

Floppy plays with a bone.



Floppy



Floppy

SMART Keyb



Teaching Interactively with
Electronic Whiteboards in
the Primary Phase

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01

Going beyond display

An electronic whiteboard is an excellent presentational device. It can be used as an alternative to virtually every other classroom resource, traditional and modern, for example blackboards, flip charts, OHPs, maps, pictures, number lines, 'big books', calculators, and cassette and video players. At a touch, the teacher has access to a bank of resources that would previously have taken years to accumulate and a vast cupboard to store.

However, the electronic whiteboard has the potential to do much more – to go beyond display, providing a tool for interactive teaching and learning. Of course, not all learning is interactive. Children may be learning when they read text, study a map or watch a video. The trouble is, from the teacher's point of view, the nature of this learning cannot be observed – it is not possible to see whether pupils are understanding or internalising the ideas being presented to them. Interactive teaching involves the use of strategies that stimulate feedback from pupils. This is not just of benefit to the teacher. Children learn much more effectively when they are active agents in their own learning, when they make their thinking explicit by words or actions, when they take ownership of ideas and information. Also, slower learners benefit from seeing other children demonstrate and explain their thinking and model how they arrive at their solutions.

02

What is interactive teaching/ learning?

Interactive **teaching** is a two way process wherein the teacher modifies her approach in response to the needs of the learners. The interactive teacher is keenly aware of the learners and their different learning styles. All good teachers are interactive teachers. It is not possible to teach effectively without interaction.

Interactive **learning** is also a two way process but the learner may be interacting with the teacher, with peers, with resources or with all three. For example, envisage the following mathematics lesson in which the teacher aims to develop pupils' ability to estimate angles. (The coloured highlights show the type of interactions taking place: **teacher-pupil**, **pupil-pupil** and **pupil-resource**.) She draws a circle on the electronic whiteboard and divides this with two straight line. **She invites a pupil to the board to label 90° (recapping prior learning) and asks the class to calculate how many degrees there are in the whole circle.** The teacher then removes the 90° label and adds another radius to the circle in a different colour. She asks the pupils to estimate the size of the new angle and **invites them to explain to the class why their estimate is sensible.** When all the pupils have a basic understanding the teacher loads software which tests the ability to estimate angles giving feedback clues such as too large/too small. **The class uses this as a team game with teams vying to get the most correct answers.**

It is not always necessary for children to interact physically with the electronic whiteboard – the teacher can be a mediator.

03

What needs to be in place for this to happen?

The recipe for good interactive teaching and learning is not new – all the key ingredients are accepted good practice. They include:

- a task or lesson which offers a challenge and gives pupils something to think about
- a positive learning ethos which fosters confidence and respect, enabling learners to give and accept constructive criticism and see errors as stepping stones to success
- teaching which addresses a variety of learning styles, has high expectations and allows thinking time
- appropriate resources in the right place – for example, an electronic whiteboard may be more valuable in a classroom where it can be integrated into the whole curriculum than in a computer suite where its use may be restricted to demonstrating software or whole-class ICT lessons.
- leadership vision which anticipates the needs of teachers and pupils.

04

How can an electronic whiteboard support interactive teaching and learning?

Computers have always stimulated interaction between children. Imagine, for example, a group of children seated in front of the computer. They are trying to read a piece of text displayed on a large monitor screen. Their problem is that the text, like a partially developed photograph, is not fully visible. Odd words and letters can be seen dotted around the screen and the children are struggling to find the missing parts and make sense of what they are reading:

What could that word be, -ENTI-T?

I know, DENTIST – maybe the poem's about going to the dentist.

Yes, let's see if we can find TEETH.

There's a word with double E near the end – there – look!

But that can't be TEETH because it's got E at the end too.

See that word C--IR, I bet that's CHAIR.

Yes and it's the end of a line, maybe it rhymes with something.

But not the line above, because that ends in a D.

What about the line below? Yes, it could be that --IR, what is it?

CAIR, DAIR – no you don't spell them like that.

It could be FAIR.

Or perhaps it's HAIR?

When a computer is used for interactive group work it can stimulate collaboration and a high level of on-task discussion. The screen enables all children to share a common experience, a single keyboard forces the team to reach consensus before any entry can be made, and the presence of an external focus can help with the development of social skills.

The electronic whiteboard is an even more powerful stimulus to interactivity because:

- everyone can write on it and changes can be saved – this gives shared ownership
- it has high visual impact, creating a theatrical effect in the classroom
- it facilitates better class control/management – the teacher can be at the front, facing the class
- it makes a wide range of resources instantly available
- presentations and such like can be annotated by teacher and pupils
- it engages pupils – getting them moving and participating and improving behaviour
- it facilitates concept mapping – items can be moved easily around the screen
- it supports discussion (on topic) and learning from other pupils
- it is motivating, because both teachers and children enjoy using it.

It is not always necessary for children to interact physically with the electronic whiteboard – the teacher can be a mediator. Sometimes it is okay for the teacher to hold the pen to model a particular skill or concept, but more often than not the children should be directing what is happening on the screen. Some applications lend themselves to pupils' use of the whiteboards, and there can be no doubt that children enjoy working in this way.

Strategies for interactive teaching and learning with an electronic whiteboard

1) Enhancing classroom discussion

An electronic whiteboard is an ideal focus for classroom discussion, providing opportunities to raise questions and stimulate exploration. Various techniques may be used, including:

- using a picture as a stimulus for discussion
- using written prompts
- brainstorming
- sorting
- text-disclosure activities
- asking the right questions
- sharing expertise.

Using a picture as a stimulus for discussion

Electronic whiteboard software has a rub-out-to-reveal facility. This involves placing a layer of colour over the top of a picture to hide it, and then using the eraser to reveal the picture a bit at a time.

One teacher used this technique to stimulate discussion to help pupils formulate ideas for writing. A single detail was revealed and the pupils were asked to describe what they could see and to predict what else might be in the picture. Pupils were encouraged to invent a story to explain the image and to add annotations in the form of speech bubbles and other comments before the whole image was revealed to the class.

The spotlight tool, available on most whiteboards, could be used in a similar way.

Using written prompts

One teacher used the drag-and-drop facility to stimulate discussion about what children already knew about the earth, sun and moon. He prepared a screen with a circle in the middle and a selection of key words and numbers around the edge (eg 365, month, rotate, eclipse, tides, night, 24, sun, moon, axis, orbit, day, earth, shadow). Pupils were invited to come to the whiteboard and drag two of the key words into the circle and then talk about them. This prompted statements such as "The moon orbits the earth" or "The earth takes 24 hours to rotate." The use of key words and the theatrical effect of standing at the whiteboard were more effective in encouraging children to articulate their knowledge than simple teacher questioning would have been. This technique can be used effectively in many different subject areas.

Brainstorming

One teacher used the whiteboard as a focus for a brainstorming session to find out what pupils already knew about Vikings. Children contributed their ideas and the teacher noted them down by hand on a flip chart page. The written words were then converted to typescript for clarity and moved around the screen to group the ideas into common themes.

Sorting

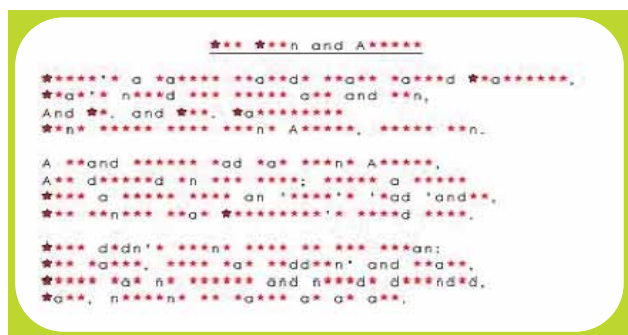
A Key Stage 1 class was exploring what homes were like a long time ago. The teacher had prepared a page of images of old and new things found around the home. This contained clip art, digital photographs, images captured from the internet and scanned pictures from magazines. Children came to the front of the class to drag and drop an item into the appropriate 'old' or 'new' box. As they did so, each child was asked to say or ask something about the chosen item, for example "My gran uses a tea cosy" or "That looks very old – what was it used for?" The activity was used to stimulate general class discussion, and although it took time to set up, it was kept on file in the teacher's resource bank and used with other groups of children in other classes.

Text-disclosure activities

As part of a unit of study on humorous verse, a teacher presented the class with an extract from a poem, hidden in a text-disclosure program. The screen display consisted only of a star for each letter and all the punctuation.

The children were told that the bold stars represented capital letters, and asked what they could deduce about the text. They rapidly agreed that it was a poem because of the layout, and that it contained proper nouns/names at the end of the first line and elsewhere.

The single-letter word was predicted as an 'a' and all other occurrences of the same letter filled in throughout the text. Three-letter words beginning with 'a' were then predicted as 'and' and occurrences of 'n' and 'd' also inserted.



This activity can be found online at:
<http://www.mape.org.uk/activities/discloze/resources/menu.htm>

Much rich discussion took place in trying to decode the rest of the text. The children were puzzled by the title, which seemed to have no relation to the text extract. This spurred them on to read the whole poem.

Asking the right questions

In the above activity the teacher's questions prompted children to analyse the text and make deductions about it. The questions were open rather than closed, prompting explanations as opposed to single-word answers. The children were also asked to reflect on the process of their thinking, not just the result. For example:

- What can you say about this text?
Why do you say that?
- How do you know that it is a poem?
- Where can you see possible rhymes?
What clues are helping you identify them?

