Report of an investigation into the use of some contemporary digital resources in the classroom and their impact on teaching and learning.

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I would like to thank Leicestershire Local Authority for funding the project and e the schools involved with this opportunity to develop knowledge skills and understanding that can provide an educational insight into some of the contemporary digital resources that are currently available.

I would also like to thank the teachers from

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Mountfields Lodge Primary School
Thistly Meadow Primary School
John Ferneley High School
The Longfield High School

Who all worked extremely hard and gave considerable time and effort to develop their own action plans, implement the use of their selected digital resources and provided an account of their activities which provides the basis of this report. I would also like to thank not only the teachers but all other staff at the schools involved who made me feel welcome and provided hospitality on my observation and other visits.

Report of an investigation into the use of some contemporary digital resources in the classroom and their impact on teaching and learning.

Background

Leicestershire Local Authority initiated this small scale research project in March 2007. The aim was to investigate the effectiveness and impact of some of the new digital teaching and learning resources that were emerging on the market. As the new technologies and digital resources such as digital video cameras, digital cameras, digital pens, digital voice recorders, visualisers, student response (voting) systems Bluetooth slates and other similar devices have become more affordable teachers are faced with considerable choice but little information as to the effectiveness of the resources in the classroom. Using teacher practitioners to actively engage in the research and produce case studies it was felt that the project outcomes would include some credible qualitative evidence that could then be used to

- inform other teachers of the impact of these technologies on teaching and learning
- generate a group of 'expert' practitioners that could lead future support networks should any of these technologies become more widespread
- provide some insight for the ICT team into how effectively teachers embrace a range of new resources and how they can impact upon aspects of teaching and learning.

Teachers were identified by head teachers of
4 primary schools (2 teachers from each school)
2 secondary schools (3 teachers from each school)

Funding would be provided to allow teachers to purchase digital learning resources from a specified range up to a maximum budget, additional equipment could be purchased from schools own budget.
Funding would be provided for cover and release time for teachers to attend briefing meetings, learning / familiarisation of digital learning resources, planning opportunities for integration into teaching, attending a series of 4 half day participant network meetings, collaboration with colleagues, writing up a case study.

The project was to be very open-ended and was not testing a hypothesis. However it was essential that for the outcomes to have credibility participating teachers would need to work within an agreed framework. It was felt that as the research evidence was to be practitioner based with the local authority only having capacity to provide the funding and initial support for procurement and initial training the participating teachers needed to take ownership of the research from the earliest stage.

Taking the premise Crowne[1] that we need to *"…take the discussion out of the technology world and place it firmly in the world of learners and learning.*" at the initial meeting participants were invited to consider and become involved in the development of the project design. During subsequent meetings a project brief was negotiated and participant teachers agreed the following generic objectives:

[1] Crowne S (2007) BETT Keynote– Stephen Crowne. 'Nearly isn't good enough' [online] http://events.becta.org.uk/download.cfm?resID=28597&download_url=/content_files/corporate/resources/events/2007/jan/bett_2007/crowne_keynote_bett2007.doc.

- To develop their own personal knowledge skills and understanding of how to develop the use of a particular technologies
- To gain their confidence is using new technologies in the classroom
- To improve their practice of sharing learning outcomes with pupils
- To identify a focus for the main theme for a case study e.g.
    - Difficult to teach concept
    - An element of a programme of study/framework
    - Improve a particular identified area of weakness
- To identify any impact the technologies have in terms of their main focus
- To maintain a log of other incidental advantages/disadvantages that might be found with the technologies being used
- Record incidentals/diversions/creative ideas and pupils ideas
- To record examples of how these technologies were used positively to share with colleagues in school and more widely.

It was also agreed that this would be a learning journey and that a measure of progress would be valuable. It was agreed that an adaptation of element 3 from the Becta self review framework would provide a competencies matrix which could be used as progression route and series of markers against which any personal development could be measured. Each participant filled in an "I can" series of statements at the start of the process and agreed to complete a second set at the end to see if they felt progress had been made against any of the identified criteria.

The classrooms of most of the participating teachers were already equipped with Interactive White Boards and digital projectors, but for those who did not have a data projector they were provided with a Mitsubishi XGA projector. All schools were also supplied with a 1 Canon MD160 mini DV camera and tripod for classroom filming. By negotiation with the teachers the following range of digital technologies were included as part of an initial wish list

Genee 6100 Visualiser
Genee Slate
Digiblu Movie Creator digital video camera
Tuffcam digital video camera
Acecad digital notebook
Talking tins
Mitsubishi XGA projector

Although Student response (voting) systems were originally discussed by the group they were excluded from the wish list as previous research (Wasteney) [2] and experience within the team had shown that these technologies require significant investment by the teacher in learning the software and a significant learning curve is needed to develop effective practice.

