who worked (and did exactly the same task) on paper worked more slowly – and one girl did not want to 'share' her work because it meant going up to the front of the class, because it had to be 'spoken', rather than shown on the interactive whiteboard for the work that the pupil completed on the laptop. A form of sharing, where pupils are asked to 'talk about' their work from the front of the room, may

well be rather intimidating for some pupils, and discouraging the involvement of 'quiet' children.

Another teacher oversaw the work on the SMART Table. His experience with other year groups suggested that these Year 5 pupils were not as open to discussion as pupils using the SMART Table in Years R to 2. He found that the Year 5 pupils tended to work in silence, and only talked when they were using the dominoes activity.

Developing activities further, including uses of SMART Fizzbooks
The key teachers, reflecting on their initial and early experiences after a month, suggested that:
- Devices that would allow pupils to write on them by hand would be advantageous.
- It would be useful to develop specific activities to work with particular elements within a formal lesson structure.
- They would ideally want the saving and overwriting issue (of SMART Notebook files) to be resolved quickly.
- They could deploy a laptop on each table, so that children could go back to things during the lesson – as one teacher said, 'the laptops would be like a teacher to each table'.
- It would be useful to devise other activities integrated into lessons, which would focus on practical (kinaesthetic) interactions, for example.

By December 2010, the school had acquired five SMART Fizzbooks. Having a stylus that pupils could use for writing was found to be advantageous – it was particularly useful for mathematics notation. It was found that pupils with SMART Fizzbooks got on well with the writing aspects – while it was difficult for those with the Netbooks to do this. As a consequence, it was found that they were more motivated to learn.

One activity that was run, using the SMART Fizzbook technologies, was to explore Euler's theorem – to create a table of features and to use this to answer a set of questions. The teacher found that the technologies supported certain individual pupils particularly. He found that one boy, with low self-esteem, did particularly well, although he did find that

pupils generally were trying to do things 'too perfectly' (they were too concerned with presentation, rather than focusing more on the subject content - an issue found also when some pupils started to use MS Publisher for the first time, for example). However, some children (10 were selected initially) were able to access materials at home; however, some issues did arise:
- Although the drop-box was at that time working, the SMART Student Edition had its own built-in save facility, which meant that saving to the right folder was an issue for some pupils (as the default saved to the built-in facility).
- Access to the full version of SMART Notebook would have been useful to both teachers and pupils.
- Better in-school wireless connectivity and higher network capacity would have enabled the facilities to work more seamlessly.
- As a precaution, it was suggested that temporary internet files were deleted by parents, as it was felt that these might create an issue (but having this issue resolved within the system would clearly have been easier for the school and for parents).

After only a short period of time (a matter of days), experience indicated that all children would like access to SMART Fizzbooks. Learning outcomes were being seen to be enhanced – children were happier using the technologies. When they used the SMART Fizzbooks, they needed to do 'decent handwriting' (so that it could be recognised by the system), and one teacher particularly found that this helped to usefully 'force letter drawing'.

The SMART facilities allowed pages to be created immediately as a pdf, so copies could be designed easily. Audio files could easily be embedded – so teachers' comments could be recorded rather than written.

Two additional facilities that were identified that would aid the teachers further were:
- A 'comment box' present on the SMART Table.
- Having templates for teachers.

Further uses of the SMART Table had been explored by the key teachers after two months in the project. One teacher had used the SMART Table for pupils to discuss the 'making of a bridge' across a river, so that they could design it, discuss it and amend it as needed. It is clear that this form of activity could well be involving and leading to higher order thinking – produce and analyse needs, evaluate the best features, and synthesise them together into a coherent design, for example.

One of the key teachers thinks that the use of an e-portfolio will aid this focus on higher order learning too. He feels that amendment of work by pupils is perhaps accepted more when work is in electronic form, and that this amendment would enable pupils to consider higher order needs more.