- What could the bold stars in line 3 signify?
Why do you think that?
- Can you make a guess at any of the words?
What clues are you using?

Children were also invited to ask their own questions about the text, even if there were no quick, easy answers. For example:

- What letters can come after the apostrophes?
- What could be the significance of apostrophes at the beginning of words (second verse third line)?
- What could the final three words be?

Sharing expertise

Whereas the above activities assume the presence of a teacher who will drive the activity, an electronic whiteboard can also be a good focus for a group of pupils working collaboratively without the teacher. Collaborative group work involves a group of children focusing on the same task, working together towards a common goal, with all the debate which this involves.

A group of four children worked at the whiteboard as part of a newspaper simulation. While others in the class worked on individual stories or pictures, this group formed the editorial team putting the final product together. These children were teaching themselves and each other. All were familiar with the basics of word processing and drawing on screen, but the newspaper program was new to them and they had not previously worked on any similar task.

One of the group, Kate, was known throughout the class as a computer expert, and she readily led explorations of menus and options when trying to work out how to reformat text. Another child, Ben, was a rapid reader who took control of the manual, dipping into it when required. A third, Michael, had artistic talent and took responsibility for planning layout. And the fourth, Rhoan, a careful and pedantic child, was chief copy-editor, responsible for correcting errors. But perhaps the most important aspect of this division of labour was that, although one individual took charge of each element of the process, the others were also involved at all times, and every decision was discussed and shared.

2) Modelling – demonstrating – annotating

While modelling is essentially presentation – showing how to do something – it can be made interactive by the inclusion of opportunities for feedback. Children can also use the whiteboard to model activities to each other or as a tool for demonstrating work to their peers. Opportunities for modelling include:

- drag-and-drop activities
- shared reading
- collaborative problem solving
- annotation
- collaborative writing
- peer teaching.

Drag-and-drop activities

Specialist whiteboard software allows items to be created which can be dragged and dropped. A teacher can use this to create modelling resources. For example, a Year 1 teacher set up a resource to help teach about the pronunciation of the letter 'c'. She prepared a flip chart with a variety of words beginning with 'c' and showing a cobweb and a circle. She explained how 'cobweb' begins with a hard 'c' sound and 'circle' with a soft 'c' sound, and then invited pupils to the whiteboard to drag and drop the other 'c' words into the cobweb or the circle as appropriate. The children were asked to think about the words in the two categories and to try to formulate a rule that would help them decide how 'c' should be pronounced. They were able to see from the grouped words that 'c' has a soft sound when it comes before 'e' or 'i'.

Annotation

Whiteboard software allows annotation of any images or text by writing by hand over the top. This allowed a teacher to explore the key features of non-chronological writing with her class. She showed the class a typical piece of non-chronological writing in the form of a page from a website. The children were asked to identify the key features of this type of text – for example, title, subheadings, short paragraphs, use of present tense, use of technical vocabulary, illustrative pictures. Pupils came to the front of the class to highlight these in colour and add annotations.

Shared reading

Electronic books (e-books) are available from many websites and can also be quickly and easily prepared by a teacher or teaching assistant. They are an ideal medium for shared reading, as they have large letters and graphics which can be seen easily by the whole class.

Most whiteboard software has a reveal tool that allows the screen to be revealed a line at a time. This can be used like a piece of paper moved up or down an OHP acetate. Highlighting and spotlighting can also be used on screen-based texts to focus pupils' attention on key aspects.

Shared reading is an enjoyable way of teaching pupils how texts work, helping them to understand the role of punctuation, and developing reading strategies. When reading a 'big book' on screen, the teacher can help children to use overall meaning to deduce the meaning of specific, unknown words, and use illustrations along with print to help understanding and to recognise frequently encountered words. The teacher can periodically invite children to summarise the story so far and predict what might come next.

One teacher had a 'poet of the day' scheme whereby each day a different pupil led the class in shared reading of a favourite poem. The reader stood beside the whiteboard and led the shared reading by moving the reveal tool down the screen one line at a time.

Some of the best on-screen 'big books' encourage a pantomimic involvement – children reading *The missing pencil* on the BBC website [<http://www.bbc.co.uk/schools/laac>], for example, can study the pictures to try to spot Mickey's pencil, which is behind his ear throughout the hunt.

Collaborative writing

A teacher used a prepared set of writing frames to bring together work that pupils had researched on the theme of ancient Greece. Each group of pupils had been investigating one aspect of the topic, and the teacher prepared a separate page framework to allow each group to summarise its area. These involved different devices – timelines, drag and drop and more traditional writing frames with prompt beginnings to each paragraph.

Another teacher stimulated collaborative writing with a set of pictures chosen to present an open framework for a story. These were arranged in sequence and the story written around them. The teacher acted as scribe and prompted the children to generate text with questions such as:

- Who has a good starting sentence?
- How else can we say that?
- How can we combine those two thoughts?
- Who has another idea?
- Could we use a stronger word?
- What happens next?

A third class worked on a piece of existing text, changing it into something quite different. The story was set in a wood and it involved events at different times of the year. Descriptions of the wood in all seasons were included. The teacher demonstrated how to use search and replace to change the setting from a wood to a beach. However, now all the descriptions and much of the action became inappropriate. The class worked together on the on-screen text offering suggestions for modifications to create a new story.

Collaborative problem solving

Co-operative experience seems to be at its richest when children have something interesting to co-operate on – when they are engaged in a mind-stretching problem-solving or investigative activity, or when their task has a concrete outcome. Collaborative problem solving involves: understanding and representing the problem; clarifying terms and understanding vocabulary; trying things out (what would happen if...?); learning from mistakes; and evaluating the result and the process that achieved it. All this can be modelled very effectively with the use of an electronic whiteboard.

For example, pupils working on text-disclosure activities are engaged in:

- repeated reflective reading of the screen text, both individually and in chorus
- thinking about what has been read in an attempt to construct meaning from available cues
- proposing suggestions and trying these out
- evaluating the suggestions of others
- expounding rational arguments to help the group choose between alternative proposals.

These types of activity are characteristic of much of the best computer-based group work, whether it involves solving problems with Logo or control technology, making sense of the results of database enquiries or datalogging experiments, exploring a model or a series of set challenges in an adventure game, or finding the best way to communicate with a specified audience.

Peer teaching

A class had been working on micro-organisms. Each group of pupils used a website to research one allocated microbe. The pupils collected images and information and compiled these into a visual presentation. At the end of the unit of work, each group presented its findings to the class on the electronic whiteboard.

This model can be applied widely across the curriculum and can include presentations to other pupils, for example in assemblies.

References – Further reading

The REVIEW project – Ros Walker, University of Hull

<http://www.thereviewproject.org/index.htm>

The REVIEW project was a two-year research project, which looked at how interactive whiteboards are being used in classrooms across the UK. From August 2002 to July 2004 the project observed more than 200 classroom lessons, from foundation years to post 16. With a remit to 'find and disseminate good practice in the use of interactive whiteboards', observers visited many schools and watched lessons in many subject areas.

Findings were compiled into a teacher-training CD-ROM called 'The good guide to interactive whiteboards'. This CD is no longer available for general distribution, although UK-based initial teacher training institutions may obtain copies from Tim Tarrant at the Teacher Training Agency (TTA). Much of the material is also available on the REVIEW project website.

Effective practice and interactive whiteboards – Raising standards: Using SMART interactive whiteboards to support learning and teaching – Georgina Stein, Canterbury Christ Church University College

The communication and IT (client [c&IT]) research, development and publication unit at Canterbury Christ Church University College (CCCUC), Kent, is conducting research into how interactive whiteboards are being used to support learning and teaching in schools. To access the case studies, go to:

<http://smarteducation.canterbury.ac.uk/research/casestudies>

Based upon the evidence gathered from working with schools for many years, and to complement the interactive whiteboard research activities undertaken by the client [c&it] unit, an extensive range of resource materials have been designed to support the needs of students, teachers, teaching assistants and tutors. To access the classroom resources go to:

<http://smarteducation.canterbury.ac.uk/classroom-resources>

Different forms of support are available from CCCUC to encourage effective use of ICT in schools generally. *All of the material is freely available to schools and colleges.* Specific resource packs have been created to increase the ICT confidence and competence of students/teachers. The 'Great ICT Ideas' resources, for example, are available from:

<http://client.cant.ac.uk/gii>

Access to the student/teacher ICT Audit Tools and Help Centres can be gained by going to:

<http://smarteducation.canterbury.ac.uk/audit/default.asp>

Further information: client@canterbury.ac.uk

Phone: 01227 782 802

The National Whiteboard Network

<http://www.nwnet.org.uk>

The National Whiteboard Network was launched in May 2004, and is part of the Primary National Strategy.

Its aims are:

- to improve the quality of learning and teaching and raise standards through the use of ICT
- to provide professional development for key LEA representatives on making use of interactive whiteboards

- to provide training materials and examples of effective use for LEAs and initial teacher training institutions to use with their primary schools
- to build a professional learning community to develop, collate, share, improve and disseminate best practice more widely.

The National Whiteboard Network website is being developed to support all interactive whiteboard users with a wide range of resources, guidance and the opportunity to share resources.

