Using Interactive Whiteboards to Enhance Maths Teaching

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Introduction

Over the past three years Richardson Primary School has transformed its entire educational program based around the widespread introduction of Interactive Whiteboards (IWBs) into the school. A review of this initiative states " Richardson is the first school in the ACT, and probably Australia, where the total school community, the students, staff and parents, has embraced a new approach to the use of ICT, which enhances the holistic education of the students…… The Richardson effort represents a near revolution in the use of ICT in schools."

Early in 2005 Richardson Primary School was awarded one of the Federal Government's National Awards for Quality Schooling for Outstanding School Improvement based on the results achieved using Interactive Whiteboards.

This article will describe the new style of pedagogy that was developed to take advantage of this technology with particular reference to teaching in a Mathematics context.

Interactive Whiteboards and 'e-Teaching'

An interactive whiteboard set up involves the image generated by a computer being projected onto a touch sensitive screen the size of a conventional whiteboard, where the touch of a pen is the equivalent to a mouse click. It is simply a touch screen computer with a very large screen, however "the interactive whiteboard is more than a computer, a projector or a screen – its sum is greater than its parts" (Glover 2001). Lee and Boyle (2003) state, "after noting how the technology is now being employed at Richardson, the generic term 'interactive whiteboard' fails to communicate the immense education capacity of the tool. In reality Richardson is using the technology as a large-scale, digital convergence tool."

IWBs have allowed teachers to take advantage of power of ICT within the 'teaching' component of the teaching and learning process in ways that that are just not possible with the traditional personal computing approach to ICT in schools. The term 'e-teaching' has be coined to describe the new pedagogy that is evolving promoted by the use of the IWBs. Succinctly, 'e-teaching' involves the use of ICTs to enhance the art of teaching. Harnessing the potential of digital technology in presenting a concept, exploring implications, placing the concept in various contexts, creating links with existing knowledge, and leading discussions that probe student understanding and allow students to take their learning in personally relevant directions. e-Teaching is essentially a group activity and so sits comfortable within a classroom. The group can range up to the size of a normal class group. In this way e-teaching differs from conventional approach of incorporating ICTs into teaching programs, where normally the

activities are aimed at the individual or small group.   e-Teaching is a move along the spectrum away from a didactical pedagogy to a more interactive one. Students can not only interact with IWBs in ways that are simply not possible with a standard whiteboard, they can also interact with the content and context of the lessons by digitally capturing and manipulating their work and local environment, incorporating it within the lesson and sharing it with the group. e-Teaching involves teachers managing this convergence of digital information from a wide range of sources and devices when presenting, discussing and reflecting upon a concept with a class group. In an 'e-teaching' context, a multi-literacy teaching and learning environment is standard. The students' experience with computer games and TV enables them to easily relate with the multi-media, multi-sensory, multi-faceted style of lessons e-teaching promotes.

e-Teaching Generalisations

As the use of IWBs within schools increases and becomes more mainstream it has been possible to evolve the concept of 'e-teaching' from the broadest of notions, that is 'Using ICTs to enhance teaching'. e-Teaching as a pedagogical concept has developed into a number of generalisations which teachers in any context can practically apply to enhance their classroom practice.

E-Teaching Generalisation One – IWBs facilitate Digital Convergence

In some ways an IWB can be thought of as a touch screen computer the size of a regular whiteboard. As such any device or program that can operate on a computer will work on with an IWB. In a classroom context this results in a wide range of digital tools being able to converge through the IWB. Moving between viewing a DVD, to the Internet, making notes in a word document and collecting information from a data logger is now possible with only a few clicks on the board.

For the class to access technology in the classroom, teachers no longer have to wheel TVs and DVDs into and out of the classroom; or organise Computer lab bookings; or cycle students through pods of computers in small groups.

In a Maths context, teachers with an IWB now have a wide range of ICT possibilities available to support their teaching. When and as required, teachers can easily move between using virtual graphics calculators, spreadsheet programs, learning objects and Maths based software applications. In order to respond to and engage students in their learning, teacher can use 'real world' examples captured via a digital camera, or use 'live' data sourced in real time from the Internet.

The teacher still manages the learning environment, leading the discussion, posing questions, responding to student suggestions, but now they can do so fully supported by a wide range of technology, rather than just a stick of chalk and their voice. Enhanced teaching is a natural outcome when teachers can take advantage of the potential that digital convergence provides.

