Interactive whiteboards:

Some lessons from the classroom

Julie-Ann Edwards, Mike Hartnell
and Rosalind Martin

One of the pleasures of being involved in Initial Teacher Education is the opportunity it affords to observe trainees who are managing a range of ICT efficiently in their classrooms and providing effective learning as a result. I offer some possibilities for using the interactive whiteboard as a means of stimulating pupils' thinking and for pupils' active participation in learning that I have either observed in Rosalind Martin's or Mike Hartnell's lessons or learnt about in discussion with them both.

Rosalind wrote a programme in Excel to use as an oral and mental starter with a very low attaining year 7 class (11-12 year-olds). Projected onto the interactive whiteboard were a series of shapes with a section of each shape coloured differently (see figure 1). Pupils were asked to write on their own (non-interactive) whiteboards, the percentage of the whole shape which was coloured.

Figure 1

Rosalind was able to use the interactive whiteboard to highlight the whole shape and, separately, the coloured area. This is a feature of the interactive whiteboard which could equally be used by pupils to explain their solutions to a problem, but Rosalind's aim in this lesson starter was to recap work and improve the speed at which these particular pupils responded to questioning. In posing the questions, Rosalind's use of highlighting the whole shape and the coloured section meant that pupils clearly understood the question and responded quickly and accurately. It took only three questions until all pupils were holding up whiteboards in less than a minute with accurate responses recorded on them. This indicated a truer assessment of pupils' understanding than many static examples I have seen with pencil and paper where a pupil's understanding of the question is more of an issue.

Another important feature of the interactive whiteboard, as highlighted by both Jenny Gage in her article (page 5) and by Dave Miller in his Opinion (pg 48), is the use of the internet in the classroom in real time. Mike has done just this. With his year 8 class (12-13 year olds) he used a program called "Who wants to be a Pythagoras Millionaire?" (see figure 2).

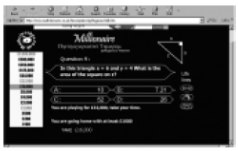

Figure 2

Most pupils this age will be familiar with the game-show television programme of a similar name which allows the contestant to 'ask the audience' as an option if the answer to a question is not known. Mike set the question responses to the 'ask the audience' choice for every question so that the whole class could work interactively with the program. Pupils were given cards labelled A, B, C and D to represent the four answer options offered and they held these up to answer the question. The card appearing most often for each question was the answer the class offered the program. Not only did pupils thoroughly enjoy this program but they began to hone their responses to indicate more accurate decision-making and less guessing. The value of working as a class in this activity rather than as individuals at a machine each, lies in the opportunities it gives the teacher to monitor pupils' progress and their rate of progress and to identify weaknesses or misconceptions very early in the activity so that these can be rectified. This program is available from

http://www.mathslessons.co.uk/lessonplans/pythagoras/milli.html

For another lesson with her Year 7 class, Rosalind introduced 'translation' using an interactive whiteboard (see figure 3). This is an ideal piece of technology to demonstrate movement of objects with the opportunity to discuss the situation with the whole class. She also used the pupils' personal whiteboards to ask them to record a movement either as a diagram (on the squared grid) or as a description.

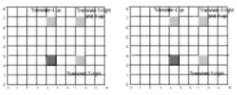

Figure 3

Rosalind wrote the program in Powerpoint, creating a pile of squares which were able to be moved according to particular vectors. For example, the T shape below was created using a pile of 6 squares, 5 of which moved and the H shape was produced by moving 11 of the 12 squares in the pile (see figure 4). Pupils were asked to describe the movement with an emphasis on developing vector notation.

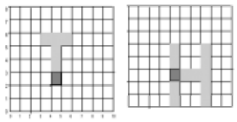

Figure 4

Tasks for the main class activity asked pupils to describe particular movements of shapes (see figure 5). Rosalind was able to demonstrate the movement of each shape to its new position. The shapes were labelled so that pupils were able to describe a particular position more easily.

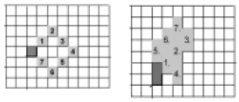

Figure 5

As an application of translation, Rosalind provided challenges relating to tessellations (see figure 6). The actual movement of shapes on the interactive whiteboard made it easier for pupils of this level of attainment to transfer the images to their own whiteboard grids or onto paper.

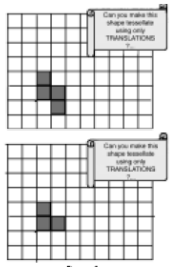

Figure 6

Once again the power of the interactive whiteboard to display an image from the internet was demonstrated when Rosalind used an Escher image to consolidate pupils' work on translation and to introduce other transformations (see figure 7). This image is available on

(http://www.cs.unc.edu/~davemc/Pic/Escher/Horses.jpg)

Figure 7

This provided a focal point for the lesson plenary, enabling a discussion of the translations involved in creating part of the image and the reflections necessary to complete the image. This acted as an introduction to the next lesson. The interactive whiteboard is an obvious medium for teaching and learning about transformations.