From a teacher perspective, it has been found that the 'wrap around' facilities offered by SMART Notebook have been quite manageable – it was thought at first that it would involve a lot of work. One of the key teachers feels that it is an easier way to work than the way used before. Another key teacher feels that this type of activity needs to be undertaken anyway - that the script put into a lesson plan in this format provides a lesson plan that helps to ensure learning. He feels that this means that lessons have been covered in more detail and that they can easily be amended. He feels additionally that it is possible for someone to deliver someone else's lesson easily. Another teacher (not in the key teacher group) picked up the facilities to produce 'wrap around' resources in a week and produced very detailed lesson plans. It has been found by teachers using this method that, as a consequence, the lesson plan becomes the lesson in itself much more easily, as 'child-speak' is used more, rather than 'teacher-speak' alone. It is also found that the making of recordings means that lessons can easily be given, without the teacher being there, or at home.

One of the outcomes arising at this time is that children may be attracted to the use of laptops more than they are to the use of the interactive whiteboard. Using facilities on the laptops, the introduction of children's work could be used to start a lesson or a teacher would be able to send a piece of work to all pupils. For the key teachers this realisation is certainly raising the question of when an interactive whiteboard will be used in the future, and when SMART Sync will be used. The key teachers also recognise that they are beginning to see increasing potential in the uses of the SMART Table.

Monitoring comments from the head teacher

The head teacher in the school has not been directly involved in the implementation of and teaching in this project, but she has monitored uses and outcomes across classes involved. Her observations are highlighting some specific benefits arising, for individuals and for groups:

- "Participation in this project has motivated staff and developed their individual ICT skills."
- "The school's home-school links have been enhanced and positive feedback has been received from parents."
- "Well planned and appropriate use of the SMART Table has led to high quality ICT opportunities within lessons linked to specific learning objectives."
- "Participation in the project has encouraged outstanding and innovative use of technology which has led to enhanced teaching and outstanding learning."
- "Where ICT is planned and used appropriately the learning is visible (can be seen and felt in the room) and all children are fully engaged in the lesson."

9. CONCLUSIONS

Teachers have rapidly seen the potential of the range of SMART technologies available to them. They have discussed important possibilities, piloted their use, and developed further activities in the light of their experiences.

The facilities allow teachers to detail their lesson planning more, and to focus this on pupils and their learning more. Facilities allow resources to be accessed easily, quickly and more seamlessly, interrupting pupils' lines of thinking less. Pupils working using technologies have been seen to engage more, and to focus more on task. Facilities are supporting a sharing of pupil work more, and encouraging quiet pupils in classrooms to engage more in textual interactions. Facilities

are encouraging writing, and aspects of the quality of writing more. Facilities allow a greater teacher presence, even when a teacher is physically absent. Facilities allow a greater reflection on work, and encourage higher order thinking, when teachers set tasks appropriately. As the head teacher has observed: "Where ICT is planned and used appropriately the learning is visible (can be seen and felt in the room) and all children are fully engaged in the lesson."

SMART Sync is felt by the key teachers to be a crucially important application. Pupils like to see 'their' work, and like reading their work out aloud for others. It is likely that if pupils are modelling their work on the practice of others, that this is perceived by them as being more personal (as it is their work or that of their peers and friends, with which they may have a higher emotional engagement).

SMART recorder is being used to support some lesson activities, and the facility to go back to previous work and review and look at adv ice is recognised as a key benefit. Associated with this, the ability to easily revise items that have been recorded for the following year, and the ability for items to be easily seen by parents at home are also recognised as offering advantages that go beyond the opportunities afforded by facilities that have been accessible to date.

SMART Notebook has been used in a wide range of ways. Uses have included recording, reporting, presentation, synthesis, annotation, sequencing, editing, creating, handling as a 'digital wrapper', and multimedia authoring.

A SMART Table has been used to set up activities that can be used by specific groups of pupils. These activities have involved using hot spaces, hot spots, different media, paint facilities, and multiple choice questions.