E-Teaching Generalisation Two – Using an IWB to promote intellectual quality within student learning through substantive discussions based on content that can be easily manipulated.

The content of a traditional whiteboard is not very interactive. Often once the content has been written on the board in order to explore an idea with the class that content is probably erased and re-written in a different form. Reverting to the original content is often not possible without another process of erasing and re-writing. Interacting with content printed on paper is often even more difficult.

IWBs, either via lessons created with their 'flipchart' software or via the use of various forms of learning objects allows for content with which the class can interact. Through interactions with the content of the IWB teachers can:

- o promote higher order thinking, easily shifting the students' focus from merely remembering the content to gaining an deep understanding of concept being taught.
- o Lead substantive conversations that allow the class to create or negotiate understanding of the subject matter.

Teachers can easily present knowledge as problematic, open to multiple interpretations, rather than fixed. Within a Maths classroom this means that teachers can lead discussions that probe student understanding of Mathematical concepts without being limited by the students' arithmetic abilities.

### Example 1 – 'Perceptual' Number Skills

In a junior primary setting the same concept of interactive 'play' based around interactive content on an IWB is used to assist in the teaching of basic number skills.
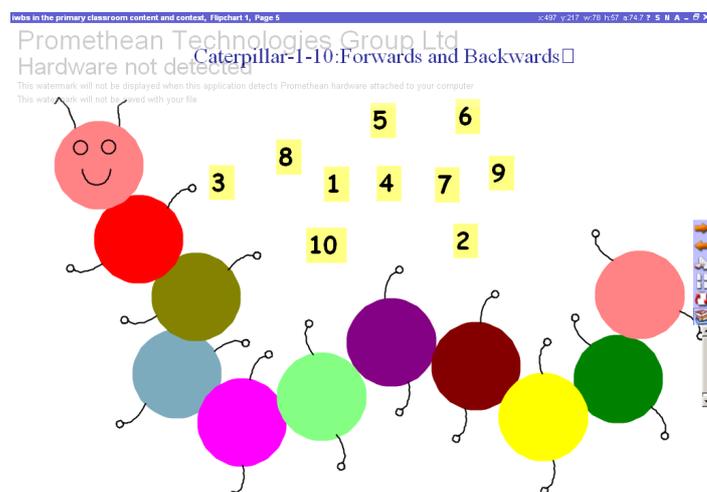
The above graphic is an Interactive Whiteboard activity inspired by a 'Count Me In Too' (http://www.curriculumsupport.nsw.edu.au/maths/countmein/) activity and used to enhance the teaching of this numeracy program.

In this activity the teacher would lead students in exploring 'perceptual' number skills. Students would drag the numbers onto the caterpillar's body in the correct order. Teachers can promote intellectual quality and substantive discussions by varying the starting position and counting forwards and backwards from that point. Further, teacher could assist students in exploring the concept of skip counting.
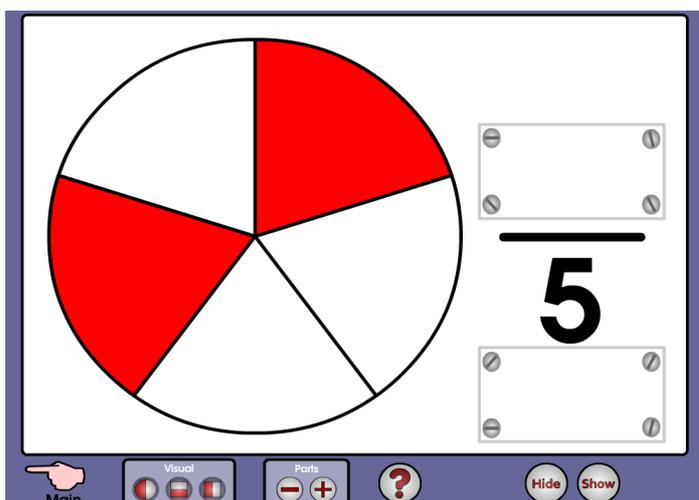
Learning objects, Flash and Shockwave activities and Educational CD ROMS are other examples of IWBs being able to provide content for a lesson that students can interact with.

Not only can teachers explore various concepts and present knowledge as problematic, the IWB can be used to model the operation of a learning object to a class, ensuring that make the most effective use of the digital content in their learning activities.