07

Teaching interactively with electronic whiteboards: Examples from the Foundation Stage

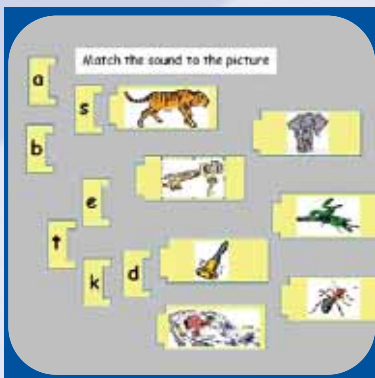
These cameos from early years settings in Worcestershire LEA schools exemplify a range of effective practice in the use of electronic whiteboards for interactive teaching and learning.

Anyone who has witnessed the delight of four- and five-year-old children interacting with large-screen displays that respond to their touch cannot doubt the impact electronic whiteboards are having on their education. Teachers have changed their teaching strategies and been wonderfully creative in presenting interactive activities for their children to respond to. Some of the most powerful learning experiences have occurred when children were left to explore whatever was left on the screen for them. Many learning outcomes observed by teachers were not originally planned for, but presented rich assessment opportunities as they watched the children taking turns, explaining ideas and concepts, modelling how to achieve a particular outcome and simply learning from each other. Language development has been particularly noteworthy as the children use technical vocabulary in their explanations to others. Children reluctant to integrate with the rest of the class have found a way through because they desperately wanted to have their turn.



Matching initial sounds to pictures 1

Children dragged the initial letters to the pictures. The activity was modelled by the teacher and a few children, and then left available for others to return to once they had finished their guided or independent work. The whiteboard was set up with letters and images at the bottom of the screen within easy reach for the children.



Matching initial sounds to pictures 2

A teacher demonstrated this activity on the whiteboard, then children completed it individually working on laptops. As each child finished, the teacher checked the work and then allowed the children to replace the initial sounds ready for the next child's turn. (The children took great delight in this, thinking they had set a real challenge.)

07



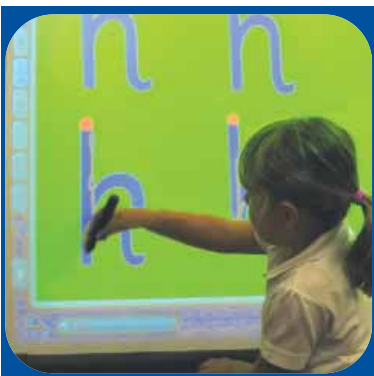
Matching initial sounds to pictures 3

From gross motor skills and collaborative learning...



Matching initial sounds to pictures 4

...to fine motor skills and independent learning (these four-year-olds have excellent mouse control).



Learning to read and write 1

Learning letter formation becomes a much more attractive activity with an electronic whiteboard. Two rows of letters were used – one for the teacher to model at a comfortable height and a lower set to suit the children.

Another setting used whiteboards for the children to self-register as they arrived in the morning. Initially the children selected their photographs and dragged them across to the area that says 'I am here today'. They progressed to recognising their names to drag across, then writing their names and, using the handwriting recognition facility, changed the writing to text.



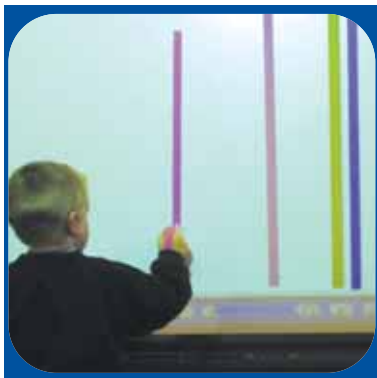
Learning to read and write 2 – personalised learning with Clicker 4

Using the whiteboard, children are much more engaged and focused on a task, because they want to participate and come to the whiteboard to interact with it. Here Clicker grids were used, which link to the children's reading books.



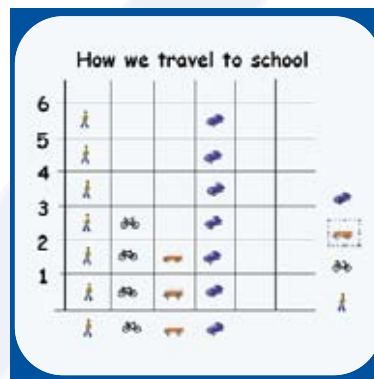
Listening and remembering – introduction to modelling

Children listened to a story and built up the picture. They had to remember what goes where and how many of each item to use



Measurement

This example was a whole-class introduction to comparing and ordering different lengths. It was followed by various practical activities involving measuring, cutting, sticking and gluing.



Data handling

Children added their own data to build up a graph. This could be about travel to school, eye colour, favourite toys...



Counting 1

Counting can be taught in many different ways. An infinite number of images can be accessed easily if they are made copiable.

Here children had to put the right number of apples or pears on the trees.



Knowledge and understanding of the world

Children visited the whiteboard to put the furniture in the right room or choose the appropriate clothes for the weather.



Counting 2

How many pieces of fruit did the Hungry Caterpillar eat on each day? The activity developed mathematical skills in the context of a well-loved story.



Exploring, creating and finding out

And, of course, children need time just to play. Here the teacher substituted a paintbrush for the whiteboard pen marker to make it feel more like 'electronic painting' for the children.

08

Teaching interactively with electronic whiteboards: Examples from Key Stage 1

These case studies exemplify a range of effective practice in the use of electronic whiteboards for interactive teaching and learning at Key Stage 1.

English/literacy Year 1: This is me

Children used a digital camera to take photographs of each other. These were displayed on the electronic whiteboard and the children wrote captions.

First a Year 1 teacher showed the children how to take digital photographs of each other. When everyone had been photographed, the teaching assistant uploaded the images to the computer and prepared a multimedia file with a separate page for each photograph, alongside a frame for text to be added. She entered the first few words: 'This is a photo of me. My name is...'

Using the electronic whiteboard, the teacher showed the children the series of pictures, explaining that they were to be used for a class display for parents on open evening. She showed the children how to move through the pages to access their own photographs. The idea of adding captions to pictures was introduced, using books and websites as examples, and the children were invited to provide the captions for their photographs.

After a demonstration of the use of the keyboard, space bar and shift key, the children were asked to come up in turn and type their names in the writing frame. The first few children did this with everyone watching as the teacher checked understanding of the task. The class then moved away to work on other activities leaving the display on the whiteboard. The teaching assistant then invited the rest of the children to come to the computer in turn to enter their captions.

All the children took great pride in showing the display to their parents on the open evening.

What value did the whiteboard add to this activity?

The whiteboard enabled a shared visual experience and facilitated a class display which children could interact with both during its creation and later when showing it to their parents. Its use was integrated with that of another ICT resource – the digital camera.

Literacy Year 1: Shared reading ICT text

The teacher used an interactive text called *The silent worm* as a focus for shared reading with her Year 1 class. The text was displayed on the whiteboard and the children read the text in chorus. The teacher helped the children to discuss reasons for causes of incidents in the story and to become aware of character and dialogue.

After the class had read each page, the teacher encouraged one of the children to come to the whiteboard to turn over the page. The children started to read the next page immediately, without prompting. Other children were encouraged to come to the screen to click on the interactive features of the text. This clearly had a very motivating effect – all were very engaged with the reading. The story included a song, which the class sang together.

The teacher asked questions such as:

- How do you think the moth would speak? Why?
- How do you think the mantis would speak? Why?

She encouraged the children, when reading aloud, to use the types of voices they had suggested (quiet for the moth and evil for the mantis).

What value did the whiteboard add to this activity?

The whiteboard was used to present an interactive text to increase the range and flexibility of children's reading strategies. The text was displayed in short sections making reading easier. The teacher interspersed the shared reading with questioning to support understanding, and the large display provided a focus for discussion and dialogue.

This example is taken from the National Primary Strategy CD-ROM 'Learning and teaching using ICT – Year 1'

[http://www.standards.dfes.gov.uk/primary/features/embedding_ict/939253].

Mathematics/numeracy Year 1: Mittens

Children in Year 1 used a computer program to sort mittens according to the shape pattern on the back of each mitten. The activity gave opportunities to use mathematical names for shapes, to classify objects in simple ways and to frame questions that could only be answered 'yes' or 'no'.

The teacher downloaded the mittens activity from the Naace Primary website [http://www.mape.org.uk/activities/sorting_games/index.htm] and set it up on the electronic whiteboard. She chose the 'play a game' option.



She invited a child, Angela, to come and point to one of the mittens and to describe it using colours and mathematical names for shapes. The teacher pointed out the differences between the mitten chosen and the others displayed.

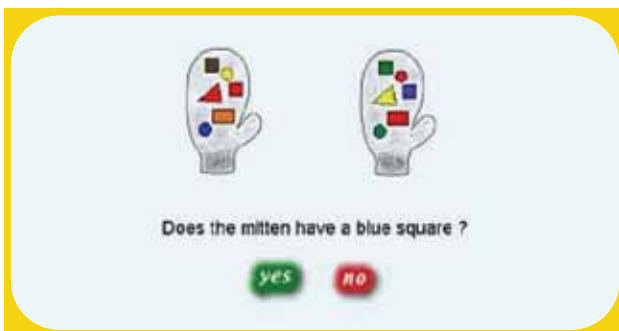
Angela had chosen the mitten with the orange rectangle because, she said, it looked different. The teacher then explained that the computer was going to ask some questions to work out which mitten had been chosen. Angela selected her chosen mitten and then went back to sit down.