Schools submitted their wish lists at the start of the summer term 2007and a significant majority of the resources were delivered to schools by half term in the summer term 2007. Two schools did not receive Genee slates until the start of the autumn term due to supply problems. Participating teachers agreed that they would use the available few weeks at

[2] Wasteney J (2006) The impact of voting systems in the classroom NAACE [online] http://www.naace.co.uk/160

the end of summer term 2007 to familiarise themselves with their chosen digital learning resources and plan how they might integrate these in the teaching of their agreed focus.

The table below shows the total purchase for all schools including the enforced requirement of 1 Canon MD160 Mini DV Camcorder and 1 Tripod per school. Projectors were deemed essential starting point requirements for classrooms that were not already equipped.

Table 1: digital learning resources final list for each school

	School						
	a	**b**	**c**	**d**	**e**	**f**	
	Number purchased	**Number purchased**	**Number purchased**	**Number purchased**	**Number purchased**	**Number purchased**	**Item total**
Canon MD160 Mini DV Camcorder	1	1	1	3	1	1	8
Tripod	1	1	1	3	1	1	8
Mitsubishi XGA projector	2	1	0	0	2	3	8
Movie Creator	0	15	20	20	0	0	55
Acecad tablet	2	0	0	0	0	1	3
Visualiser	2	2	3	2	3	3	15
Genee slate	3	3	0	0	3	3	12
Talking tins	10	10	15	20	0	15	70
Tuffcams	6	0	0	0	0	0	6

Summary of key foci of investigation identified by each school

School a: primary school with two participating teachers, a year 1 teacher and a year 6 teacher jointly chose to work on the focus "*How contemporary digital devices could be used to improve creativity in writing*". Each would be working independently but collaborating on a regular basis to share technical expertise and ideas.

School b: a primary school teaching mixed age group classes. 2 teachers elected to work collaboratively to investigate *"How contemporary digital devices could be used to enhance a joint Literacy, History, PHSE and ICT project."*

School c: a primary school with two participating teachers one teaching a mixed age group class a year 1 and year pupils and the second teacher teaching a year 3 class. Both teachers however agreed that a joint focus would be helpful for them to collaborate and learn together. Their focus was to investigate *"How contemporary digital devices could supplement expectations and outcomes outlined in the New Literacy Primary Framework"*

School d: a primary school with two participating teachers. One teacher a year 6 teacher and literacy coordinator elected to use the opportunity to find out "if the use of contemporary digital devices would improve boy's attainment in writing."
The second teacher had a 3 and 4 mixed age year class and chose to look at "How contemporary digital devices could be used in science to improve learning and link to the new primary framework"

School e: an 11-14 years secondary high school in which 3 teachers from the Maths department elected to participate in the project to find out *"How a contemporary digital device could be used to develop hard to teach topics in KS3 mathematics".*

School f: is also an 11-14 years secondary high school in which 3 teachers from the Maths department jointly had a specific focus of *"To explore if using a visualiser could enhance and improve the teaching and learning of constructions."*

The foci were investigative and exploratory in nature. Teachers were using the focus as a starting point for planning the use of the technologies in the curriculum. This focus is extremely valuable as teachers provided with technology are often unaware of how to implement it effectively in the classroom. Whilst early adopters of technology often see the potential and application in their own teaching this does not necessarily translate into immediate recognition by less ICT confident teachers to embrace, explore or invent applications for learning. By taking a focus the participating teachers all felt they had a purpose for adopting these technologies and were assured by the mutual support network to provide a sounding board for ideas and to share both positive and negative outcomes. Many of the teachers individually stated they were had not embraced or engaged with previous ICT developments as they felt isolated and did not want to take risks with little back up. The teachers that had Interactive Whiteboards in their classrooms shared experiences along these lines. Those who were part of the IWB pilot and had initial training and regular support and training through local authority consultant and networks reported a far more positive experience than those who had purchased IWBs independently and received only nominal training session from the supplier.

Case studies

The case studies were written up by most teachers as an individual report, although from two schools the participating teachers produced a collaborative school report. Detailed summaries of the case studies can be found at
http://www.strategict.co.uk/docs/Summarycs1.pdf

Main findings from the case studies.