E-Teaching Generalisation Three – Taking advantage of digital convergence, IWB technology allows teachers to modify the context of the lesson in order to engage students with real, practical or hypothetical problems that connect to their world.

Much of the richness of adopting an e-Teaching approach is when the class can capture the students' 'world' digitally and then use what is captured as part of the lesson. Through this interaction with the context of the lesson teachers can:

- o Connect the classes learning to the world beyond the classroom
- o Engage the students in learning that is relevant to their everyday life
- o Ensure that the curriculum has a real world focus.
- o Truly negotiate with the class the context of the curriculum within which they will study the defined learning outcomes.

An IWB connected to the Internet or Encyclopaedic CD ROM can act as an 'information pump' resourcing the teacher and the class such that concepts can be taught in a context determined by the interests of the students.

Example 3 – Reflection and Symmetry in a junior primary context

Rather than completing symmetry tasks for pictures from a book, students identified symmetrical objects in the room and a digital photo was taken of the object. The photo was displayed on the IWB and an opaque square was placed over half of the object, along the axis of symmetry, covering half the image. The students estimated and drew the outline of the covered half of the object, drawing on top of the square. The square was then moved away and the students were able to
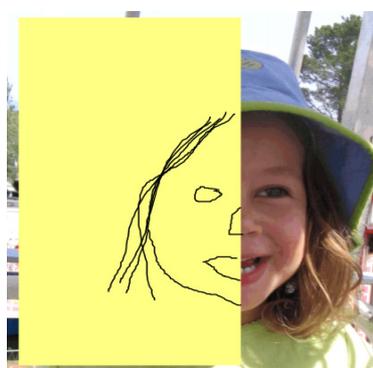
assess the accuracy of their estimation of symmetry. The most engaging symmetrical object was students' face.

Example 4 – Live Data

During 'Chance and Data' lessons teachers can apply this generalisation by sourcing 'live real world' data from internet sites that relating to the interests of the students, rather than relying solely on the contexts and data provided within the text books or by rolling dice.

E-Teaching Generalisation Four – As all lessons and work completed on the IWB can be saved; teachers and students can use IWBs to easily create complex connection between previous learning across all KLA.

Taking advantage of a computer's ability to save and retrieve files, teachers using IWBs have the ability to retrieve and display and previously taught lesson in a matter of moments. Teachers never again have to say, "Remember when?" when wanting to make a connection with prior student learning. Equally students can be empowered to ask "is this like when…" to which the teacher can respond by opening the appropriate lesson, allowing the students to drive the connections themselves.

Example 5 – Year 6 teacher lead scaffolding

When teaching a year 6 maths class the concept of decimals, the teacher became aware that a number of students were having difficulty with the idea of numbers less than 1, even though they had started developing an understanding of this concept in a previous unit on fractions. The teacher decided to start every decimal lesson by retrieving the fraction lesson that covered the same general concept. The teacher then helped the class to see the similarities between fractions and decimals, allowing students to gain a deep knowledge of the concept by scaffolding their new learning onto pre-existing understandings.

Example 6 – Year 4 student lead scaffolding.

During a Health lesson a year four class was sorting their lunches out on a table, collecting the items into food groups. Once the food was sorted the students were required to draw bar graphs of the results.

In the middle of the lesson one student asked "Is this like when we did bar graphs in maths last term". The teacher replied with "Let's find out" and proceeded to retrieve and open the bar graph lesson from last term. The class then had a discussion that enabled them to scaffold and create links between these two pieces of learning.

Applying e-Teaching

IWBs, and e-teaching, are still relatively new. There is no lock step guide informing us how to 'e-teach'. However teachers know how to teach. They know how to present concepts and information, guiding students through enquiry. This in essence is one of the major differences

between a teacher and a generally educated person off the street. Within an e-teaching framework, these fundamental qualities and skills of teachers do not change; they are enhanced through the use of IWBs.

The key to the success of IWBs and the implementation of 'e-teaching' is the professionalism of teaching staff. Teachers and their skill to teach is fundamentally the greatest asset that any school can have. Teachers should be motivated to base their use of an Interactive Whiteboards in the existing context of their professional skills and be encouraged to explore ways that the technology could enhance these professional skills by taking advantage of the principles of the e-teaching generalizations and the interactivity and digital convergence that IWBs provide.

References and Further Reading

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