08

The first question was 'Does the mitten have one red shape?' The children put up their hands to vote for 'yes' or 'no'. The answer was 'no' because the mitten had two red shapes. The teacher drew the attention of the children to the fact that the two mittens that did have just one red shape were now taken away, leaving only four mittens to choose from.



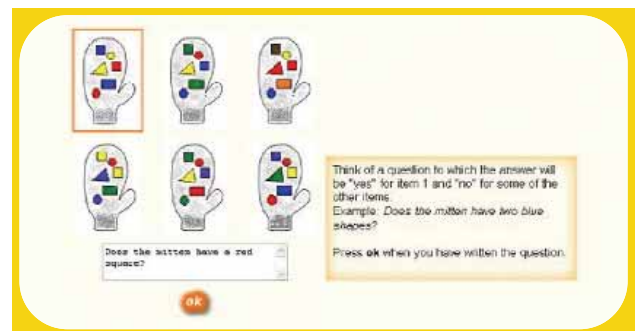
The next question was 'Does the mitten have two blue shapes?' Again the answer was discussed and found to be 'no'. This resulted in the removal of two more mittens so that just two were left. The final question, 'Does the mitten have a blue square?', again called for a 'no' answer.



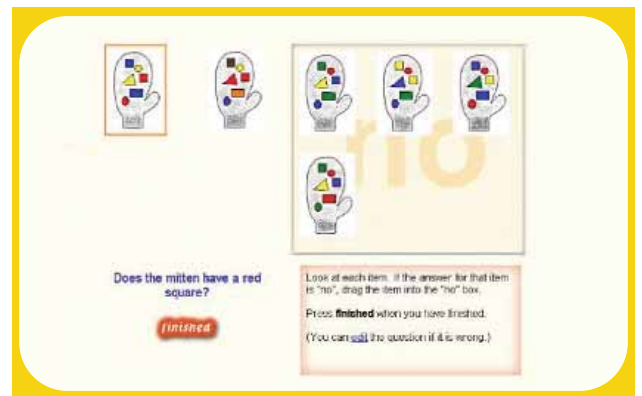
At this point the mitten that had been chosen was moved to the bottom of the screen to reveal a tick placed under it and a message that read 'This was the mitten you picked'.



The game was played again with a different child making the selection. The set of questions generated was different this time – giving lots of opportunity for practice in the naming of shapes and colours and simple observational skills. Later the children used the activity in pairs to consolidate their learning.



On a subsequent occasion the teacher chose the 'make a game' option. This time the children were invited to formulate their own questions to sort the mittens.



The teacher discussed the issues with the class and invited individual children to frame the questions, although for speed these were typed by the teacher. Children then came to the whiteboard and sorted the appropriate mittens into the 'no' box. The process was repeated until all the mittens had been identified, and then the children were able to play the game they had created.

What value did the whiteboard add to this activity?

The whiteboard made it easy for the teacher to turn a program, created as a game for a pair of children, into a valuable teaching activity for the whole class. Children were interacting both individually and collectively with the software throughout the activity.

Art and design Year 1: Self-portrait

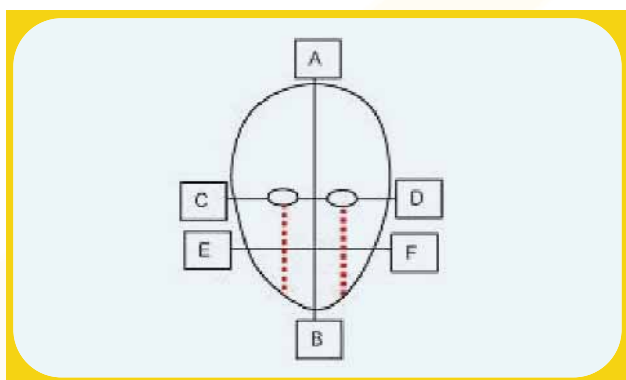
The digital photographs were used again in an art and design lesson to allow the children to explore the shape and proportion of their faces.

First the children drew their own self-portraits, which were displayed in a gallery around the classroom. The teaching assistant also scanned a selection of the portraits and set up a flip chart where each portrait was shown alongside the digital photograph of the same child.

The teacher showed the class the flip chart, encouraging the children to compare the drawings with the matching photographs. She asked "Do they look alike?", "How are they different?", "How are they similar?"

The teacher used the annotation tool to draw around the faces in each of the photographs. She asked the children to describe the shapes – were the faces round? square? oval? pointed at the chin?

She drew a straight, horizontal line across the photograph at the level of the eyes. She continued the line across the drawn portrait and encouraged the children to talk about the differences in the eye positions on the photographs and drawings. She used the measuring tool on the whiteboard to show that the eyes on the photograph came almost half way down the face. In their self-portraits most of the children had placed them much higher up.



The teacher drew further lines on the photographs and portraits showing that the nose lies on a vertical line down the centre of the face, that the mouth comes half way between the eye-line and the chin, and that the corners of the mouth align with vertical lines drawn through the pupils of the eyes.

She used the drag-and-drop features of the whiteboard to construct a basic face from fuzzy-felt-style features, experimenting with displacing the features (putting the eyes too high or the nose too low, for example) and encouraging the children to comment on the result.

She pointed out to the children that a template could be used to help them draw a more accurate portrait. The children all drew a basic face shape, life-sized on a piece of A4 paper, and then cut around the shape. With reference to the whiteboard display, the teacher showed the children how to fold their shape to get the eye line (C–D), mid line (A–B) and mouth line (E–F). Using these creases as guides, the children drew new portraits and compared these with their originals.

What value did the whiteboard add to this activity?
The whiteboard was used to annotate scanned images and digital photographs to help pupils learn about visual concepts and explore the proportions of the face. It enabled changes to be made easily and measurements to be taken using the whiteboard's ruler.

History Year 1: Time for change

Digital photographs were put to further good use in a history lesson. The teacher asked the children to bring in two or three photographs of themselves taken at different stages of their lives. She also provided five photographs of herself at different ages. The teaching assistant scanned these and a selection of the children's photographs into the computer.

The teacher used the whiteboard to display three or four photos of one individual (one being the recently taken digital photograph) and asked the children if they could sort them from the youngest to the oldest. They discussed the reasons for their decisions and were encouraged to use vocabulary such as 'This photo was taken before that one, because..'

The teacher asked the children what changes they noticed in the photographs, and whether they could suggest some ways in which they had changed since they started school, for example were they taller or heavier? The class also discussed what they could do now that they couldn't do two years ago or when they were babies, and were encouraged to compare themselves with younger siblings.

Children came to the whiteboard in turn to sort their own photographs from earliest to the most recent by dragging and dropping them in sequence, with the earliest on the left. They were encouraged to formulate a sentence (which the teacher typed) to go with one or more of their photographs explaining what they were able to do at that particular age.

The climax of the lesson came when the teacher showed the five photographs of herself at different ages. The children were intrigued to see these and enjoyed the stories the teacher told them about her own photographs. Again, these were dragged and dropped into a sequence, following discussion.

Later, the teaching assistant printed the sets of photographs and their captions for a classroom display.

What value did the whiteboard add to this activity?

The whiteboard allowed a class to look at sets of photographs together. The drag-and-drop facility allowed the photographs to be moved around the screen and arranged in sequential order, and the text tool allowed the teacher to type in a brief commentary dictated by the children. The resulting presentation was printed for a classroom display.

Mathematics Year 2: Ordering numbers

A Year 2 class was learning to order numbers to 100 and position them on a number square.



The teacher displayed a 10x10 hundred square on the whiteboard. She created a two-digit number (47) with place-value cards and asked the class to call out this number.

Individual children were then invited to the whiteboard to highlight:

- the number 47
- the multiple of 10 that comes before 47 (40)
- the multiple of 10 that comes after 47 (50).

The class then recited together "The number 47 comes between 40 and 50."

This was repeated with other examples so that children became familiar with the number square and the relationships of numbers within it.

The teacher then hid some of the numbers on the hundred square and asked children to work out what they were. She asked:

- What are the numbers hidden by the black bar?
- How did you decide what they were?
- How did the numbers you can see help you to fill in the others?
- What is this number in the square?
What information can we use to work it out?

What value did the whiteboard add to this activity?

In this lesson the teacher used the whiteboard to combine and manipulate a variety of visual images to support understanding. Features of the display could be highlighted and changed instantly to provide a focus for class involvement.

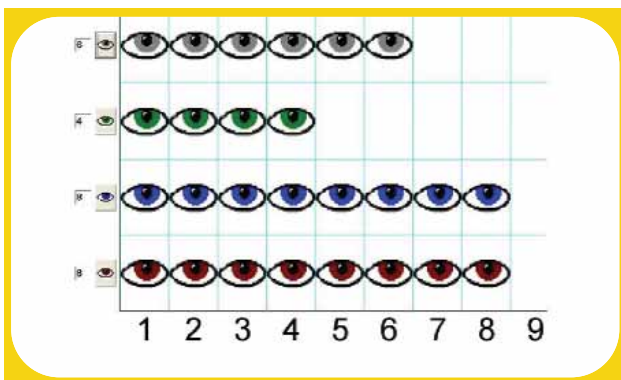
This example is taken from the National Primary Strategy CD-ROM 'Learning and teaching using ICT – Year 2' [http://www.standards.dfes.gov.uk/primary/features/embedding_ict/939253].