All teachers involved in the project reported positive experiences in terms of their engagement and the responses of the pupils. There were some minor technical issues relating to installation of equipment and these were more noticeable in secondary schools in which teachers classroom computers and laptops were networked. All these issues were however resolved.

Only one teacher reported any use of the high end camcorder provided by the local authority as an essential piece of equipment. This was provided in order that teachers might develop video as a tool for peer and self assessment of each other, video group work in class, record episodes for assessment and so on. Informally all teachers reported that whilst these might be activities they aspire to in the longer term they all felt that there was a significant learning curve required before they would be ready and confident to use this hardware. They were keen to use they the equipment they had selected and used the time available to learn their chosen equipment, experiment with it and plan activities to use this to meet their key focus.

From the case studies it is evident that four digital resources really captured the interest of the teachers and their pupils.

The Geneevision 6100 visualiser.

Visualisers had not been used by any of the participating teachers before and most had never seen one prior to this study. It was extremely well received and has only received positive feedback. It clearly demonstrates that teachers and pupils value the ability to project high quality visual images of real objects that can then be magnified live, manipulated and captured easily in the classroom. Teachers found the resources very easy to use and all reported either in the case study or as verbal feedback at the final meeting it is an extremely powerful digital asset which can be used at a range of complexities.

- Level 1 – teachers connect the visualiser to the projector and use as a low technology projection facility for all types of materials, objects and documents. Live action modeling of a skill or technique is also part of this category for example demonstration of a paper fold or to demonstrate a particular sowing stitch. The lens quality together with zoom and focus provided all teachers with instant success at this level.
- Level 2 – essentially as above but teachers begin use additional features controlled from the visualiser (or its remote control) such as split screen, mirror, title, negative, freeze and scroll. These enabled teachers to develop more sophisticated presentation techniques.
- Level 3 – connecting teacher PC or laptop via VGA port to allow instant switching between both devices. Teachers all noted this was an extremely valuable asset.
- Level 4 – as level 3 but with teacher PC or laptop also connected by USB lead to the visualiser. At this level the teacher can integrate the visualiser into all other activities and become more creative in developing the use of the visualiser. Some of the key activities outlined by teachers at this are
    - Use of the visualiser to capture high quality still images, images can be captured directly into any image manipulation software or directly into a Microsoft Office application. Effectively a scanner but with all the magnification and other visualiser tools available to use pre capture.
    - Use of the visualiser to capture high quality still images and import them into their Interactive Whiteboard Software whereby these images can be annotated, manipulated or simply integrated into other teaching resources.
    - Use of the visualiser to capture high quality still images as the basis for frames to be built into an animation – using any animation software.
    - Use of the visualiser to capture video. This was exemplified in two ways to capture a demonstration technique so that it can be replayed to a small group or individual, or to capture a group of pupils working on an activity as part of an evidence base.

Teacher's use of language in all the case studies as well as group meetings was highly positive and descriptive comments regularly contained superlatives. "Brilliant to do ……" "Use it every lesson", "pupils are totally captivated by …..", "every classroom should have one", "My lessons are just so much more interesting" "….the ability to instantly share a pupils work"

It is evident that the visualiser is valued as a digital asset entirely in its own right and can be used solely in conjunction with a projector. However, if connected to a laptop additional functionality facilitate greater opportunities for use as does its integration with other peripherals such as an interactive whiteboard or Bluetooth slate.

Talking Tins

These were purchased by all primary schools and one secondary. One school had previously seen them but again this was an innovative yet low tech. digital resource. Essentially designed to record short message that could then be placed on tins of food for partially sighted or blind people teachers were keen to see if they could be used to develop speaking and listening activities.

Again the language used in teacher commentaries was positive and enthusiastic, descriptive narrative containing many superlatives. Comments such as “What a brilliant piece of simple, effective, yet innovative technology.”, “…. immediate impact was seen”. “Talking Tins are an absolute must in any infant classroom”

On visits to the schools talking tins were in evidence on wall displays where pupils had recorded a commentary about their work on display. In group work for maths where pupils were describing their strategy for solving a problem as well as plenary activities in a lesson where pupils were recording 3 key things that they had learned.

It is evident that the teachers in primary schools clearly felt that the talking tins supported pupil learning in many speaking and listening aspects of the new literacy framework but also developed many innovative uses in other curricular areas. Limited use of this resource is recorded by the secondary school that had included them in their resource bank.