Key teachers are now considering how activities can be set up to work across the formal and informal contexts of learning. Key teachers are considering how different elements of a formal lesson structure can be 'shared across' and develop interactions in both home and school.

Even after a short period of time (a matter of only some two months), other members of staff have become interested in the project and have

begun to identify what the integrated technologies might offer to teaching and learning. As a consequence, the project's wider roll-out is being considered after only two months of pilot use.

Involving three members of staff in the project development has appeared to offer important benefits. The project has gained from high levels of commitment by the key staff, and a high level of interaction and reflection has been generated by the discussion across the three members of staff

While a range of technologies have been used, few technical issues have arisen. If those that have arisen can be addressed, this would clearly aid teachers and learners further. The drop-box does not easily allow overwriting and saving of SMART Notebook files. Teachers set up class notes on the learning platform in document libraries, and a saving and overwriting facility for SMART Notebook files would clearly aid efficiencies of use and reuse. Time to load and upload files needs to be as low as possible, so that lesson pace can be maintained. Having built-in systems to handle temporary internet files, to eliminate any issues that they might cause, would ensure ease of pupil and parent access to resources and handling uploading of files at home. Although the drop-box is working for pupils using this at home, the SMART Student Edition has its own built-in save facility, which means that saving to the correct folder is an issue for some pupils (as the default saves to the built-in facility). Access to the full version of SMART Notebook will be useful to both teachers and pupils. Having a 'comment box' present on the SMART Table, and having templates for teachers to use would both add to the usefulness of the facilities.

10. RECOMMENDATIONS

Key teachers in the school have recognised important ways to benefit from uses of integrated technologies within a remarkably short period of time. Within a matter of two months the key teachers have become familiar with a range of technologies - access technologies (interactive whiteboards, laptops, SMART Fizzbooks and a SMART Table) and associated integrating technologies (SMART Notebook, SMART recorder and SMART

Sync). Increasingly, uses implemented by key teachers have relied on the integration of key technologies.

The development of this ecology is at an early stage, but it is clear that the current position offers a future glimpse of what is to come. The school is at a point where the key teachers (and other teachers) can take this development further forward. Having seen the potential that an integrated technological ecology can have on individual pupils (such as those who are quiet in class, those who find writing hard, those who want to reflect on lesson details, or those who want to extend their learning at home), it would be anticipated that pertinent uses of the technologies would, after a further six months, lead to a position where there is not only a greater understanding of how the system works as an entire ecology, but also where there is important empirical evidence emerging of the ecology's impact on specific individuals and groups of pupils, as well as on teacher efficiencies and effectiveness. This is an important project that has high future outcome potential.

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Don Passey is a Senior Research Fellow in the Department of Educational Research at Lancaster University. He has wide experience with developing and using evaluation and research methods to look at technological innovation, and has studied and reported on outcomes of uses of leading edge technologies and their impacts on teaching and learning over the last 20 years. He has recently completed a study for Wolverhampton LA on the implementation of the LP+ learning platform, is undertaking a range of studies on home access and uses of technologies to support young people's learning, has undertaken an evaluation study for the BBC looking at outcomes of the BBC News School Report project, and a number of studies for Becta looking at potential uses of technologies with young people who are not in employment, education or training (NEET). He has worked with government agencies, non-commercial groups, commercial companies in the UK, Switzerland and Germany, with state pedagogical research institutions in France and Germany, with educational groups in Hong Kong, Bermuda, and Peru, with LAs across England and Scotland, with RBCs, and with individual educational institutions and schools, in undertaking research to inform both policy and practice. He is vice-chair of the International Federation for Information Processing Working Group on Information Technology in Educational Management and a member of an international Working Group on Elementary Education and ICT. He is a member of the BCS Schools Expert Panel. He has written widely on aspects of leading edge ICT uses in primary and secondary education.