Science Year 2: A survey of eye colour

As part of a topic on 'ourselves', a Year 2 teacher used a whiteboard to collect, store and retrieve data. The concept of a pictogram was introduced to children in a very practical way, and the computer used for simple editing, immediate display and examining the data.

The class began with a discussion about eye colours and the words used to describe them. The teacher wrote these key words on the screen. Mirrors were distributed and the children examined their own eyes and drew a picture, colouring it correctly and labelling it with the word describing their eye colour.

The teacher asked "if we wanted to know how many children have brown eyes, what could we do to find out?" She took suggestions from various children and discussed them with the class. All the brown-eyed children held up their pictures and then went to stand in a line. They could then be counted. Children with other eye colours did the same, making several lines that could be compared. This made a direct parallel with a pictogram.



The teacher explained that the computer could help with this task, and loaded a data-handling program with a prepared set of images for making a pictogram of eye colour. She used the whiteboard to illustrate how to build up a graph of eye colour. Each child came to the whiteboard in turn and added one eye to the appropriate bar by dragging and dropping. This reinforced understanding of the idea that in the pictogram one picture represents one child. The graph was printed for permanent display on the classroom wall and saved to the computer.

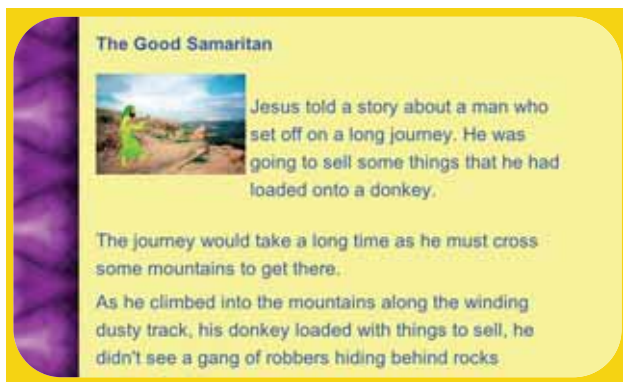
The next day the teacher recalled the graph and asked the children "What can we find out from our graph?" She explained that the graph does not allow individual children to be identified, but simply shows how many have blue eyes, for example. The class worked together to count how many eyes were in each column, and the teacher asked questions such as "Which colour is the most common?" "Which is least common?" "How many more/less...?" "What is the difference between the number of... and...?"

What value did the whiteboard add to this activity?

In this activity the whiteboard facilitated the gathering, recording and displaying of information. Children entered their own data by using the drag-and-drop tools, allowing the whole class to see how the chart was built up and make the link between concrete data and its pictorial representation. The work was printed, stored and retrieved on another day for further analysis.

RE Year 2: Stories Jesus told

The teacher used an interactive whiteboard with a single internet-linked computer to help introduce Year 2 children to some of the stories Jesus told. She connected to the website [<http://www.request.org.uk/infants/jesus/tell/stories.htm>] and selected *The good Samaritan*. The presentation on the website tells the story in a manner intended to support an adult reading to children.



The children sat in front of the whiteboard and the teacher read the story and discussed the issues with the children as the story was presented. She used the reveal tool to hide the lower part of each page, revealing the text a sentence at a time and inviting different children to read each sentence. When it came to the questions, she read them herself and encouraged everyone to offer an answer.

What value did the whiteboard add to this activity?

The whiteboard provided a screen for display of a story written in a manner encouraging discussion and questioning. The teacher was able to control the pace and structure of the shared reading by using the reveal tool.

Music Year 2: Playing 'Simon'

An interactive whiteboard was used with a class of Year 2 children to play a simple online musical game as a whole-class activity. The children listened to a sequence of sounds and were then asked in turn to repeat the musical pattern that 'Simon' set up.

The teacher introduced the work by asking the children what sounds they could hear at that moment, and how they were made. He asked whether the sounds were loud or quiet and encouraged children to make loud and soft sounds. Using a recorder, the teacher played different notes and helped the children identify whether these were high or low.

The teacher loaded the 'Simon' game from the Freegames website [<http://www.freegames.ws/games/kidsgames/simon/simon.htm>] and displayed it on the whiteboard. He explained how the game worked and compared it to the 'Simon' games that many of the children already knew. In this game the sequence of notes starts with one at random and then increases by one each time the sequence is repeated correctly. The score shows how many notes were correctly repeated, and the game is over when a wrong note is selected.

The teacher encouraged children to concentrate on the pitch of the four sounds (very high, high, low, very low). Different children came to the front to try to replicate the growing sequence.

What value did the whiteboard add to this activity?

The whiteboard allowed the class to play a game together using a free activity from the internet. The game gave children an opportunity to practise their listening skills and also their memory skills to recall simple musical patterns.

08

Geography Year 2: Graphing homes around the school

A mixed Year 2 class engaged in a geography topic – looking at the different types of homes around the school. The teacher used the whiteboard to represent information graphically in a form where it could be seen by the whole class, manipulated and discussed.

The scene was set by the display of a large-scale map of the local area, accompanied by an aerial photograph. This was mounted as a wall display with significant places labelled. The teacher discussed with the children what sorts of housing were to be found around the school, and introduced the terms ‘bungalow’, ‘terraced’, ‘detached’, ‘semi-detached’ and ‘flats’.

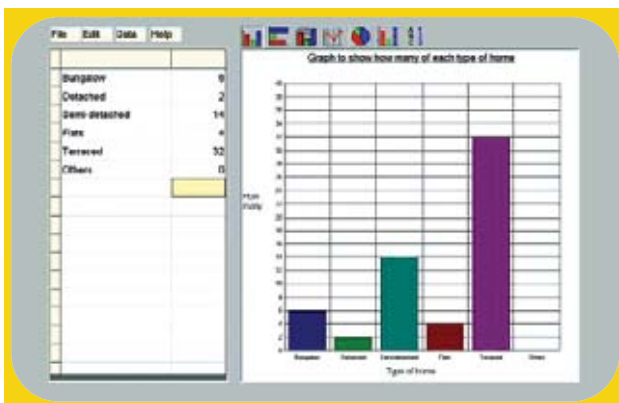
The class went for a walk around the local area looking at different types of houses and relating what they could see to a smaller version of the local map, which they had on their clipboards. Each small group looked in detail at one street. They took digital photographs and, with adult help, made a tally of the numbers of each type of house on a prepared data-collection sheet.

Back at school the teacher set up a graphing program on the whiteboard. The children counted their tally marks and noted how many of each type of house they had seen. Each group read out its data and the teacher entered it into the chart. The children were able to see the numbers and the graphic display changing each time data was added.

After all the data had been entered, the teacher asked the children questions such as “How many houses were bungalows?” and “What type of house do most people live in around the school?”

What value did the whiteboard add to this activity?

The whiteboard was used to represent, in a graphical form, data that the children had collected. It could be easily seen and discussed by the whole class.



Design and technology Year 2: Where will your pet live?

As part of a series of lessons looking at homes, the teacher used a website in a whole-class lesson to introduce the concept of a home. Later in the week the focus was on designing a suitable home for a pet, and a different website was used to introduce the activity.

After a discussion about different animals and the habitats in which they live, the teacher showed the class the 'Animal Homes' game from the Funschool website [<http://games.funschool.com/game.php?g=1003&category=0&level=1>]. She explained that the game involved helping different animals find their correct habitat.

The teacher chose an animal and asked the pupils what it was and where it might live. She encouraged the children to explain their answers. Children came out to the whiteboard in turn to drag and drop various animals into their environments, and the

rest of the class had to decide if they were correct and if so why.

Later the children were asked to design and build a home for a particular pet.

Initial discussion focused on pets that the children would like to live in their homes.

The teacher asked them to think about whether they had space for a hamster, a bird or a few fish, and where they would keep them. What about a cat or a dog? What kind of accommodation would they need for a horse, some chickens, a goat or a cow?



The 'Pets' section of the CBBC website [<http://www.bbc.co.uk/cbbc/wild/pets>] was used as a source of information about pets' needs. The whiteboard was used to display the guide to hamsters. The teacher encouraged the children to think about what a hamster might require in a home. Where would it sleep? Where would it feed and drink? What would it play with? Where would it go to the toilet and how would this be kept clean? How would it be prevented from escaping? Would it be happier alone or with another hamster? The teacher demonstrated how to find all this information using the website, and the pupils then worked in pairs to research the needs of their chosen pet.

What value did the whiteboard add to this activity?

The whiteboard was used as a stimulus to discussion and a way of presenting web-based activities and information to the whole class. In the first activity the drag-and-drop facility allowed individual children to lead class discussion.

09

Teaching interactively with electronic whiteboards: Examples from Key Stage 2

English/literacy Year 3: Collaborative writing

A teacher used a whiteboard to explore writing with her class, looking at the use of adjectives, adverbs, phrases and sub-clauses to form complex sentences.

She started with a simple main clause, presented in large text on the whiteboard:

The cat sat on the mat.

She asked the class for suggestions about the nature of the cat and inserted a couple of them into the sentence:

The fierce cat, which had red angry eyes, sat on the mat.