Pupil use video cameras

Two types of device were used the Digital Movie Creator 3 and the Tuff Cam. Schools selected on the basis of matching existing resources or previous experience. Most teachers had used or had some experience of this equipment prior to the study. All four participating primary schools purchased some of these resources. Two schools had them as the key focus for their research element, but several other teachers used them as well.

The video camera play is shown to be a positive asset. The teachers all commented on similar key features.
There is quite a high level of pre learning required by the pupils

- to click, hold and release the record button at the right times.
- to hold the camera steady to obtain a good image
- to become familiar with the software

However there are positive responses to this learning and pupils are engaged with the resources and view the technical as part of the enjoyment.
Teachers commented on the use of film making as a positive experience and valuable tool not only to provide another strategy to develop elements of the new Literacy framework but that it was a really valuable way to provide opportunities for practical collaborative group and team work. Pupils learned particular roles, cameraman, actors, director etc and this teamwork approach was well received. The ability to introduce new technical vocabulary that pupils perceive as being sophisticated and professional but yet are able to apply is another learning positive that was made explicit in the group meetings.

An inference that can be drawn from most of the comments is that to some extent the final product, made using the camera is only a relatively small part of the key learning. Whether

for making film or video much of the valuable learning has taken place earlier with the planning, sequencing and storyboarding activities. However it could be argued these activities do not work as well (or at all) without the motivation of knowing that an actual ‘shoot’ will take place as a result.

Genee Slate

The Genee slate was another piece of technology that teachers involved had not seen prior to the project. This resource is effectively a wireless graphics tablet with dedicated software that is effectively virtual interactive whiteboard software. This means in classrooms which have a projector the functionality of an IWB can be achieved through the slate and associated software. The secondary schools were all keen to use these as they did not have classrooms with IWBs. Similarly some of the primary schools had classrooms not equipped and in two cases classrooms with IWBs the teachers felt this resource could add an extra dimension. The feedback for this resource was varied because due to supply issues (drivers for Windows Vista were being developed and existing stock was sold out at the time the project started) which meant that most teachers did not receive these until much later in the project. There were also a few technical issues with the new driver which was an off-putting experience.

This resource at its most basic level has provided all the teachers now to have the ability to use all the IWB software and tools even in classrooms that are projecting onto a screen. As it is a portable device it has also been used with the teacher laptop and projector in the hall so that ‘spotlight’ feature and annotation can be used with a whole school assembly. In the secondary schools teachers said that this is far more effective and far less disruptive than IWBs. In small classrooms getting children to wherever the IWB is situated can be difficult, children have to negotiate desks, chairs, bags and other obstacles which take time and can disrupt the flow of the lesson. The slate can however be passed around and many of the adolescents who might be embarrassed to work at the IWB will operate the virtual IWB using the slate from their seat.

Teacher narrative might be described as optimistic, all teachers positively described the potential but realisation from theory into practice had not been achieved in all cases.

Summary of the competencies matrix

The competencies matrix derived from the self review framework outlined the following areas for teachers using self evaluation to benchmark certain aspects of their use of ICT and their perception of pupil attitudes. These were then re-assessed at the end of the project.

Twelve of the fourteen participating teachers recorded and submitted a record of their progress as measured against the competencies framework provided. All twelve teachers recorded progress in a minimum of 4 areas of personal competencies and 9 teachers recorded a gain in at least of the two pupil themes.

Table 2

Matrix theme	Number of teachers recording progress in this theme
3a-1 Planning for ICT in learning and teaching	6
3a-2 Planning for ICT as a means of developing inclusion	2
3a-3 Building on prior learning	7
3a-4 Extent of ICT use for learning and teaching	7
3a-5 Quality of use of ICT for learning and teaching	7
3a-6 Ongoing critical evaluation	7
3b-4 Pupils' response	5
3b-2 Opportunities for pupils to choose to employ ICT	3
3b-3 Digital literacy skills	4
3b-4 Pupils' response	5

Although the gains in teacher competencies were for differing themes for each individual Table 2 indicates fairly widespread improvements in five of the six areas recorded. Most teachers recorded a one level gain but some teachers recorded a gain of two or three levels. Some of the teachers did not specify how many levels they had progressed making a weighting exercise impossible. Those that did specify a gain of 2 or more levels showed maximum gains in

- 3a-5 Quality of use of ICT for learning and teaching
- 3a-6 Ongoing critical evaluation

Summary

All teachers felt that participating in the project had been a positive and valuable experience. For many this was the first time they were actively engaging with adopting contemporary technology in the classroom. Although all teachers had laptops 50% of participants did not have projection facilities therefore could not use their laptop as a teaching resource. For those with projection facilities most also had an IWB and used it regularly.