Sometimes it is not possible to fully utilise some interactive features of the whiteboard if a connection to the internet is not possible or appropriate at a particular time. For one of Mike's lessons, he did not think a program from the internet was entirely appropriate for his Year 7 class but he decided that the images and ideas it contained were motivating. This program (available on http://www.ambleside.schoolzone.co.uk/ambleweb/mentalmaths/functionmachines.html) acts as a 'function machine' allowing pupils to input a number and activate the 'numeric processor' according to a particular mathematical rule such as 'double and add 1' or 'subtract 5'. Combinations of either an input and a rule or an output and a rule are allowable in the program. Mike wanted a combination of input and output to be possible so that pupils were required to suggest possible functions. He therefore converted an image to an executable file for use without a connection to the internet (see figure 8). He was then able to use the projected image for all three combinations.

Both Rosalind and Mike are adamant that projecting an image in this way is far superior to copying the image and projecting it as an overhead transparency. I witnessed the reactions of pupils when the 'numeric processor' image was projected for them to work with. Comments such as "Oh, wow!" and "Cool, sir" and "Where's that from?" greeted Mike. Even the regular class teacher was genuinely surprised (and pleased) by pupils' reactions. It is therefore not surprising that all pupils were fully engaged in response to Mike's questioning, allowing him to change the pace of the lesson according to pupils' responses and the level of difficulty of questions posed. Perhaps pupils will be motivated to use educational websites themselves in their own time if we are able to utilise such internet-generated images within the classroom.

Angles and bearings is another area of the mathematics curriculum that lends itself well to use of the interactive whiteboard. Rosalind found

Figure 8

her Year 9 class (13-14 year olds) had considerable difficulty in measuring angles which prevented them from utilising any understanding they had of work on bearings. Once again using Powerpoint, she designed a game in which pupils needed to measure angle and distance in order to play the game. In hindsight, she says she should have asked all pupils to design their own 'maps' for homework in preparation for the lesson, but decided at the time that the response would have not been positive. She now thinks otherwise. For the lesson, a child's map was scanned into Powerpoint as a background and the game demonstrated using slides. Rosalind used a 360 degree angle measurer on an overhead transparency to draw the game moves, just as pupils were expected to do on their own maps. The first three consecutive moves of a game are demonstrated here (see figure 9 a to c).

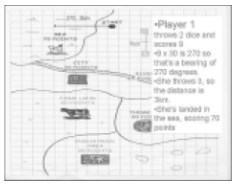

Figure 9 (a)

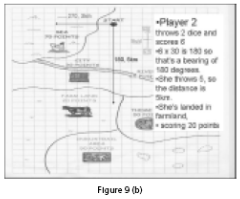

Figure 9 (b)

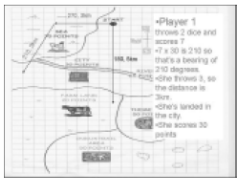

Figure 9 (c)

Pupils used 360 degree protractors with only 0, 90, 180 and 270 (and also N, E, S, W) labelled and lines at one degree intervals drawn (but not labelled) to play the game. These prevented the confusion which often arises by using angle measurers containing too much information. The angle measurers, available to download from http://www.ex.ac.uk/cimt/res2/trolha.pdf, had enough information on them to make the game playable and little enough to make pupils think carefully about the size of turns (given that these were in multiples of 30). Rosalind believes that using the whiteboard to demonstrate the bearings game with this class improved their listening skills and their security with the task, evidenced by significantly fewer questions arising than previously with this class.

Rosalind comments that if she had the choice between an interactive whiteboard and some PC's in her classroom next year, she would always choose the whiteboard for its flexibility and the opportunities it allows for individual and whole class assessment as the teacher works with the class. The examples described in this article demonstrate some of the versatility of using an interactive whiteboard to teach mathematics in the classroom. And then there are the possibilities for taking the register on screen and saving the file to your electronic markbook …

Julie-Ann Edwards works at the Centre for Research in Mathematics Education,University of Southampton. **Mike Hartnell** begins teaching mathematics at Henry Cort School,Fareham, Hampshire, in September, 2002. **Rosalind Martin** begins teaching mathematics at St Peter's School,Bournemouth in September 2002. Both Mike and Rosalind are currently trainees on the secondary mathematics PGCE course at the University of Southampton.