The class was then asked to consider what the cat had been doing, where it had come from or why it was there:

Having been chased by a Great Dane, the fierce cat, which had red angry eyes, sat on the mat.

Next, attention was directed to the mat. What kind of a mat was it? Was there anything else significant about it?

Having been chased by a Great Dane, the fierce cat, which had red angry eyes, sat on the greasy mat, which bore the marks of huge teeth.

The teacher pointed out that although it is possible to keep adding to a text in this way, the sentence begins to become difficult to read and rather silly:

Having been chased by a Great Dane, the fierce (though curiously attractive) cat, which had red angry eyes, sat in an elegant posture, on the greasy mat, which bore the marks of huge (though not necessarily sharp) teeth.

To explore how much embellishment of the original clause was effective, the teacher then used the undo function so that, bit by bit, phrase by phrase, the sentence was reduced to its original form. Redo was used to expand it once again, yo-yoing backward and forward until a consensus was reached about which sentence read best.

What value did the whiteboard add to this activity?

The whiteboard was used in a very simple but effective way to explore text with a whole class. The displayed text was easily modified and the use of the undo/redo function facilitated a form of experimentation with the text that could not be achieved in any other way.

Literacy Year 3: What's in the news?

A Year 3 class was comparing the way information is presented in two news websites for different audiences – the BBC News website for adults and the Newsround website aimed at children.

The teacher used the split-screen facility to display both websites on the whiteboard. She encouraged the children to discuss the differences between the two in small groups. She then drew the class together and asked them to share some of the things they had discussed.

Comments included:

- The pictures are different.
- On the adults' site there's more writing.
- On the kids' site it makes it easier but on the adult one it uses words that some children could not read.
- The adults' sentences are long and the children's sentences are short.

After each observation, the teacher asked question such as:

- Why are there those differences?
- What sort of words can you see that might be difficult for children to read?
- Why do you think the adults' sentences are longer?

What value did the whiteboard add to this activity?

The whiteboard was used to allow two electronic texts to be compared side by side. The text was presented in a large form, which could be read at a distance by the whole class. This allowed the teacher to highlight particular sentences and words and to facilitate effective questioning about the text.

This example is taken from the National Primary Strategy CD-ROM 'Learning and teaching using ICT – Year 3'

[http://www.standards.dfes.gov.uk/primary/features/embedding_ict/939253].

Modern foreign languages Year 3: Vocabulary development

A Year 3 teacher used the whiteboard extensively in the teaching of French. She prepared simple presentations to help consolidate knowledge of the French alphabet and practise the vocabulary of simple colours. She also used an on-screen interactive clock-face to teach the vocabulary of time-telling.

The teacher revised the children's knowledge of the alphabet orally using flashcards of large letters presented on the whiteboard. One of these showed all the letters in alphabetical order, and children were invited to the front to point to a specific letter. The teacher asked, for example, "Montrez-moi la lettre 'g'."

The teacher introduced basic colours on the interactive whiteboard by filling simple objects and shapes with various colours and telling the children the names of the colours. She then invited the children to come to the whiteboard to colour in the object using the flood-fill facility, saying, for example, "Coloriez le ballon en bleu." Later the children took turns to ask their peers to do the same.

Activities from internet sites were also presented via the whiteboard as a focus for French teaching. The teacher used an interactive clock-face to develop the vocabulary of time, and used various aspects of the BBC Primary French 2 site [http://www.bbc.co.uk/schools/primaryfrench/pf2/what_time/cartoon_flash.shtml].

A particular advantage of the latter was that it provided examples of the language spoken by native French-speaking children.



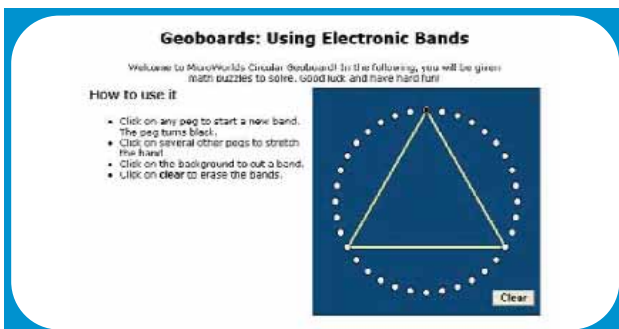
What value did the whiteboard add to this activity?

The whiteboard allowed the teacher to create letters, objects and shapes, and to colour them quickly and easily. The large-screen display formed a focus for discussion and vocabulary development. Use of a whiteboard improved motivation, gave pace to the teaching and enabled children to interact with the display.

Mathematics/numeracy Year 4: An electronic Geoboard

A Year 4 teacher used an electronic Geoboard to create regular polygons on the whiteboard, encouraging children to identify patterns in number and to make predictions and test their hypotheses.

The lesson began with some revision of the names and properties of 2D shapes. The teacher showed the class various shapes by selecting them from a shapes library and dragging them onto the main work area of the whiteboard. She asked them to name each shape and describe it using the correct mathematical vocabulary. Displaying an equilateral triangle and an irregular triangle, she asked the children to tell her what was similar/different about them. She repeated this with other shapes, ensuring that everyone understood that a regular shape is one in which all sides are the same length and all angles are equal.



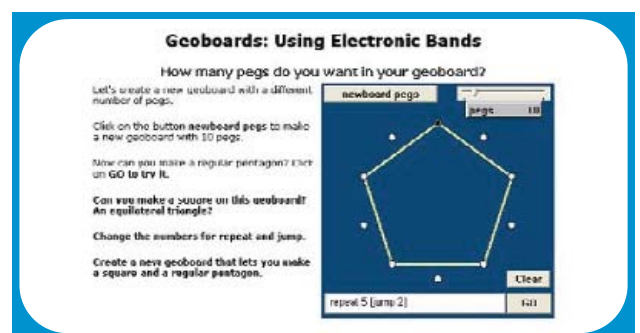
The teacher then loaded the electronic Geoboard [http://www.microworlds.com/library_old/math/geoboard/index.html] and demonstrated how to join pegs by clicking on the points at either end. She invited a child to come to the whiteboard and construct a triangle. He did this by joining three dots at random, creating an irregular triangle. The teacher asked the class "Is it a regular triangle?" "What's the name for a regular triangle?" "How could we make a regular triangle with the Geoboard?" The children realised that although it was possible to make an equilateral triangle by guesswork, the surest method was to count the pegs.

The children then worked in pairs at networked computers. For each 2D shape they tried to make an irregular and a regular shape on the Geoboard. They recorded which shapes could be created and which could not.

In a later lesson the teacher used a version of the Geoboard that had a variable number of pegs [http://microworlds.com/library_old/math/geoboard/geo5.html]. She demonstrated how to change the number of pegs by using the sliding scale and clicking 'newboard pegs'. She asked the children to suggest why they had been able to make regular triangles and hexagons on the first (36-peg) Geoboard, but regular pentagons and octagons were impossible. After some discussion one child said "It is because there are 36 pegs and you can't divide 5 or 8 into 36." The teacher encouraged a more precise use of language, and led the class to the conclusion that it was only possible to make regular shapes when the number of sides was a factor of 36. Someone suggested that it might thus be possible to make a regular 12-sided shape, and this was put to the test.

Children were then allowed to experiment with Geoboards with different numbers of pegs to see if they could create the regular shapes that couldn't be made in the previous lesson. They were challenged to identify the Geoboard with the fewest number of pegs that could be used to create:

- a triangle and a hexagon
- a square and a triangle
- a square and a pentagon
- a triangle and a pentagon
- a hexagon and a square.



A final challenge was to develop a Geoboard that would allow the creation of any regular polygon, up to and including a decagon. Children were encouraged to make predictions and to test their hypotheses.

What value did the whiteboard add to this activity?

The whiteboard facilitated interactions between the teacher and children and provided a context for rich discussion and collaborative problem solving. Pairs of children also used the software for further investigations in the computer suite.

Science Year 4: Pond life

The whiteboard was used to display input from the school computer microscope so that the class could look at specimens together and discuss their characteristics. It was also used to create a branching database to identify all the animals found in the local pond.

Children first visited a local pond to investigate what animals were to be found. Specimens were collected by pond dipping, and taken back to the classroom for further study and identification using reference materials.

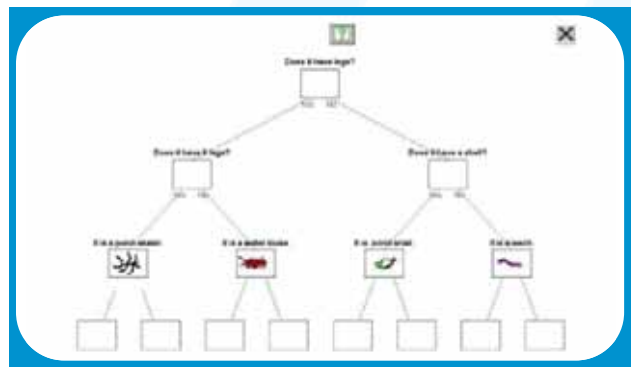
The teacher set up the computer microscope, connected to the whiteboard, using 10x magnification and top lighting. Different animals were placed under the microscope and the teacher asked the class questions about the specimens to get them to focus on various features:

- Is the body made up of different segments or sections?
- Is there a shell – what shape?
- Is the body transparent?
- What shape is the body – is it long and thin or rounded?
- Are there legs – how many and are they longer than the body?
- Can you see the eyes – are they large or small?
- Can you see antennae on the head – what shape are they?
- Are there appendages at the tail end of the animal – how many and what shape?