The passion with which teachers have written their case studies, the constant use of superlatives particularly when describing the implementation of the visualisers and the huge volume of exemplars is an indicator of the impact that this project has had.

The teachers themselves highlight many instances of impact upon pupil learning an area which is worthy of a more rigorous research project. The study supports many of the findings of contemporary research into aspects of visual learning for example, the construct that that images have become a basic cultural phenomenon—a ubiquitous and influential aspect of the current age Bustle[3]. The dominance of film, television, and the multimodal recreational technologies available to young people at home presents new challenges for teaching and learning that include a clearer understanding of the role of visual representation.

[3] Bustle, L. (Ed.). (2003). *Image, inquiry, and transformative practice: Engaging learners in creative and critical inquiry through visual representation.* New York: Peter Lang.

Burmark[4] also believes that children today experience a visually rich communication culture that requires them to use both figurative and literal language to a greater degree than ever before. He contends that incorporating visuals such as colour, art, photos and fonts into lessons can enhance and accelerate learning. He contends that researchers have found that humans process visual information 60,000 times faster than textual information and they have also concluded that visual aids can improve learning by up to 400 percent. Whilst this study did not set out to measure any quantitative learning gains the case studies did support the notion that the ability to use additional visual representations did improve and accelerate learning.

Gombrich[5] contends that images, still or moving, are supreme in their capacity to arouse emotions a view evident in the comments throughout the case studies.

Hibbing and Ranking-Erickson[6] in their research report that whilst teachers at the primary level continue to use more visual cues than their counterparts at the secondary levels. As students progress through the school system, they are expected to rely more on text and less on visual images. They also found that strategic use of external visual images such as sketches, illustrations, picture books, timelines and movies can provide the background knowledge and memory pegs to help students *see* what is happening and unlock confusing text. They have also found that students who lack the ability to create their own visual images when reading often experience comprehension difficulties. However when stimulated with appropriate images supplied by the teacher there was significant improvement.

As the digital projector together with classroom computer, laptop and / or visualiser has provided the facility for enrichment of lessons with many forms of visual media and ability to share visual representations then it also becomes increasingly more important to teach students how to interpret as well as effectively use the types of communication that will shape their world. This view is shared by Albers[7] who similarly believes "if we want children to represent meaning visually, musically, and/or dramatically, along with their written texts—in other words, to create a semiotic system—we have a responsibility to teach them how to create meaning in many sign systems".

In addition this initial exploratory study suggests that the digital learning resources can be identified as being utilised in two main ways:

- for planned activities
- for spontaneous use

Planned activities:

a) Activities dependent upon planning: The use of the video equipment requires planning. Lessons are planned to take into account the development of the work that pupils need to develop in readiness for using the equipment; developing a

[4] Burmark, L. (2002). Visual literacy, learn to see, see to learn. *Association for Supervision and Curriculum Development,* Alexandria, VA

[5] Gombrich, E.H. (1982). The image and the eye: Further studies in the psychology of pictorial representation. Ithaca, NY: Cornell University Press.

[6] Hibbing, A. and Ranking-Erickson, J. (2003). A picture is worth a thousand words: using visual images to improve comprehension for middle school struggling readers. *The Reading Teacher* Newark Vol. 56, Iss.8

[7] Albers, P. (2001) "Literacy in the Arts." *Primary Voices K–6* 9.4 (April 2001): 3-9.

context, creating a storyboard, developing a narrative, organising groups, techniques and skills training with pupils to be able to use the equipment and so on.

b) Activities planned to include teacher use of the technology but not dependent upon it. Many contemporary technologies from basic presentation technologies e.g. showing a PowerPoint or downloaded animation, to use of an ITP with IWB software controlled by a Bluetooth slate, to the technologies considered in this project are deployed by teachers to add an extra or different dimension to the lesson. The learning that is intended to take place could take place without the technology but the teacher feels that the technology adds a different perspective, or extra engagement or motivational factor. In such activities teachers plan a script and allocate appropriate resources to support a learning activity. For example a teacher might want to develop pupil understanding of parts of a flower. Previously appropriate images, labelled diagrams, and pupil activities are identified and allocated to the teacher laptop to display or use with an IWB. Now a real flower head is picked ready to display on the visualiser and the teacher has planned to zoom in to clearly show the stamens and stigma and create opportunity for dialogue with pupils about structure and function, to supplement or as an alternative to the before. The case studies exemplify many activities that fall into this category and for all the digital resources.
c) Activities planned in which pupils use a technology. This could include the need to book a network suite for whole class use, book a trolley of laptops for classroom use, or with limited resources organise paired or small group activities to use the Bluetooth slate, visualiser, or other digital asset in turn.