Images of each creature were captured using the microscope software.

Next the teacher demonstrated how to create the database. First she asked the children to identify a feature that could be used to split the pond creatures into two clear groups. She then helped them to use this feature to phrase a question with a yes/no answer: 'Does it have legs?' This was entered into the branching database software as the first question and the yes/no answer used to sort the animals into two groups. Next the children looked at just at one of the groups, the creatures that do have legs, and were asked to formulate a new question to split this group. One child suggested 'Does it have six legs?'

As the process continued it became more and more difficult to phrase effective questions, and the children were forced to study the animals in detail and focus on their distinguishing features. The teacher used the whiteboard to display the stored microscope images of the animals.



Later the children worked in groups to construct their own versions of an identification database that contained all the animals from the pond. They included pictures of the animals to provide a final confirmation that the creature had been identified correctly. Some used images taken with the computer microscope and others used their own drawings (see diagram).

What value did the whiteboard add to this activity?

The whiteboard provided a large display for output from the computer microscope to allow everyone to see the specimens at once and discuss their characteristics. It was also used to allow the whole class to work together on the construction of a branching database, learning about the use of effective questions.

09

Geography Year 4: A village map

A Year 4 class was investigating the specific features of a village settlement and the reasons for the location of some of these features.



The teacher presented a map of a site for a possible village on the whiteboard. The site had features including a river, a hill and two roads, which crossed near the centre of the map. The children were also introduced to an image bank of different kinds of buildings that might (or might not) be found in a village – shop, houses, castle, flats, church, pub and so on. The teacher first asked the children to identify which of these buildings were most likely to be found in the village.

Individual children were then invited to come to the front and drag and drop buildings to the position on the map where they thought they might be found. The class then discussed whether the chosen position was suitable, for example:

- It's too close to the river. It might get flooded.
- The church should be in the middle of the village so everyone can easily reach it.

- The castle should be on top of the hill where it could be more easily defended.

When the map had been completed, the teacher asked the children how this picture map differed from a proper map. One child responded that proper maps have symbols instead of pictures. This led in to the next session where the children looked at transforming their picture icons to Ordnance Survey (OS) symbols.

What value did the whiteboard add to this activity?

The whiteboard was used to make an image bank instantly available and facilitate the build-up of a map by drag and drop. The teacher encouraged many different children to participate directly and used the display to focus discussion and questioning.

This example is taken from the National Primary Strategy CD-ROM 'Learning and teaching using ICT – Year 4'

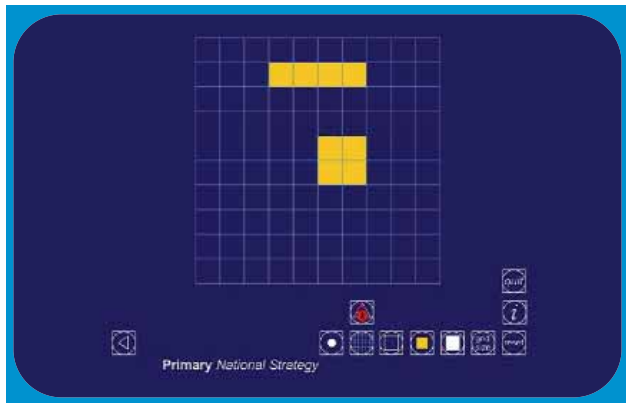
[http://www.standards.dfes.gov.uk/primary/features/embedding_ict/939253].

Mathematics Year 5: Area of a rectangle

A Year 5 class was investigating the areas of rectangles. The teacher worked with the whole class using the Area interactive teaching program available from the Primary National Strategy (illustrated). The objective of the lesson was to explore the relationship between the area of a rectangle and its perimeter.

The teacher introduced the session by reminding the children what they knew about area and perimeter. He showed a rectangle with an area of two square units, then asked "Can anyone tell me how to make a rectangle with four square units?" There were two responses:

- Four units in a line.
- Two units in a line with another two directly above.



The teacher displayed both of these rectangles on the grid as shown. He asked "Are we all in agreement that this is a rectangle? I can see some of you shaking your heads." It was clear that many children thought that the second shape was a square and not a rectangle. The teacher picked up this misunderstanding and explained that a square was a particular kind of rectangle.

He then asked the class how they would measure (or calculate) the perimeter. Suggestions included:

- Walk around it.
- There are four in length and one in breadth and if you double that it's 10.

The children later used the same software in the computer suite for investigations of the relationships between area and perimeter.

What value did the whiteboard add to this activity?

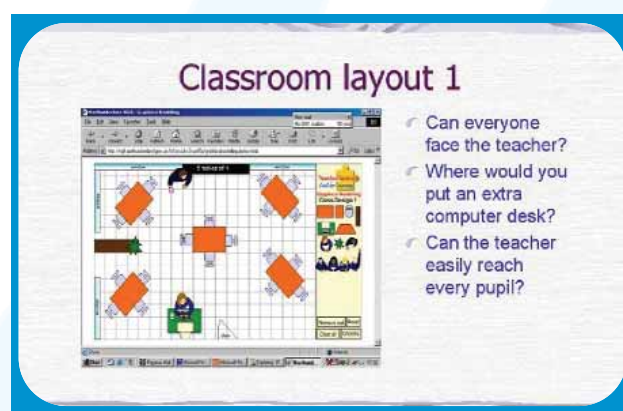
The whiteboard was used to present a grid display, which can be rapidly changed. The teacher used the display to focus questioning and encourage sharing of expertise.

This example is taken from the National Primary Strategy CD-ROM 'Learning and teaching using ICT – Year 5'

[http://www.standards.dfes.gov.uk/primary/features/embedding_ict/939253].

Design and technology Year 5: Design a classroom

A design and technology project involved designing a new layout for the classroom using graphic modelling software. Working in groups, the children designed a layout and then prepared multimedia presentations for the whiteboard to share their findings and make recommendations to the rest of the class.



The teacher began by using a prepared slide show on the whiteboard to introduce the task. The presentation offered a selection of different layouts and used key questions to highlight some of the strengths and problems with each design.

The children were then assigned to groups and given a specific design brief to address. This involved designing a classroom layout that would accommodate a wheelchair user or a pupil with sight/hearing difficulties.

After they had developed their designs, each group had to prepare a report explaining how it tackled the challenge and justifying the decisions it had made. These reports were prepared electronically and presented to the rest of the class using the whiteboard. They included screen dumps from the modelling program, annotated to show why a particular layout had been used.

What value did the whiteboard add to this activity?

The whiteboard was used as a presentation device, first by the teacher and then later by children. The teacher's presentation was made interactive by the use of judicious questioning. The presentations allowed children to share what they had learned with their peers and discuss alternative ideas.

RE Year 5: The five pillars of Islam

In this activity, children in Year 5 used a selection of websites to gather information on Islam so they could make a presentation to the rest of the group.

The teaching assistant prepared for the lesson by bookmarking a number of websites appropriate to the age and abilities of the children. She also prepared a PowerPoint template for the presentations.

After the teacher had introduced the task, the children used the bookmarked websites and a CD-ROM to research information about the five pillars. They used a prepared collection sheet to make notes on their findings.



Children then created their presentations using the ready-made PowerPoint file to structure the information they had collected. Their findings were presented to the rest of the class on the whiteboard.

What value did the whiteboard add to this activity?

Preparing a presentation is a useful device for making pupils look for hard information and convey it to an audience. The whiteboard facilitated peer teaching and the sharing of expertise.

Music Year 5: Playmusic orchestra

A teacher used a website [<http://www.playmusic.org/stage.html>] to support her teaching about percussion instruments.

After the class had explored the emotive potential of sounds from percussion instruments available in school, the teacher showed the Playmusic site on the whiteboard. She started with the 'Back Stage' percussion jukebox. The class listened to short excerpts (many using instruments which they did not have in class) and discussed their mood and effect. The teacher then visited the 'Stage' section about percussion instruments, and talked about each instrument in turn.



What value did the whiteboard add to this activity?

The whiteboard allowed the teacher to use a website as the basis for a lesson, presenting sound clips, images and text-based material. All of these were used as a stimulus to class discussion.

English/literacy Year 6: Non-chronological reports

A Year 6 class was investigating the use of language in the production of non-chronological reports. They deconstructed an existing text and organised it into a planning diagram. The objective was to help them understand the structure of the planning diagram so that they could use it later to plan their own non-chronological writing.

In one lesson, a piece of text about cheetahs was displayed on the whiteboard. The class analysed this in a shared text session and the teacher added highlights of different colours identifying the key features of non-chronological text. For example, one colour was used to highlight text written in the third person and another to highlight use of the present tense.

In a later session the text was reloaded and the children asked to remember and identify what each highlighter stood for. The teacher then displayed a spider diagram writing frame. This was new to the class, which had used linear approaches to planning in the past. It was explained that the class was going to use this form of writing frame to plan a piece of non-chronological writing.

The teacher used the split-screen facility to display the text and the diagram alongside each other. She explained that each bubble in the diagram was to be used to present an outline of one paragraph of the text. The general introduction went in the centre, as this was the starting point, and all the other sections of the text were arranged around it. Each bubble was given a heading representing the subject matter of the paragraph (for example 'habitat') and key words were dragged from the text into the diagram.