The key learning objectives activities that are built into the planning of activities generally attributed to b) and c) do not necessarily depend upon a digital asset. Most teachers would have been teaching the same learning objectives prior to the project however, the case studies show that teachers perceived that the use digital learning resources maximised learning gains through enhancement or enrichment of the learning process.

In some instances demonstrated in several studies the visualiser to made significant difference to pupils learning especially when demonstrating use of basic mathematical tools. Most teachers in this study acknowledged that teaching how to use measuring instruments accurately was always problematic and many pupils took a long time to develop the techniques and skills. Whilst there have been other resources for many years, giant wooden protractors and rulers for blackboards, plastic versions for whiteboards and virtual versions to use on interactive whiteboards, teachers consistently reported many pupils found it difficult to relate the demonstration version to the reality of their own equipment.

In this study teachers used the visualiser not only to demonstrate the real object leading to improved pupil acquisition of techniques and skills, but in many classes pupils were encouraged to demonstrate their level of understanding by using the visualiser to share their learning with the whole class. This in turn led to enhanced learning gains. Many examples of improved learning when using the visualiser to share real objects as opposed to virtual models and simulations are given throughout the case studies.

Unplanned activities

Whilst it is evident that teachers plan lessons carefully to include learning objectives and outcomes, a variety of activities, resources and assets to be used and so on, there are often occasions when teachers need to deviate from or amend the plan to accommodate

pupil ideas that have occurred spontaneously or through effective assessment for learning strategies have recognised that an individual, group or entire class has not understood a learning point.

The visualiser is cited in numerous instances throughout the case studies and quoted in the meetings as being an incredibly valuable asset for spontaneous responses to particular need, e.g. to reinforce an idea that has not been understood, to respond to assessment for learning opportunity, to enable a pupil to share a piece of work or learning outcome visually whilst they describe it to the class, to instantly capture a piece of work, artifact, other resource to use with other groups of pupils, to capture a piece of learning as assessment evidence, to promote pupil confidence by giving them an opportunity to share learning, creative ideas and so on. The case studies available at exemplify many examples of practical classroom application.

The case studies were unanimous in reporting overwhelmingly positive outcomes for all the participating teachers despite identifying some issues of a technical nature, constraints due to time, the steep learning curve and other practical issues. The case studies have provided a substantial number of practical workable ways in which the digital resources have been used to good effect in the classroom. Participating teachers have demonstrated a huge amount of creativity in developing effective applications that are reported as having impact upon pupil learning. The teachers have all improved significantly on their personal competencies in using technologies in the classroom and have themselves become “champions” of innovation within their own schools and potentially for the local authority.

The project has also highlighted significant opportunities for further rigorous academic research, using accepted methodologies, for example to:

- substantiate the efficacy of these results in different settings
- identify the impact of such digital learning resources on the impact of learning,
- consider these resources in relation to current theories of learning,
- consider how these resources might be further developed to support classroom activities.

Conclusion

Teachers involved in the project have all found that developing elements of visual learning through the use of relatively unsophisticated or more complex digital resources facilitated significant opportunities to enhance teaching and learning.

Implementation of the the Geneevision visualiser can be seen to follow a common set of distinct developmental stages (explained earlier).

Teachers find tools that can be easily used for planned and unplanned activities easier to integrate into their teaching repertoire. Visualisers and Talking Tins were positively identified in this area.

Teachers quickly developed many creative uses for the resources they had chosen. The teachers involved all found new opportunities to use the resources to enhance learning even outside the key focus of their particular focus.

Teachers can become easily frustrated if their network system (human resources or technological) prevents quick set up of resources. The secondary schools notably experienced greater difficulties and longer time frames before having a working solution.

Although not formally part of this research teachers unanimously stated that feedback from pupils about the use of the digital resources was universally positive. Pupils constantly requested the visualiser to be used either for the teacher to use or for themselves to display and share their work or demonstrate ideas to a group or whole class.

Active participation in this research had a positive impact on teachers use of ICT in the classroom. All teachers made demonstrable progress against criteria on the Becta Self Review framework.

Some teachers identified considerable reduction in photocopying charges through the use of the visualiser to display texts.