The teacher pointed out that this type of spider diagram does not fix the order of the text – just its content. She asked the children if there were any paragraphs, other than the introduction, which had to remain in the same position as in the original writing. One child observed that the final paragraph about the need for conservation was effectively a conclusion to the whole piece, and had to remain at the end. It was agreed that all the rest of the text could be presented in any order.

On another day, in the computer suite, the children used the same writing frame to deconstruct a new text, and later to plan their own non-chronological reports.

What value did the whiteboard add to this activity?

The whiteboard was used to enhance classroom discussion. The teacher was able to annotate text to highlight its features, presenting it in a form that could be read by the whole group. She used a split screen to display information in two different formats, and was able to drag and drop text from one window to another.

This example is taken from the National Primary Strategy CD-ROM 'Learning and teaching using ICT – Year 6' [http://www.standards.dfes.gov.uk/primary/features/embedding_ict/939253].

Mathematics Year 6: Patterns and sequences

A teacher led his Year 6 class in an exploration of patterns and sequences in numbers. He used the Twenty Cards interactive teaching program to stimulate the children's thinking.

The teacher explained that he had a stack of numbered cards that followed a sequence. He showed the class the first number (1) and started the interaction with a question:

Teacher: What do you think the next number is in my sequence?

Child: 2.

Teacher: Why do you think it's 2?

Child: Because 2 comes after 1.

Teacher: So you think it's 2 because 1 and 2 are consecutive numbers? [Expanding vocabulary.]

Child: [Nods.]

The teacher dragged the next number into place – it was 2. He asked for a prediction for the next number. A different child suggested 3, but when the number was revealed it was not 3 but 4. This caused puzzlement on the faces of the children. Clearly the original hypothesis about the nature of the sequence was wrong.



Teacher: Well it's not 3 – it's 4. So what do you think the next number might be?

Child: 7.

Teacher: Why do you think it's 7?

Child: Because $1 + 2 + 4 = 7$.

Teacher: That's a good answer. [Points to the cards and repeats $1 + 2 + 4 = 7$ to clarify the reasoning, and reveals that the next number is indeed 7.]

Teacher: So if the next number is 7, what do you think the number after that will be following your rule?

Child: 12.

Teacher: Why 12?

Child: $4 + 7 + 2 + 1$.

Teacher: Does that make 12?

Child: No, er – 14.

Teacher: So you think the next number should be 14? But it's not. [Reveals the next card, which is 11.]



This caused further puzzlement, so the teacher switched to a different display, which arranged the cards 1–20 in a face-down array. He turned over 1, 2, 4, 7 and 11, and drew the children's attention to the number of face-down cards between each of those in the sequence. They were able to see that the number of face-down cards increased by one each time, and thus made a successful prediction of the next number (16). This was then checked back against the stack.

What value did the whiteboard add to this activity?

The teacher used the whiteboard to display some stimulating problem-solving work. The Twenty Cards interactive teaching program allowed children to see the numbers in the sequence and the patterns in the intervals between the numbers. They were able to study the display to predict numbers and use the program to test and confirm their ideas, generating sequences that follow given rules. The interactivity of the software was both motivating and stimulating.

This example is taken from National Primary Strategy CD-ROM 'Learning and teaching using ICT – Year 6'

[http://www.standards.dfes.gov.uk/primary/features/embedding_ict/939253].

History Year 6: What can we learn from pictures?

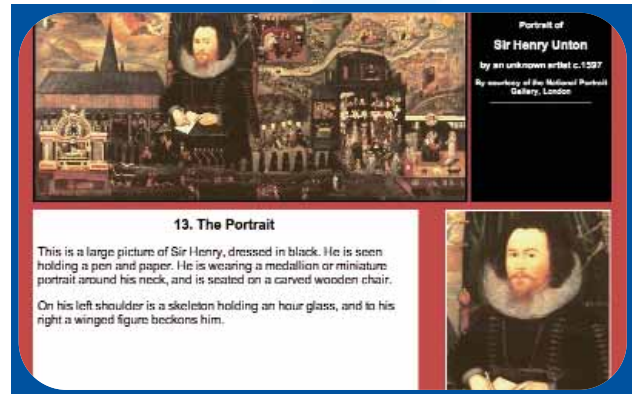
A Year 6 class studied a 16th-century picture, displayed on a whiteboard, to find out about life in Tudor times.

The teacher began by introducing the Tudor period and locating it on a timeline. She explained the difference between primary and secondary source material (primary source material was gathered at the same time as the events occurred; secondary source material was compiled later). The class played a game of Chinese whispers to see how facts become distorted over time.

The teacher explained that they were going to study a portrait that was painted around 1596 and now hangs in the National Portrait Gallery in London. Without telling them any more, she asked the children to suggest what sort of information they might learn from a portrait. Various suggestions were made. Children thought they might be able to find out something about the buildings people lived in and the clothes, hairstyles and jewellery they wore.

The teacher displayed the whole picture as shown on the Naace Primary website [<http://www.mape.org.uk/activities/untun/index.htm>]. She explained that the portrait depicts the life of Sir Henry Unton, and was commissioned by his widow after Sir Henry's death.

Because it not possible to see much detail when looking at the whole picture, the teacher clicked on each section of the picture in turn showing how this produces an enlargement of the section with some accompanying notes. She showed the children how to study one section in detail with reference to the bottom right-hand corner, which shows Henry's birth. Initially the teacher masked the notes by placing a layer of colour over them, and asked the children to describe what they could see in that section of the picture and what information the artist might be trying to convey. Later she revealed the text a paragraph at a time and drew the children's attention to the key points.



Later the children worked in pairs to study a section of the picture. They pasted the image into a word processor and added annotating notes.

What value did the whiteboard add to this activity?

The whiteboard allowed a whole class to study a picture and to discuss its value as primary historical source material.

Art and design Year 6: Realism in art

Art collections such as those found in virtual art galleries on the internet or on CD-ROM can be used to develop higher-order skills of questioning, analysis and explanation, provided that children use the resource to investigate a specific issue. In this activity, pupils were challenged to think about the way paintings have changed over time. The teacher used the internet to look at an art collection to investigate whether art has become more realistic over the centuries.



The teaching assistant prepared for the lesson by downloading a selection of images from the National Gallery website and saving these to the whiteboard computer. The pictures were taken from various

periods in history and included *The coronation of the Virgin* by Giusto deMenabuoi (1367), *An experiment on a bird in the air pump* by Joseph Wright of Derby (1768) and *The Angelus* by Jean François Millet (1857).

The teacher began the lesson by explaining to the pupils that they were going to test the hypothesis 'art has become increasingly realistic over the centuries'. She discussed what they might need to do to test the hypothesis. This included:

- gathering a collection of images by different artists
- identifying similarities and differences in pictures from different centuries
- exploring a wide range of paintings
- sorting and arranging pictures by date.

The teacher then displayed the three pictures that had been saved on the whiteboard. She asked the children:

- What is the painting showing?
- Does it look like a photograph?

- How does it look like a photograph?
- Can we put these three pictures in chronological order of when they were painted by how realistic they look?

She asked the children to guess the correct order, giving reasons for their choices.

The children then carried out their own research using the National Gallery website and produced a multimedia report of their findings. When the reports were complete, the teacher encouraged the children to reflect on their work by speculating about why early painters were unable to make their work look like a photograph. By looking at the work of artists over time, they had discovered that, although much modern work is far from realistic, early art looks very 'flat', and pictures that could almost be photographs were not painted until after the 15th-century. She told them that painters had to develop techniques for painting realistically. They had to learn about perspective and gain an understanding of the effects of light and reflection on a picture.

The teacher also told them about Hockney's theory that it was the invention of projection devices (notably the camera obscura) that led to the breakthrough in painting more realistically. She demonstrated this on the whiteboard by asking a child to come up to draw a face freehand. She then displayed a photograph on the whiteboard and invited another child to draw a face on top of this – effectively tracing the photograph. The children were able to see how much easier it was to get the proportions right when a projected image was available as a template.

What value did the whiteboard add to this activity?

The whiteboard allowed the class to study a selection of pictures downloaded from the internet and to discuss these collaboratively. It also facilitated demonstration of the power of projection in art.

Geography Year 6: Locality presentation

Children worked in groups to create a multimedia presentation featuring a locality known to them. They integrated digital pictures, recorded sounds and a map of the locality to construct a hyperlinked presentation as a guide to the area. They then presented this to peers on the whiteboard and later repeated their presentation to parents.



The teacher explained the task and each group decided upon a locality to research and present. The children were familiar with the concept of a hyperlinked multimedia document, but had to be reminded of the need for careful planning and of how to integrate sounds and digital photographs. They worked from a prepared template and used a planning sheet to decide what images and sounds to incorporate. They then went out to collect the material, armed with a digital camera and tape recorder.

The groups showed the finished presentations to the rest of the class using the whiteboard. The children wrote evaluations of their own and each other's presentations, noting what had worked well and what was less successful. The presentations were repeated for visitors at a parents' evening, and some were made available on the school's website.

What value did the whiteboard add to this activity?

The whiteboard allowed children to present a piece of work that they had researched. This enabled them to learn from their peers and to evaluate their own work and that of others.

Floppy plays with a bone.



Floppy



Floppy

Clip art used by permis

SMART Keyboard



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